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THE DENE-YENISEIAN CONNECTION

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Editors' Introduction**THE DENE-YENISEIAN CONNECTION:
BRIDGING ASIA AND NORTH AMERICA**

James Kari and Ben A. Potter
University of Alaska Fairbanks

1.0. INTRODUCTION**1.1. Background**

As we write this introduction to the 18 articles in the volume, it is just over two years since the Dene-Yeniseian¹ Symposium was held on February 26–27, 2008, at the University of Alaska Fairbanks and continued on February 29 at the annual Alaska Anthropological Association conference in Anchorage. The papers in this volume were either presented in an early form at the 2008 symposium or were solicited by the editors after these meetings. The lead article by Edward J. Vajda presents evidence for a very far-reaching historical linguistic hypothesis—Dene-Yeniseian. This hypothesis states that there is an ancient genealogical relationship² between Ket, the only surviving language of the Yeniseian family of languages in Central Siberia and the Na-Dene languages (the large Athabaskan family plus the Eyak and Tlingit) of northwest North America. Accompanying Vajda's paper is primary data on Na-Dene historical phonology by Jeff Leer, along with critiques by several linguistic specialists and articles on a range of topics (archaeology, prehistory, genetics, kinship, folklore) by experts in these fields.

The process of external scrutiny of Dene-Yeniseian continues with the publication of these papers. The evidence presented by Vajda is considerable, a good amount of potential grammatical and lexical cognates plus he has identified numerous systematic sound correspondences. Several authors note that traditional methods and standards of historical linguistic proof are being applied. According to Eric Hamp, the rapidity and decisiveness of this presentation of materials for Dene-Yeniseian are unprecedented for a proposed long-distant language relationship. If fully accepted by the broader academic community, Dene-Yeniseian would be the first substantiation of a language stock between Asia and North America. From its western Asian limits to its spread deep into North America, Dene-Yeniseian, would represent the farthest geographic distance for a pedestrian hunter-gather language stock. The geographic positions of the branches of Dene-Yeniseian are prompting a wide range of opinions as to the location and the antiquity of common Dene-Yeniseian.

Edward Vajda, trained as a Slavist, began studying Ket in 1990. He combed the extensive Russian and German sources on the Yeniseian languages and in 2001 published an annotated bibliography. In 1998, Vajda received funding from the Linguistics Department of the Max Planck Institute for Evolutionary Anthropology, Leipzig, to travel to Germany and Russia, where he worked with Ket speakers in Leipzig and Tomsk in 1998,

¹ Since January 2009 the editors and contributing authors have used the earlier and more established term "Yeniseian" in place of "Yeniseic."

² We follow Bernard Comrie's (this volume, footnote 1) use of "genealogical" when referring to descent from a common linguistic group and "genetic" when referring to human biological descent.

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2005, and 2006. In August 2008, Vajda was able to work on the language among the Ket population in their Yeniseian homeland. In the late 1990s Vajda began to write a series of articles on facets of Ket grammar, on topics such as Ket prosodic phonology and the origin of tones and the structure of the verb and its highly complicated morphophonemics. His fullest published treatment to date is his 105-page grammar of Ket (Vajda 2004). In his 2004 grammar, Vajda made no strong claims of a genealogical link between Ket and Na-Dene, writing: "My own research has noted significant parallels with Athabaskan-Eyak-Tlingit (though not with Haida). These are manifested in verb affixes as well as core vocabulary reconstructed by deriving the Yeniseian tones from simplified consonant articulations. The list of plausible cognates is still too meager to argue a strong case for genetic relationship" (ibid.:1). In the final section (ibid.:92), Vajda made these observations on Ket vocabulary: "Aside from the effects of language contact, Ket vocabulary shows no clear lexical affinities with other Eurasian language families. The inability of linguists to demonstrate a genetic connection between Yeniseian and other Old World families underscores the status of Ket as landlocked northern Asia's only language isolate."

The Dene-Yeniseian hypothesis has developed rapidly in the past four years. The August 2006 Na-Dene Workshop at the Max Planck Institute in Leipzig, organized by Vajda and Comrie, featured presentations by Na-Dene specialists Leer, Krauss, and Enrico, along with presentations by Vajda, Hamp, and Comrie. Comrie's summary of this one-and-a-half-day workshop, published in the *SSILA Bulletin* (2006), gave notice to the linguistic community that Vajda was presenting a serious new hypothesis linking Na-Dene and Yeniseian.

During the summer of 2006, Vajda and Kari began their correspondence. They saw the need for a conference focused on the Dene-Yeniseian hypothesis followed by a publication. Without any grant funding, Kari organized the February 2008 Dene-Yeniseian Symposium at the University of Alaska Fairbanks and at the Alaska Anthropological Association in Anchorage. Kari developed an email list with about 35 potential participants. In December 2007, a homepage was set up at the Alaska Native Language Center site (www.uaf.edu/anlc/dy.html), and a link at the UAF Rasmuson Library site had background readings and drafts of conference papers. About 30 scholars and UAF students attended the February 2008 symposium in Fairbanks. Several hundred persons attended the Anchorage presentations, which culminated in a lively discussion session.

Immediately following this symposium, a position statement drafted by Nichols, Vajda, and Kari (2008) was circulated in English and in Russian (partially quoted here):

A long-sought connection between Siberian and North American language families has been demonstrated by linguists from Washington and Alaska. Professor Edward Vajda of Western Washington University (Bellingham), a specialist on the Ket language isolate spoken by a shrinking number of elders living along the Yenisei River of central Siberia, combining ten years of library and field work on Ket and relying on the earlier work of Heinrich Werner on the now-extinct relatives of Ket, has clarified the dauntingly complex morphology and phonology of Ket and its Yeniseian congeners. At [the Dene-Yeniseian Symposium] Vajda shows that the abstract forms of lexical and grammatical morphemes and the rules of composition of the Ket verb find systematic and numerous parallels in the Na-Dene protolanguage reconstructed to account for the modern Tlingit and Eyak languages and the Athabaskan language family (whose daughters include Gwich'in, Koyukon, Dena'ina and others of Alaska, Hupa of California, and Navajo of the U.S. Southwest).

For about three months in 2008 there was considerable notice on the Internet and in the news media about Dene-Yeniseian. Among the more prominent of these were feature articles in the *Anchorage Daily News* (March 1, 2008) and the *Toronto Globe and Mail* (April 9, 2008) and short notices in *Science* (sciencemag.org) and *National Geographic* (news.nationalgeographic.com).

Since the symposium Kari has been the moderator for the linguistic papers in this volume. Drafts of many of the papers have been circulating among the authors, and there have been extensive email discussions

among about fifteen scholars in the Dene-Yeniseian discussion group. Subsequent Dene-Yeniseian events include Vajda's lecture in October 2008 at the Alaska History Conference in Anchorage, a workshop on "Dene-Yeniseian natural history terms" in Fairbanks in June 2009, and a daylong session on Dene-Yeniseian at the LSA Institute and the Athabaskan Languages Conference at the University of California Berkeley (July 2009).

This volume represents the next stage in evaluating and exploring the Dene-Yeniseian hypothesis. Simply put, this hypothesis states that Na-Dene languages (Athabaskan, Eyak, Tlingit) and Yeniseian languages (e.g. Ket) are genealogically related; that is, that the similarities in various elements (lexical cognates connected by sound correspondences; numerous grammatical affixes, especially verbal affixes) are not due to chance or diffusion or convergence, but rather derive from a relationship to an ancient common language. In the past two years Vajda has added numerous refinements to the presentation on Dene-Yeniseian. Vajda, Kari, Hamp, and Fortescue have noted that there are still more promising lexical and grammatical cognates that can be proposed. If the DY hypothesis is correct, it has enormous significance to many important questions in Northeast Asia and Northwest North America, including the peopling of the New World and various Late Pleistocene and Holocene migration scenarios.

A wide range of views are expressed about the implications of the Dene-Yeniseian hypothesis for the peopling of the New World. Throughout the process of the publication of this volume, there was sharing of draft papers and data among the specialists, with a focus on facilitating discourse across disciplines. The conclusions, agreements, and disagreements within and between these interdisciplinary scholars are enlightening and suggest new questions to explore and new avenues to research.

In this introduction, we discuss the organization of the volume (section 2) and situate the geographic context of the Dene-Yeniseian hypothesis (including several general and linguistic maps (Maps A–D) for reference (section 3)). A number of these papers are highly technical, which illustrates in part the complexity of the subject matter as well as potential difficulties in fully integrating very different types of data often considered within separate methodological and disciplinary perspectives. Because of this, we provide critical summaries of each paper as they relate to the main research questions, relating to linguistic and ancillary (biological, archaeological, etc.) data bearing on the Dene-Yeniseian hypothesis (section 4). Finally, we summarize some research problems that point toward future discussions and collaborations (section 5).

1.2. Brief description of Na-Dene and Yeniseian language groups

Na-Dene (defined throughout the present volume as Athabaskan, Eyak, and Tlingit, but excluding Haida) is recognized as a language stock that is limited to North America. It consists of the large Athabaskan language family, which is the most widespread Native language family of North America, and two distant branches, Eyak and Tlingit (Maps B and D). Athabaskan languages are situated in western North America and in two discontinuous branches: on the Pacific Coast (Washington, Oregon, and California) and in the American Southwest (Apachean). The coastal Na-Dene languages, Eyak and Tlingit, are at the north end of the Northwest Coast linguistic area. Eyak, extinct as of 2008, was situated in a small area along the Gulf of Alaska (Krauss 1965, 1973, 2006). Krauss (1973:932) notes that "Eyak is coordinate with all of Athabaskan as one branch of a two branch Athabaskan-Eyak family." The Tlingit language is even more divergent from Athabaskan and Eyak. Many core grammatical features of the Tlingit verb are shared with Athabaskan-Eyak, but much of the Tlingit vocabulary appears to be unrelated. Until recently, it has been difficult to work out sound correspondences between Tlingit and Athabaskan-Eyak. However, Leer has in recent years made important advances on AET sound correspondences, the subject of his article in this volume.

In this volume, the terms *Na-Dene* and *Athabaskan-Eyak-Tlingit (AET)* are synonymous. The debate about the position of Haida is long standing, and for our purposes we exclude Haida, since the comparisons being made with Yeniseian have not yielded any new potential evidence that Haida is related within Dene-Yeniseian. Leer (1990:73) observed that the evidence for including Haida with Na-Dene phylum was inconclusive. The documentation on Haida is now abundant with the publication of Enrico's Haida dictionary (2005) and his thorough presentation of possible cognates or diffusions between Haida and Athabaskan, Tlingit, or Eyak

(Enrico 2004). In a recent review of Enrico 2004, Campbell and Poser (2008:280–282) conclude that Enrico's presentation of putative cognates for Haida with AET "falls short of being convincing." Therefore, we feel that Haida should still be viewed as a linguistic isolate. However, as Fortescue (this volume) notes, Haida and the Queen Charlotte Islands may have played an important role in early coastal migrations into North America. The interface area of Tlingit, Haida, and the Tsimshianic language has been a hub of linguistic diffusion along the Northwest Coast. Thus Haida lexicon and grammar remain important as a control on the rest of Na-Dene. The Haida verb has a mix of prefixes and suffixes; it does not mark subjects within the verb; it has a large amount of lexical diffusions shared between Tlingit, Tsimshian, and some Athabascan; and it has a large amount of unique non-sourced lexicon (as do Tlingit and Eyak).

The Yeniseian language family consists (at present) of a single language that has been considered to be a linguistic isolate, Ket, encompassing an area of 90,000 square miles in the middle Yenisei River basin (Map C). Other extinct Yeniseian languages are known from early Russian sources, including Yugh (extinct 1970s), Pumpokol (extinct early 1800s), Arin (extinct 1730s), Assan (extinct 1800), Kott (extinct in 1850s but well documented by Castrén in 1846–1848). Other small Yeniseian dialects or groups, whose names but not their languages were recorded by 17th century tsarist fur-tax collectors (Baikot, Yarin, Yastin), vanished by the early 1800s (Vajda 2001:xxvi, 2009) and cannot play a role in investigations of historical Yeniseian linguistics.

The papers in this volume focus only on the Dene-Yeniseian language relationship. We have not attempted to address proposals that include Ket and Yeniseian in larger language groupings such as Dene-Caucasian, Sino-Caucasian, or Karasuk (Ket and Burushaski). Vajda in his introduction states that the larger relationships that may or may not involve Dene-Yeniseian "deserve serious consideration." Comrie's article and Vajda's two articles provide references for these proposals by Starostin, Ruhlen, Bengston, and others. George Starostin and John Bengston presented papers at the 2009 Dene-Yeniseian session in Berkeley. Note that Vajda in his presentation of sets in his section 3 credits the Yeniseian materials he has incorporated from Ruhlen or Starostin. Campbell and Poser (2008: 280–285) in sections titled "Na-Dene" and "Beyond Na-Dene" give a history of proposals to include Haida with Na-Dene (by Sapir in 1915 and Greenberg in 1987) and the various long-range proposals for Dene-Sino-Caucasian, and they state, "the evidence presented so far falls short of making a plausible case" (ibid.:284). Campbell and Poser 2008 make no mention of Vajda's Dene-Yeniseian hypothesis, his draft paper having followed the completion of their book.

2.0. ORGANIZATION OF THIS VOLUME

The papers in this volume are presented in three sections: primary linguistic data (section 1), multidisciplinary perspectives (section 2), and commentaries (section 3). We provide a brief list of the articles here; more detailed summaries are provided in the next section. In section 1 Comrie provides an introduction to the Dene-Yeniseian hypothesis. Vajda then presents his first and second papers. The first is this volume's key paper, which presents in two long sections the grammatical evidence for Dene-Yeniseian and proposed cognate sets organized by the consonant series of Proto-Na-Dene. Vajda's second article is a reader-friendly popularized account of the previous research work on Ket and Yeniseian as well as stages in his own research during the past ten years.

Section 2 contains seven papers from a range of disciplines, that evaluate the Dene-Yeniseian hypothesis from multiple perspectives and discuss many of the implications. Scott and O'Rourke survey the biological literature for connections between Yeniseian and Na-Dene. Potter provides a broad synthesis of archaeological literature for Siberia and Northwest North America. Leer contains a new presentation of the consonant system for Na-Dene (aka AET), and a careful selection of cognate sets for three consonant series. Kari proposes that the Athabascan languages may be so strikingly homogenous for a combination of specific linguistic and ethnogeographic reasons. Kari posits an early entry into North America by the proto-Na-Dene language group. Ives, Rice, and Vajda provide a new compilation of Ket kinship terms and assess the Yeniseian kinship data in terms of Athabascan, Eyak, and Tlingit kinship materials. Berezkin gives

a summary based on the massive database he is assembling of worldwide folklore motifs. Kim-Maloney discusses a pair of Ket and Navajo myths that relate to insects that appear to have a cognate term, Ket 'dragonfly' and Navajo 'fly'.

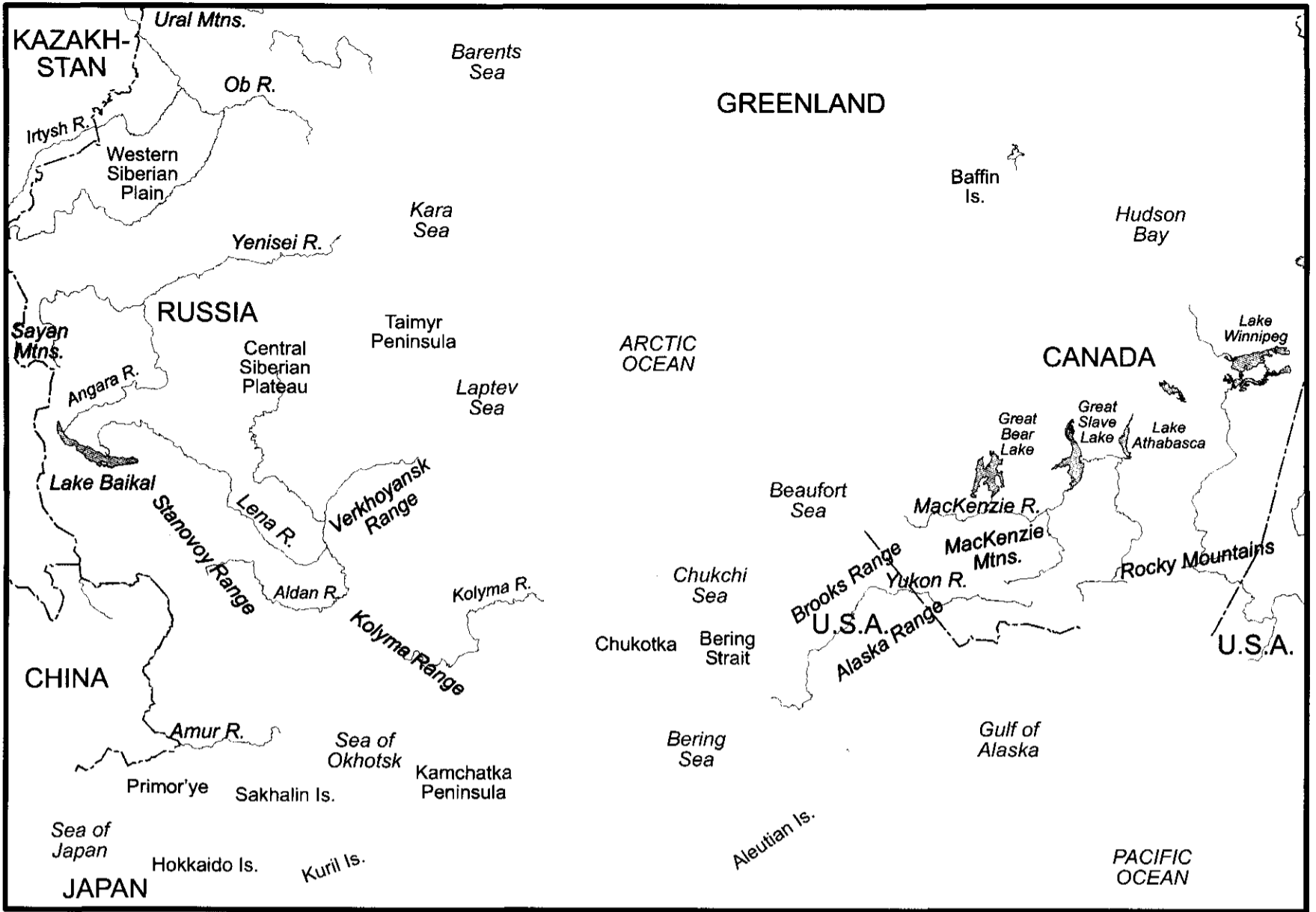
Section 3 consists of seven commentaries on various aspects of Dene-Yeniseian, from its evidentiary status to implications for prehistory. These commentaries are from five linguists and two archaeologists who critique Vajda's lead paper and/or discuss implications of the Dene-Yeniseian hypothesis. Eric Hamp assesses how Dene-Yeniseian can be viewed in terms of both early and more recent milestones in historical linguistics, and he strongly endorses Dene-Yeniseian in terms of the quality and quantity of evidence. Hamp also explains for us how the recent work by Leer on Proto-Na-Dene sound correspondences has contributed to the advances in Dene-Yeniseian. Johanna Nichols evaluates Dene-Yeniseian in terms of the statistical measures she has developed for proof of historical hypotheses. Nichols concludes that the Dene-Yeniseian morphological evidence, on its own, is proof of relationship and that the lexical evidence is "probable proof" of relationship. She comments that the quantity of evidence for Dene-Yeniseian suggests to her that the proto language was somewhere in Asia after Beringia was flooded. Michael Fortescue offers a proposal that if it can be shown that Tlingit is morphologically closer to Yeniseian than to Athabascan-Eyak, a westward migration of Yeniseian from North America to Asia may have taken place. Andrej Kibrik offers his assessment of Vajda's data for the Dene-Yeniseian hypothesis, being more supportive of Vajda's assembled lexical evidence than he is of the grammatical evidence. Willem de Reuse's article directs us toward the implications of the distribution of Yeniseian hydronyms throughout west-central Siberia. Two archaeologists, Jack Ives and Don Dumond, provide commentaries about the implications of the Dene-Yeniseian hypothesis, particularly in context with known patterning of genetics and archaeology for Northeast Asia and Northwest North America. Kari has assembled Appendix A as a guide for equating various technical writing systems and conventions used within this volume and in many of the previous sources on Na-Dene and Athabascan.

3.0. GEOGRAPHIC CONTEXT OF DENE-YENISEIAN

The geographic position of historic-contemporary Na-Dene and Yeniseian languages is a paramount issue as we begin to contemplate various spatial and temporal relationships of Na-Dene and Yeniseian ancestors, as well as early populations of surrounding language families (Uralic, Yukaghir, Tungusic, and Eskimo-Aleut). For orientation to this volume, we provide a series of general physical and linguistic maps for this introduction and for various papers in the volume (Maps A–D). All maps are in a North Pole Azimuthal Equidistant Projection.

Map A illustrates the major physiographic regions, rivers, mountain ranges, lakes, seas, and national boundaries for the area of interest, encompassing Northeast Asia, east of the Ob' River, and Northern North America. Map B is a general linguistic map of the same area; Northeast Asian linguistic data represent 17th-century distributions, derived from Dolgikh (1960, cited in Pakendorf 2007), and North American linguistic data are time-transgressive, at various points of early Euroamerican contact (generally between the 17th and 19th centuries) (Goddard 1996). For perspective, the North American map reflects other language family distributions. Map C is a Siberian language map, derived also from Dolgikh (1960), with Yeniseian toponymic data, derived from Vajda (2001) and Werner (2005:5), and extinct Yeniseian language locations derived from Vajda (2001:ix–xix; 2009). Map D is a more detailed linguistic map of North America, based upon the 1996 volume 17 map (Goddard 1996), with Na-Dene updated from Kari's map in Jetté and Jones (2000:xlvi).

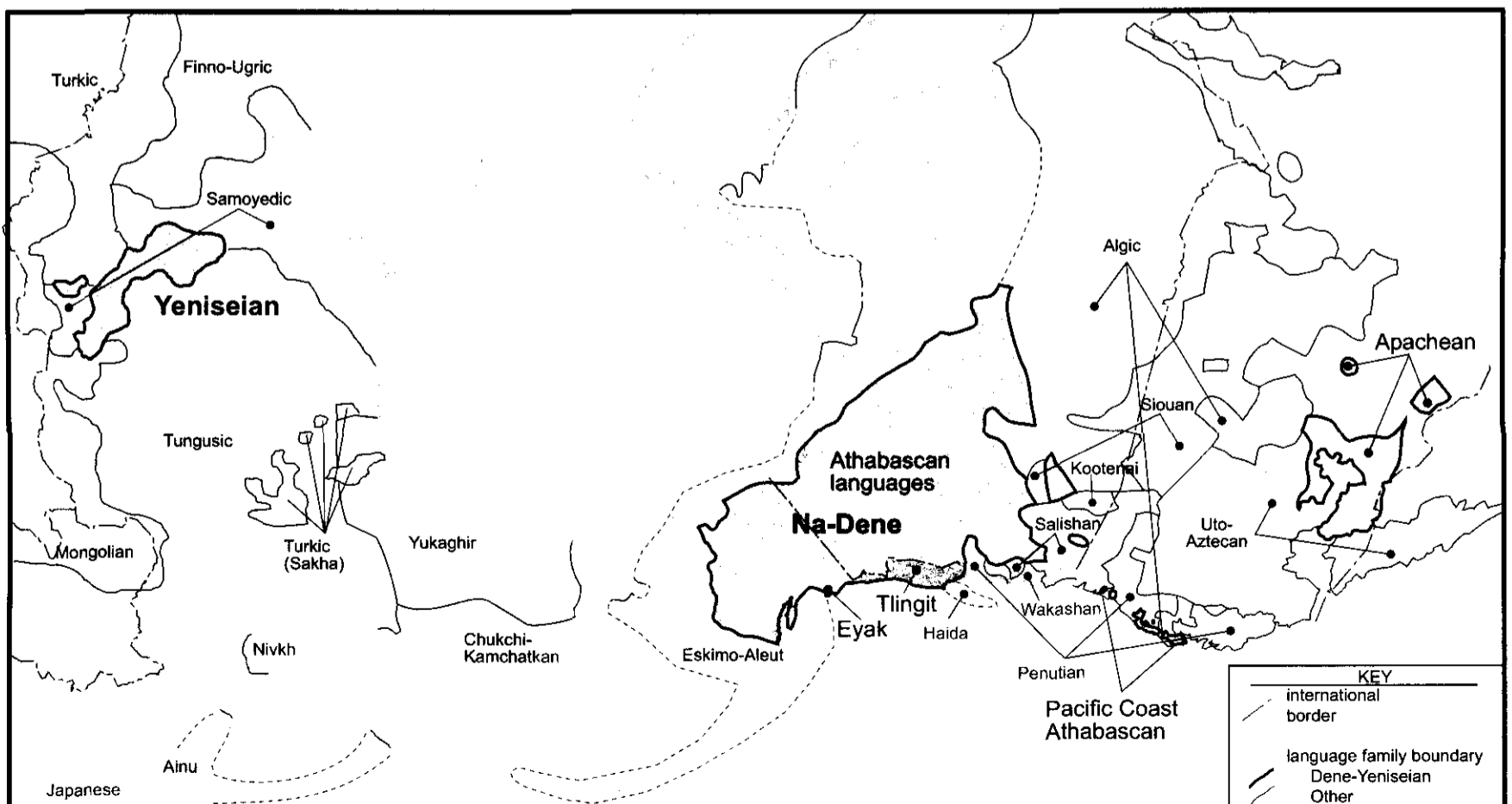
Na-Dene languages are located entirely within North America. Athabascan languages represent a widespread (1,563,000 mi²), relatively homogeneous language group, largely situated in the western Subarctic of North America, with branches along the Northwest Pacific Coast (Alaska, Washington, Oregon, and California) and a southern group in the U.S. Southwest (Maps B and D). Na-Dene is contiguous in the northern area, stretching from Western Alaska to Hudson Bay, whereas Athabascan languages on the Pacific Coast and in the Southwest United States are discontinuous, representing approximately dateable southern migrations from the northern areas (see Ives, this volume). Eyak is situated in a small area on the south-



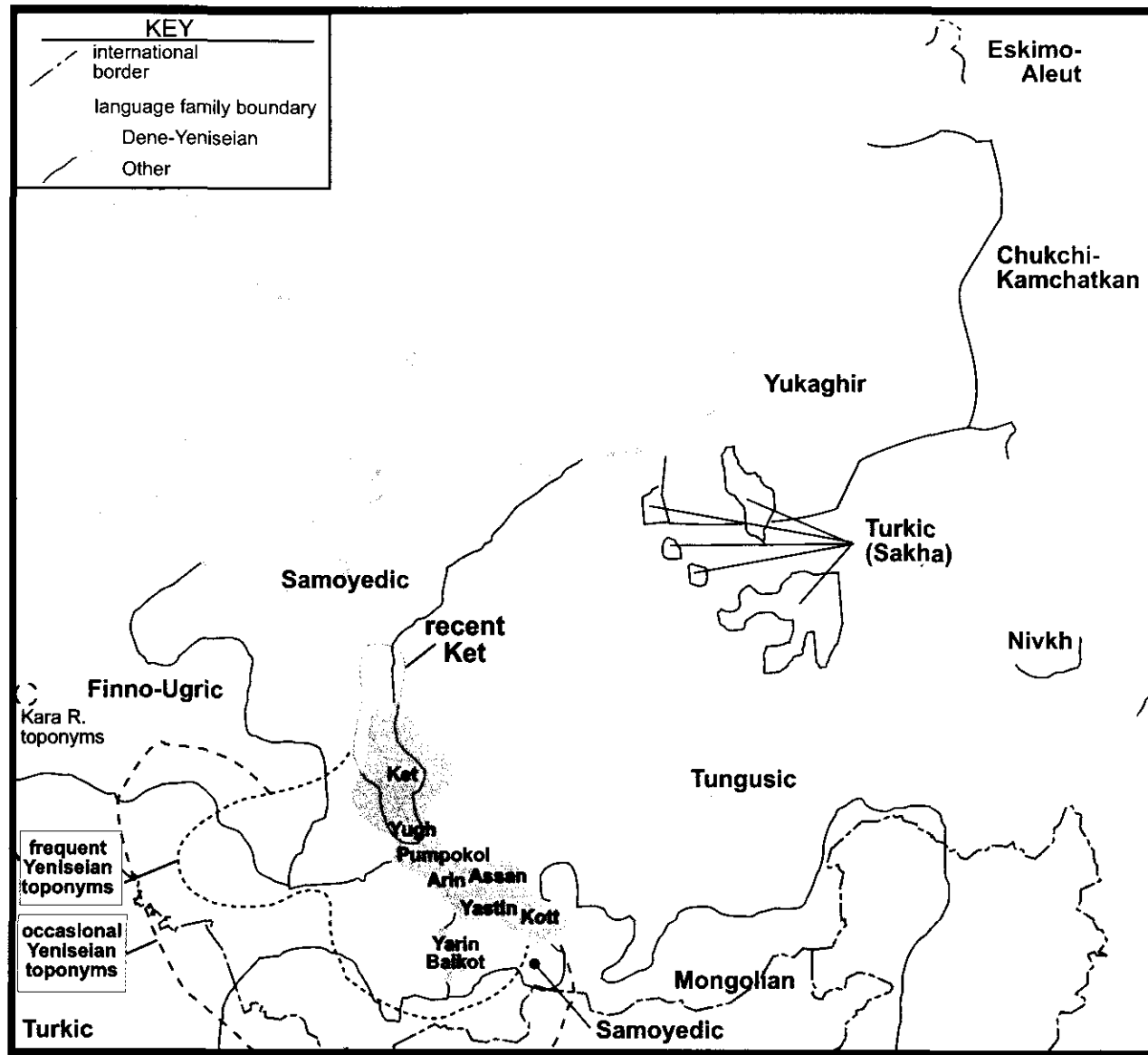
The Dene-Yeniseian Connection: Bridging Asia and North America

MAP A. Physical Map of Northeast Asia and Northwest North America

James Kari and Ben A. Potter



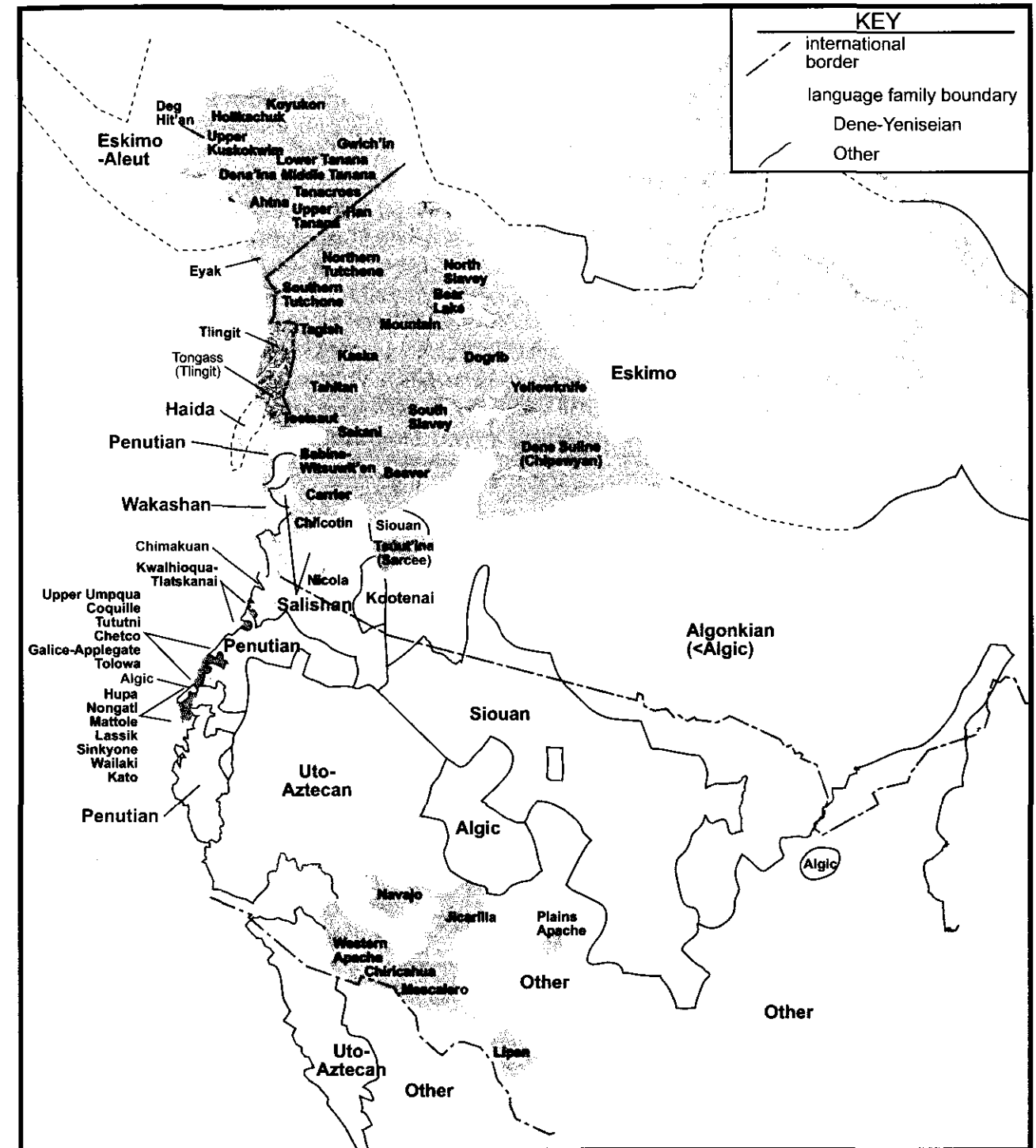
MAP B. General Linguistic Map of Northeast Asia and North America (data from Goddard 1996, Dolgikh 1960, Jetté and Jones 2000; see text)



MAP C. Northeast Asian Linguistic Map (data from Dolgikh 1960; Vajda 2001, 2009; Werner 2005)

central Alaska coast. Tlingit is located along the southeastern Alaska coast and adjacent interior (Map D). Map D, with 53 Athabascan language and dialect groups, serves as a reference map to several articles (e.g. Kari, Ives et al., and Leer).

In contrast to the geographically widespread Na-Dene languages in North America, Yeniseian languages are spoken today by one to two hundred Ket speakers who live in fewer than a dozen small villages along the middle Yenisei River basin in central Siberia (Map C). The location of the most southerly and easterly Ket is the Mountain Tunguska River, while the most northerly ones live in Kureika and Maduika, slightly above the Arctic Circle. The most westerly Ket live in Kellog village along the Yelogi River. When we circumscribe the Ket language area it is about 90,200 mi² (which is a bit smaller than the state of Oregon). However, Vajda (p.c.) points out that such a figure is misleading as much of this area is uninhabited swamp and forest. Moreover, the current geographic position of Yeniseian presents only a fraction of a larger language family. Fur tax records from the 17th century (Dolgikh 1960) and Yeniseian toponymic data (Vajda 2001, Maloletko, 2002, and Werner 2005) illustrate a widespread distribution of Yeniseian speakers, of perhaps 960,000 square



MAP D. North American Linguistic Map (data from Goddard 1996; Jetté and Jones 2000)

miles. More ancient territory occupied by Yeniseian speakers is further to the southwest in areas now occupied by Turkic peoples in South Siberia. As discussed by Vajda (2001:4), "The noted Turologist Wilhelm Radloff took the first steps in using toponymical data to determine the probable prehistoric distribution of the Yeniseian-speaking peoples." In the mid-20th century the prolific A. P. Dul'zon "proved the former presence of a Yeniseian substrate among the Chulym Tartars and worked out the geographic distribution of

Yeniseian substrate toponyms" (also Radlov 1884, Dulzon 1950, 1952, 1959; as well as Maloletko 2002, Werner 2005:3–5). It is fascinating to contemplate how and when this western substrate developed, presumably via population mixture and bilingualism between Turkic and Yeniseian. Also, the absence of a similar substrate to the east is intriguing (see de Reuse, this volume). Coupled with the lack of evidence of linguistic groups in the Lena basin prior to recent Tungusic migrants, these lacunae likely form a key piece in understanding early Yeniseian prehistory (see Potter, this volume).

If Na-Dene and Yeniseian-speaking populations were originally a common population and a set of adjacent languages, it is not a simplistic endeavor to situate this group within the geography of Northeast Asia and Northwest North America. Approximately 3230 miles (5200 kilometers) of taiga boreal forests, tundra, and the Bering Strait separate the nearest Ket villages from the nearest Athabascan villages (of the Deg Hit'an). Nichols (2008, this volume) notes that with a distance from the end points of the branches of Dene-Yeniseian (northernmost Ket to Lipan Apache) of about 6840 miles (11,000 km), Dene-Yeniseian represents the largest pedestrian language spread on Earth.³ Furthermore, if we model back in time from the present (Potter, this volume), it appears that the combined branches of Yeniseian and Na-Dene, for a long and continuous period, perhaps 6000 years, may have maintained the largest hunter-gatherer territories in the world. For comparative purposes, we have listed in Table 1 various geographic estimates of these two language groups.

TABLE 1. Estimated geographic distributions of Yeniseian and Na-Dene language groups

Language Area	km ²	mi ²
Yeniseian (Ket) (1 language)	234,000	90,200
Yeniseian (17th century, fur tax records, Dolgikh 1960) (7 to 9 languages)	495,000	191,000
Yeniseian hydronyms, frequent (Vajda 2001)	1,675,000	645,000
Yeniseian hydronyms, frequent + occasional (Vajda 2001)	2,491,000	960,000
<hr/>		
Northern Na-Dene (34 languages)	3,755,000	1,458,000
Eyak (1 language)	2100	800
Tlingit (1 language)	147,000	57,000
Northern Athabascan (32 languages)	3,600,000	1,400,000
Apachean (7 languages)	400,000	155,000
Pacific Coast Athabascan (14 languages)	21,800	8400
Total Athabascan (53 languages)	4,022,000	1,563,000
Total Na-Dene (55 languages)	4,177,000	1,621,000

4.0. PRELIMINARY PATTERNS

For the purposes of this summary, we divide the articles and comments in this volume into two groups, those dealing specifically with linguistic and folklore/kinship data and those dealing with genetics, physical anthropology, and archaeology.

³ Interestingly, an Upper Kama River group of apparent Yeniseian toponyms may represent a migration of a band of Ket in the 16th and 17th centuries (via Werner 2005:2–5). The Kama River is west of the Urals and about 600 miles west of modern Ket. Consider the 16th–17th century spread of Dene-Yeniseian: from west of the Ural Mountains to northern Mexico and the southern perimeter of the Apaches.

4.1. Linguistic data and nature of the Dene-Yeniseian connection

Bernard Comrie, author of *The Languages of the Soviet Union* (1981), has been familiar with Vajda's research for more than 20 years. Comrie summarizes the geographic settings of the languages in this volume. He notes how several of pieces of Vajda's evidence show systematic sound change and the sharing of rare and highly marked grammatical affixes. Comrie concludes, "The data presented here can be considered a prima facie argument in favor of the Dene-Yeniseian hypothesis: the examples of regular correspondences between the two families give rise to predictions that can be tested. . . . Only a broader discussion following on its publication will tell whether this hypothesis will be accepted by the linguistic community."

Vajda's lead paper took its beginning from three lectures he presented at the Max Planck Institute in 2005 and 2006. In the past two years there have been eight circulating drafts prior to the final version published here. The paper has been closely critiqued by about 10 linguistic specialists. Here we summarize several salient points. In the second section of the paper, Vajda compares the modern Ket verb with a model of the proto-Yeniseian verb of perhaps 2000 years ago. He then surveys the verb structure in four other prefixing languages that upon inspection do not bear much close resemblance to Ket or Na-Dene. In section 2.2 Vajda examines more closely the verb structure in Tlingit, Eyak, Navajo, and Generalized Athabascan and then presents a more detailed account of the verb complex in Proto-Yeniseian. This section sets up his discussion of the specific correspondences he proposes in section 2.2.1 for the tense-aspect-mode (TAM) verbal affixes for common Dene-Yeniseian. This section presents evidence that three Dene-Yeniseian TAM prefixes and three suffixes appear cognate in shape and function. Three linguists (Nichols, Comrie, and Hamp) feel that the quirky nature of these TAM correspondences is especially convincing of common origin. Vajda's section 2.2.2 surveys the pronoun systems where numerous items do not appear to be cognate. Ket's complicated agreement systems have been impacted by convergence with its neighbors. Vajda is tentative about cognates among the pronouns. He suggests five pronouns and pronominal affixes that may be cognate between Yeniseian and Na-Dene and states that additional work can lead to other core pronouns being cognate as well. His section 2.2.3 suggests that three of the shape or qualifier prefixes between Yeniseian and Na-Dene are cognate. His section 2.2.4 surveys the complicated classifier positions in the Na-Dene verb that do not have direct counterparts in Yeniseian, though Yeniseian may contain cognates to at least some of the morphemes that coalesced into the Na-Dene classifiers. Vajda offers some examples of verb roots in Na-Dene and Yeniseian that seem to share lexicalized classifiers before the verb root. He also discusses the frequently occurring noun-forming instrumental suffix *ł*, which is cognate in Dene-Yeniseian. This suffix appears in a few bimorphemic cognate items like 'hanging hook' and 'club'. Vajda suggests that while the causative (transitive-increase) function in Na-Dene is not present in Yeniseian, the *ł* instrumental suffix is a plausible precursor to the *ł* classifier. He also suggests the Na-Dene **dā* (transitivity decrease) classifier may have a precursor in some uses of *d-* in Yeniseian and Na-Dene as an auto-instrumental, 'one's own' prefix. As Kibrik notes in his paper, the powerful classifier system of Na-Dene is not present in Yeniseian. In section 2.3 Vajda presents what appears to be an aberrant shared archaism found in only two languages, Kott and Eyak, the 'action nominal derivation.' These two languages share an intricate formula: **s+verb root+n*. Vajda's section 2.4 is a brief summary of the correspondences in the preceding sections, in which he has posited that nine verbal affixes in Yeniseian and Na-Dene are cognate; several others are potential cognates (homophonous affixes such as *dā*, or 'plural' *n* [Yen. suffix but Na-Dene prefix]).

Vajda's section 3 works through his proposed systematic sound correspondences based upon a selection of about 100 possible cognates. He summarizes some of the main consonant mergers and rules for the reduction of consonant codas in Yeniseian. In five tables he presents Na-Dene (Athabascan) tonal systems that correlate with four tonal contours in Yeniseian. Then in two tables he presents some possible cognates in sonorants and a few stems with nasal followed by a glottalized consonant. Then he presents the obstruent series correspondences in twelve tables. Throughout section 3 Vajda cites many of the affixes presented earlier in section 2. In section 3 Vajda has about 140 citations of potential Dene-Yeniseian cognates. Many of the items are listed twice and thrice to illustrate differing correspondences. With multiple listings, about 90 individual, distinct stems and roots are in section 3. Altogether in Vajda's lead paper and in the kinship

paper (Ives et al.), Vajda has posited Dene-Yeniseian cognates for about a dozen grammatical affixes or grammatical stems (such as pronouns) and just over 100 lexemes.

Carrying added weight are the several multi-morphemic DY cognates that Vajda has found. Nouns include 'hair of the head,' 'club' and 'hanging hook.' The doublet verbs themes in his Table 20 are quite striking. Ket/Yugh/Arin verbs of 'see' vs. 'look at' share with Proto-Athabaskan two contrasting cognate classifiers Yen. \emptyset vs. $\chi/q/\text{ʃ}$:: PA \emptyset vs. l plus cognate verbs roots. (In PA \emptyset is in 'glimpse' and l is in 'look at'). Vajda notes that in Arin three pieces of the verb theme 'look at' appear to be cognate with PA: Arin *ng-l-on* and PA *ne-l-en*. Thus this set has survivals of three parts of a discontinuous verb theme. Elsewhere (such as sections 2.2.4 and 2.3 and footnote 28) Vajda mentions numerous other potential cognates—'earth,' 'stream,' 'spend the night,' 'thought'—for which specific sound correspondences or etymologies cannot yet be stated. Not included in Vajda's paper are other possible cognates noted by Fortescue, Hamp, and Kari. Vajda's presentation of DY sound correspondences will also be subject to further review. Eric Hamp's Tables 3, 4, and 5 highlight the extremes of the consonant inventories of the two branches, where Proto-Na-Dene has one of the world's larger inventories with 43 consonants (in Hamp's configuration) and 51 consonants (in Leer's configuration), whereas Proto-Yeniseian has about 20 consonants and Ket only 13 (in Hamp's configuration).

With the publication of these articles, the Dene-Yeniseian hypothesis will begin to receive extensive and independent scrutiny. In long-established language families there are debates about the evidence, about proposals for specific cognates or of sound correspondences or of sequences of changes. Vajda as well as the volume editors welcome scrutiny of the methods, the putative cognates, and the data sources. Several authors in the volume are of the opinion that the case for the Dene-Yeniseian will become stronger with further investigation. The 115 or more potential cognates within Vajda's paper may vary in degree of certitude, and Vajda has offered reservations about specific forms. Vajda has organized the sets in section 3 by the current knowledge of the Proto-Na-Dene sound system, and he supplies an array of systematic sound changes. At least 10 grammatical affixes appear to be cognate in form and function, and the affixes follow regular sound correspondences that also operate in lexical roots for Dene-Yeniseian. Many of the verbal affixes are even in similar positions left to right with respect to a final verb root. Some pieces of Dene-Yeniseian discontinuous strings have been detected, and these can be considered some of the rarest types of structures cross-linguistically.

Even prior to publication, the Dene-Yeniseian hypothesis has provoked a great deal of interest and is being treated in the linguistics community as a serious proposal. We can tally the positions of the linguists who are contributors to this collection. Numerous evaluative statements by these authors are embedded within their papers.

- Proven: Comrie, Hamp, Kari, Nichols
- Promising but awaits further scrutiny: de Reuse, Fortescue, Leer
- Not yet sufficiently supported: Kibrik

Several linguists external to this volume have evaluated Vajda's work. One published statement by the Australian linguist Nicholas Evans is based upon his reading of Vajda's March 2008 draft. Evans titled a section of his popular book (2010:124) "Long Lost Subarctic Cousins," in which he writes: "Although the evidence for a connection between the Yeniseian languages and Na-Dene has not yet reached the point of convincing all linguists, it is rapidly shaping up." Senior Athabaskanist Michael Krauss actively participated in the 2008 symposium and has commented extensively on drafts of Vajda's paper. On the evening of Feb. 27, 2008, Krauss stated, "You can say that I became a convert to Dene-Yeniseian yesterday when we found explanations for some heretofore unexplained features of Eyak and Athabaskan." In a recent comment, Victor Golla (2010:22), who reviewed Vajda's lead paper, wrote: "... historical linguistics has scored a major triumph by demonstrating beyond a reasonable doubt the existence of Dene-Yeniseian, a language family with approximately the time depth of Indo-European..." Thus, the opinions of the linguists most closely involved for the past two years are largely in support of Dene-Yeniseian.

Vajda's selection of data for the sets in sec. 3, as is routine in historical linguistic debates, will undergo

review. We can comment that the sets represent a broad semantic spectrum of the Dene-Yeniseian lexicon (nouns from a range of domains, a few incorporates, verbs stems, an array of grammatical affixes). Virtually all the Na-Dene forms are from published sources and a vast majority of the forms are widely distributed and well known to Athabaskan and Na-Dene specialists. Vajda does not consistently state or mark how rare or robust the Yeniseian forms are, but he does make note that some Yeniseian forms are obscure or rare (see Table 32 and 'blood'). When the semantic closeness/leeway of his forms is reviewed, we find many strong semantic matches ('liver,' 'birch,' 'conifer needles,' 'mosquito,' 'cry,' 'wart,' 'shamanism'). Some may be debatable or tenuous (Table 29 ND 'sharp' matched with Y 'claw,' 'fingernail' or Table 38 ND 'cloud' with Y 'dark'). The semantics of some sets could be amplified with commentary. Take for example one of his proposals (in Table 37):

PA *ge's 'king salmon' Ket *kē*'s 'burbot' (fish)

While the meanings are not identical, they share some biogeographic and economic attributes. Burbot are widespread throughout the circum-subarctic but are a low-priority food fish. Proto-Athabascans would have encountered a new species, 'king salmon,' in Western Alaska. The most common Alaska Athabaskan term for 'burbot' is *čʷa nəyə, which is deprecatory in meaning: 'funny living thing'; thus it is plausible that in Proto-Dene-Yeniseian, the original meaning was 'burbot'.

The paper by Ives et al. (this volume) raises numerous interesting questions. The authors assess the differences in the Na-Dene and Yeniseian kinship systems, noting three detectable cognates in Dene-Yeniseian and Na-Dene in kin terminology. They comment, "More pertinently, Krauss (1977:32) noted that Proto-Athapaskan *-unəyə (eB, eFBS, eMZS) is the only one of the four Athabaskan sibling terms that is demonstrably cognate with an Eyak (♂ -χəwəχ) and Tlingit sibling term (♂ húnχ?)" (Ives et al., this volume). Checking through Krauss's 1977 manuscript, for Proto-Athabaskan more than 30 kin terms can be reconstructed. There are more than 20 roots in Athabaskan with a specific kinship meanings. Koyukon itself has 22 roots with specific kin meanings. Eyak has about a dozen kin terms that are cognate with PA terms. But Ives et al. ask why Tlingit has so few kin terms cognate with Athabaskan or Eyak. We think that this is yet another measure of the early separation of Tlingit from Athabaskan and Eyak. Ives et al. suggest that the apparent divergence between Ket and Na-Dene kin terminologies can be explained by "predictable developmental processes" relating to factors selecting for kin group exogamy. Possible antecedent Dene-Yeniseian kin systems are then discussed.

Yuri Berezkin (this volume) offers a fresh look at the distributions of myth motifs between Asia and North America. While he has noticed no direct parallels between Yeniseian mythology and Northern Athabaskan, we have been making Berezkin aware of the extensive gray literature and unpublished sources on Tlingit and Athabaskan folklore, which could contain additional parallels to Yeniseian folklore. At this time what we find most interesting of Berezkin's findings are the shared motifs between Algonkian and Northern Athabaskan. These diffusions can be quite ancient.

As editors of this collection of articles, we have attempted to bridge the many asymmetries in our knowledge of the languages under consideration. While there is a rich and complex literature on Na-Dene, most of the Ket-Yeniseian literature is in German and Russian with only the recent items being in English. We can note that the Na-Dene specialists at the 2008 symposium know Ket or Yeniseian data mainly as it has been presented by Vajda. Numerous references on Ket and Yeniseian are provided in Vajda's two articles (this volume). The disposition of data on Na-Dene languages is highly complex, and there are extensive primary sources, many unpublished sources, and numerous alternative technical writing systems (as noted in Appendix A). Extensive Na-Dene linguistic references can be found in various papers in this volume (e.g., Vajda, Kari, Leer, Ives et al.).

4.2. Biological data: Genetic relationships and colonization events

To address the question of genetic relatedness of extant Na-Dene and Yeniseian groups, Scott and O'Rourke (this volume) summarize the current biological data on these and neighboring groups in

Northeast Asia and Northwest North America. Additionally, the papers by Potter, Ives, Fortescue, and Vajda (this volume) discuss genetic analyses that bear on associations of archaeological cultures and biological populations (and associated linguistic affiliation) and different models of colonization of the Americas. We summarize here the basic findings as they bear on the archaeological, biological, and linguistic prehistory of these regions.

Scott and O'Rourke provide a comprehensive review of current data on biological relationships among Northeast Asian populations in general, and Ket in particular, with respect to Northwest North American populations. These datasets comprise primarily genetic data (mtDNA, Y chromosome), but physical anthropological data (e.g., dental characteristics) are also considered. Their key finding is that there are no obvious direct links between current Ket and current Na-Dene populations, citing among others the one paper primarily designed to evaluate the Dene-Yeniseian hypothesis (Rubicz et al. 2002). Ket populations generally cluster with their Siberian neighbors (Samoyedic and Tungusic speakers) while Na-Dene populations generally cluster with their North American neighbors (e.g., a sister branch with Eskimo) as well as with Russian Far East groups Chukchi, Koryak, and, intriguingly, the Nivkhi (located in the lower Amur/Sakhalin Island area). Distinctive mtDNA haplogroups like D2 (found in Na-Dene, Eskimo, and Aleut) are not shared by Ket and Na-Dene populations. No rare genetic markers are shared exclusively between the groups. Scott and O'Rourke note the conflicting requirements for certain datasets and haplogroup patterning posited by various authors to encompass one, two, three, or many separate migration events.

Given their biological similarities with surrounding groups speaking dissimilar languages, Scott and O'Rourke note that the most parsimonious explanation is that if the Yeniseian and Na-Dene speakers are from an initial single biological population, then the time depth has obscured genetic links through recent gene flow and admixture with neighboring groups. However, Scott and O'Rourke note that we presently lack an adequate sample of the Yeniseian gene pool.

Ives and Potter review other genetic data relating to genetic relationships among ancient and modern Siberian and North American populations and colonization of the Americas. Most salient are the recovery of DNA from ancient human remains associated with specific archaeological cultures of these regions, given the common caveat that analysis limited to modern populations is biased by recent admixture that can obscure ancient relationships (Rubicz et al. 2003; Scott and O'Rourke, this volume). For the early microblade-using peoples in North America, we have only one sample (from On-Your-Knees Cave, Alaska; see below) (Kemp et al. 2007), dating to about 4000 years after the initial colonization of Alaska. The association with modern American Indian groups in North and South America (but not Na-Dene or Eskimo-Aleut populations) is significant, suggesting to Potter (this volume) that we cannot consider broad technological patterns in the Late Pleistocene and Early Holocene that span multiple continents to be isomorphic (i.e. equivalent in geographic distributions) with individual language families.

As will be seen below, there is room for disagreement on the biological and linguistic affiliation of Arctic Small Tool tradition (ASTt) populations, which spread across northern coastal North America about 5000 cal BP.⁴ Genetic evidence from Gilbert et al. (2008), Rasmussen et al. (2010), and Hayes et al. (2002) on multiple ASTt and ASTt-related individuals showing fixation of mtDNA haplogroup D2a1 suggests a relationship with Aleut and Siberian Yupik Eskimo, but they are very distinct from Na-Dene, who are effectively fixed for haplogroup A (see Scott and O'Rourke, this volume).

No comparable genetic analyses of Yeniseian ancestors is available at present, but several authors (Ives, Potter, Vajda, Fortescue) note the analysis by Mooder et al. (2006) of ancient human remains from the Lake Baikal area in Southern Siberia. This analysis suggests that the clear archaeological break between Kitoi (8000–7000 cal BP) and Serovo-Glazkovo (after 6000 cal BP) represents biologically distinct populations. While the later Serovo-Glazkovo populations are related to modern Siberians of the area (mainly Altaic speakers), the Kitoi (with high frequencies of the rare mtDNA haplogroup F) are different from all but modern Ket (Yeniseian) and Shor (Turkic with known Yeniseian substrate) (Mooder et al. 2006:349). It is

⁴ Years cal BP refers to calibrated years before present (i.e. radiocarbon ages BP calibrated for atmospheric fluctuations of carbon).

possible that the earlier southern Siberian occupations, culminating with the Kitoi culture, represent direct Yeniseian biological ancestors. The lack of other ancient DNA samples limits further speculation.

With plausible Late Pleistocene time-depths of separation of Dene-Yeniseian, we must consider the colonization of the New World. There are ever-increasing numbers of synthetic genetic studies attempting to delineate the timing and number of migration events (see review in Schurr 2004), which have produced an array of conflicting results (see Eshleman et al. 2003). Some studies (e.g., Torroni et al. 1992; Perego et al. 2009) suggest that Na-Dene represented a separate migration event (from the earlier Amerind), while others (Tamm et al. 2007) suggest a single rapid migration event of both groups after a "pause" in Northeast Asia during which the various mtDNA haplogroups diverged. While these issues are far from resolved, we may see some elements of consensus among the archaeological and genetic data for terminal Pleistocene dates (~19,000–14,000 cal BP) for the initial peopling event(s) (Goebel et al. 2008; Achilli et al. 2008). A recent paper by Volodko et al. (2008) focused on estimating time of divergence of mtDNA haplogroups targeting Beringia-specific lineages (Chukchi, Eskimo-Aleut, Na-Dene, Yukaghir, and Samoyedic). Haplogroup A2a is the only one shared exclusively by Chukchi, Eskimo, Aleut, and Na-Dene populations. The time estimate of coalescence for Siberian and American A2 mtDNAs (A2a+A2b) is 16,200+/-2100 BP (Volodko et al. 2008:1087), very congruent with the expansion of the Diuktai culture in northeast Asia and the first peopling of Alaska (Beringian tradition) (see Potter, this volume). They conclude "the geographic specificity of the lineages confined to Chukotka and Alaska (A2a and D2a1a) is the main argument in favor of the refugial hypothesis, which assumes the origin of the founding population of Eskimo-Aleut and Na-Dene Indians in Southern Alaska at the terminal Pleistocene to early Holocene" (Volodko et al. 2008:1095).

Two primary biological models of Dene-Yeniseian connection have been offered. The first, the Single Origins model, proposes that all Native Americans derived from a single Asian population, splitting up in Asia or Beringia prior to migration to the New World (in other words, the Yeniseians are related equally to all North American groups). The second, a separate Na-Dene migration model (Ruhlen 1998), proposes that Dene-Yeniseian formed a specific population in Siberia (thus, both groups share more similarities than with other adjacent groups in both regions). Scott and O'Rourke (this volume) note that the biological data at hand provide no direct preference for either model.

The current geographic positions of Eskimo, Na-Dene, and Algonkians suggest a pattern for the order of colonization, Algonkian first, perhaps via the midcontinental corridor, Na-Dene next, and Eskimo last (the last is clearly documented, with the Thule culture spread from Alaska around 1000 years ago). Algonkian biological relationships are not addressed in this volume, but the potential long-term border shared with Na-Dene posited by Berezkin (this volume) suggests an important avenue of research on this problem. In a recent study, Perego et al. (2009) argue that two haplogroups (D4h3a and X2a) represent distinct migration events, the first along the Pacific coast, the other from the southern end of the ice-free corridor in Alberta. While D4h3a is widespread among various American Indian groups on the North and South American Pacific coast, X2a is directly isomorphic with the Algonkian language distribution (Perego et al. 2009:figure 3; see also Malhi et al. 2002). This may lend support to Potter's argument (this volume) of a long-term association of Na-Dene with Northern Archaic and Algonkian with Shield Archaic, in approximately the same geographic configuration. This long-term association is significant, as it suggests a relatively stable material cultural boundary in the central Subarctic for several thousand years.

4.3. Archaeological data: Time-depth and migration scenarios

To address the question of antiquity of Na-Dene and Yeniseian divergence and the connected question of age and nature of relationships among intervening groups (namely Chukchi-Kamchatkan, Eskimo-Aleut, and Yukaghir), Potter (this volume) examines the archaeological record of northeast Asia and northwest North America. Dumond, Fortescue, and Ives provide commentaries that elucidate the very complex archaeological issues of these regions and various hypotheses that can accommodate modern and recent linguistic and archaeological geospatial patterning. Archaeological artifacts are notoriously silent with respect to the language of the people who created them, but archaeology can provide controls for time-depth and avenues

for evaluating relationships among recent groups by using the direct historical approach (i.e., examining material cultural patterns of ethnographically known groups and their immediate prehistoric ancestors) and basic assumptions of continuity and discontinuity in the archaeological record (see discussion in Potter, this volume). We summarize here the basic results of these inquiries.

Potter provides a synthesis of the archaeological record in Northeast Asia and Northwest North America in light of the proposed Dene-Yeniseian linkage, focusing on identifying and exploring major continuities and discontinuities in material culture that may be linked with continuities and discontinuities in language groups. He notes that archaeological data (material culture) without documents by definition cannot be used to prove language-relationships; rather these data can provide clues in helping delimit potential geographic and technological relationships among ancient groups in the region. Linking linguistically or genetically related groups with clusters of technological characteristics is notoriously difficult (Spriggs and Blench 1997; Dolukhanov 2003; but see Renfrew 2000).

In his synthesis, Potter focuses on three elements to provide a first approximation of regional patterning: (1) evaluating antiquity of observed cultural patterns for each known group (i.e., linking ethnographic groups with their immediate prehistoric ancestors); (2) identifying contemporaneous cultural groups with separate distinct traditions, which suggests they were associated with distinct genetic and linguistic groups; and (3) evaluating broad patterns of continuity/discontinuity of material cultural traditions. While there is no firm consensus behind the causes of each archaeological transition (diffusion, migration, amalgamation, or internal change), several patterns were clearly identified. First, in Northwest North America, the coast-interior dichotomy is long-standing (at least since 5000 cal BP), suggesting ancient Na-Dene settlement in the interior Subarctic. Only three definite examples of migration across the Bering Straits/Beringia are evident in the archaeology: (1) Beringian tradition 12,000–14,000 years ago, (2) Arctic Small Tool tradition (ASTt) about 5000 years ago, and (3) Thule tradition about 1000 years ago, all of which were from the west expanding eastward, thus constraining the potential source, directionality, and timing of Na-Dene migration into North America.

Potter notes that the Yeniseian archaeological record is much more ambiguous, with a possible link with recent Tsepan' culture (~2600 cal BP). The earlier archaeological record of the middle and lower Yenisei basin is not well known. A possibility noted by Mooder et al. (2006) is the genetic link between Early Neolithic Kitoi skeletons (~8000–7000 cal BP) in the Lake Baikal area and modern Kets.

Several language groups, including Athabascan and Tlingit, can be reasonably traced back to at least 1000–2000 years ago. Some evidence for earlier correlations include ~4000–6000 years ago for Na-Dene/Athabascans, Salishan, and several Chukotko-Kamchatkan groups. The period of 4000–6000 cal BP exhibits dramatic changes in technology and economies throughout both Northeast Asia and Northwest North America, suggesting these may be useful starting points for evaluating prehistoric population movements.

Dumond and Potter agree that all evidence indicates that Dene and Yeniseian did not diverge in North America, but rather that they likely diverged from a single population in Northeast Asia. Potter identifies two of the most plausible scenarios for Na-Dene migration to North America: divergence at 14,000–12,000 cal BP in Asia, movement of Na-Dene east, and divergence at 6000–4800 cal BP in Asia, movement of Na-Dene east. This is consistent with the perspective of Dumond (this volume) perspective, though Potter, Dumond, Ives, and Fortescue differ as to the relative evidentiary weights of each scenario.

The first scenario (Beringian Model) is supported primarily by the following evidence: clear indications of population migration from Asia to North America at 14,000–12,000 cal BP, long-term continuity of material culture (associated with Na-Dene) in the Western Subarctic, the lack of migrations between 12,000 and 5000 cal BP, and the apparent antiquity of intervening Eskimo-Aleut and Chukotko-Kamchatkan groups after ~5000 cal BP. As noted by Potter, Na-Dene ancestors probably formed only part of the populations that used the widespread Beringian/Diuktai technology at this early period. The current presence of intervening Paleosiberian (and possibly Yukaghir) language groups between Yeniseian and Na-Dene descendents appears plausibly linked with archaeological materials dating back to at least 6000 cal BP, providing a minimum age for separation. Genetic evidence (while largely confined to a few widely scattered human remains)

does support this hypothesis. DNA evidence from ASTt populations indicates they are related to Aleuts and Eskimos, not Na-Dene (Gilbert et al. 2008; see below).

Intriguingly, if Dene-Yeniseian speakers were participants in the Diuktai culture in Siberia about 16,000 years ago and were separated, not just by the flooding of Beringia but also by an intervening migrant population ancestral to Paleosiberian speakers (Chukotko-Kamchatkan-Eskimo-Aleut), then a remnant Dene-Yeniseian group may have been present in Chukotka and Kamchatka between 12,000 and 8000 cal BP (represented by later Diuktai sites), when they were finally replaced by Paleosiberian populations. This possible intermediate third group of related speakers may factor into discussions of cognates and borrowing from adjacent groups.

Evidence against the Beringian Model is the very long time depth of separation between Na-Dene and Yeniseian groups, which would date to the Late Pleistocene (last Ice Age), inconsistent with the close linguistic similarities of these groups (Dumond, this volume). If the assumption of a uniformitarian rate of language change is correct, then the connection between Na-Dene and Yeniseian must have occurred at a later period. Additionally, DNA analysis of the On-Your-Knees Cave individual (associated with a later variant of the Beringian tradition, dating to 10,300 cal BP, in Southeast Alaska) indicates association with modern Native American Indian groups in North and South America (and not Na-Dene or Eskimo populations) (Kemp et al. 2007), suggesting that early Alaskan microblade users were not related to Na-Dene. However, Potter (this volume) argues that this indicates that this tradition likely represents ancestors of multiple language groups (including Na-Dene) that dispersed throughout the Americas—this is consistent with the widespread distribution of this technology in Asia during this period (encompassing Diuktai in Siberia, Japanese Upper Paleolithic, and Chinese Microlithic industries). Ives (this volume) makes this point as well; we should not *a priori* assume direct isomorphy for specific linguistic and archaeological groups.

The second scenario (ASTt Model) is supported by the clear indications of population migration from Asia to North America at ~5000 cal BP, elaborated by Dumond (this volume) and Ives (this volume). The archaeological record is somewhat ambiguous on some of the particulars, which are reviewed here. In Dumond's scenario, migrating ASTt populations could represent Na-Dene ancestors. Eskimo-Aleut ancestors may relate to an earlier migration associated with the Anangula tradition (there is evidence of continuity with later Aleutian groups). Dumond posits a northward expansion of Eskimo-Aleuts around 3000 cal BP (in part, responding to warming climate), and linked with the Norton tradition (which focused more on coastal and marine resources). He notes that associated pottery is derived from Northeast Asians, but he interprets this as amalgamation (but apparently with little or no language diffusion or borrowing from the Asian sources). The problem of geographically linking ASTt (coastal Alaska) with Subarctic and Northwest Coast Tlingit and Eyak is countered by Dumond, who emphasizes data gaps (i.e., the relative lack of excavated sites in intervening areas).

Evidence against the ASTt Model includes the lack of evidence for ASTt artifacts in core Na-Dene areas, as Dumond (this volume) notes. Contemporaneous with the ASTt (assuming the limited Irving 1962 definition) is the Northern Archaic tradition, which is clearly a terrestrial-focused, Subarctic-adapted culture that shares few technological or typological similarities with the contemporary ASTt. As noted in Potter (this volume), Northern Archaic is reasonably associated with Na-Dene given the continuity with the later Athabascan tradition and Taltheilei tradition (the latter a variant of Northern Archaic with continuous archaeological records from ~2900 cal BP that extend into the historical period). The paleo-genetic record offers the most convincing evidence against linking ASTt with Na-Dene. Gilbert et al. (2008) found links between a ~4,000-year-old Saqqaq (ASTt) mtDNA and that of modern Aleuts and Siberian Eskimo. Another study found that multiple individuals of the Dorset tradition (related to ASTt) were fixed for mtDNA haplogroup D (Hayes et al. 2002), completely distinct from Na-Dene (nearly fixed for haplogroup A).

There are also several ambiguities in the archaeological record that bear on the ASTt Model. Some archaeologists consider the clear technological links between ASTt (Denbigh Flint complex), Choris, Norton, and Ipiutak to represent a larger continuum, an expanded ASTt (Giddings and Anderson 1986). If this is the case, there is a clear distinction between this sequence (correlated with Eskimo-Aleut ancestors)

and the contemporaneous Northern Archaic of the interior Subarctic. The subsistence economy of ASTt is also somewhat ambiguous. While terrestrial fauna (caribou) are present in Alaskan ASTt sites (Dumond, this volume), seals are also found in related ASTt sites in Canada and Greenland (Pre-Dorset, Saqqaq, Independence I; see McGhee 1979, 1996; Helmer 1991). This, coupled with the clear expansion of ASTt limited to coastal and near-coastal hinterlands, is contrasted with the subarctic focus of Northern Archaic. However, both Dumond and Potter (this volume) note that archaeo-linguistic correlations in the early prehistory (before 1000 years ago) of these regions cannot be definitively accepted or rejected. However, the archaeological patterning does suggest distinct alternate scenarios of Dene-Yeniseian prehistory, which can be used as frameworks to evaluate concepts embedded in some cognate sets and time-depth of language divergence.

Ives (this volume) suggests additional potential models, largely based on the possibility of permeability of material cultural boundaries (such as ASTt and Northern Archaic in Alaska), which could allow small groups of people to spread rapidly, keeping their language but adopting different material culture, and he cites recent examples (e.g., Pacific Coast Athabascans and Apacheans). Ives suggests a number of partially exclusive scenarios: (1) A recent "backward" migration (from North America to Asia) could have occurred in the middle or late Holocene; (2) Na-Dene ancestors could have been part of the ASTt migration; (3) Yeniseian ancestors could be represented among the connectivity between ASTt and later Alaskan and Siberian coastal groups; and (4) Na-Dene or Yeniseian languages could have been transmitted horizontally among populations using different material cultural systems.

From our perspective, while these scenarios are difficult to refute (since archaeological and genetic evidence cannot be directly brought to bear given the assumption of permeability), we suggest that a recent (late Holocene) migration of Dene-Yeniseians (or some subgroup) across the Bering Strait was unlikely. For most of this time period, not just one but several material cultural boundaries would have to be permeable, with fundamentally different sets of technology, settlement systems, and subsistence economies (Dumond and Bland 1995; Potter, this volume). Second, there is no evidence of Yeniseian place names to the east of the Yenisei basin, as might be expected with a very recent migration. Third, no evidence indicates westward movements of material culture beyond the Russian Far East coastal regions. Finally, the wide geographic spread and time depth of intervening Chukotko-Kamchatkan and Eskimo-Aleut appears to be supported from at least 6000–3800 years ago. We consider as unlikely a scenario of small Yeniseian-speaking groups permeating several thousand miles of territory occupied by different language groups practicing different economies. We do note that if cognates of very recent (late Holocene) innovations with no evidence of borrowing can be found in both Yeniseian and Na-Dene languages, then the scenario proposed by Ives may represent a good description.

Fortescue (this volume) argues primarily on linguistic grounds for the possibility of Yeniseian ancestors diverging from Na-Dene (or more specifically, Tlingit) in America, and migrating westward. One piece of evidence potentially in support of this could be the discovery of mtDNA haplogroup A2a in two Selkup (Samoyedic) individuals (Tamm et al. 2007:table S1). Fortescue, who evaluates a number of hypotheses, considers the most parsimonious hypothesis to be a split of Dene-Yeniseian in North America, and a migration of Yeniseian populations westward into Siberia, perhaps caused by disruption of Dene-Yeniseian populations following ASTt expansions in the mid-Holocene. In order to accommodate the mtDNA evidence, two language shifts would be required, of a Kitoi (non-Yeniseian-speaking) population shifting to Yeniseian and Yeniseian-speakers migrating from Alaska shifting to Samoyedic (Selkup). We consider a more parsimonious explanation for the lack of robust genetic links exclusively shared between Ket and Na-Dene to be the ancient time-depth of separation and recent admixture from neighboring populations. In Fortescue's perspective, Yeniseian would be an intruder instead of a remnant in Siberia. We note that one element that obscures the mid- to late Holocene make-up of language groups in Siberia is the recent expansion of Tungusic speakers (Even and Evenks) throughout much of the region. There is evidence for widespread Yukaghir groups in eastern Siberia that have been largely replaced by Tungusic and Turkic (Sakha) speakers in the recent past. As Vajda (2001) and Werner (2005) note, substrate Yeniseian place names indicate a

much larger westerly territory in the past. In terms of the archaeological record, there is little evidence of westward movements of material culture from Northwest North America to Northeast Asia during much of the Holocene (Potter, this volume). All indications are of new elements (such as pottery) diffusing eastward or new populations migrating eastward (such as ASTt; see Powers and Jordan 1990).

Of the two main archaeological scenarios (Beringian and ASTt models), we (Kari and Potter) argue that the Beringian Model is best supported by current archaeological and genetic data, though, as Dumond and Ives note, there is certainly room for disagreement. In sum, the ambiguity present in archaeological data can accommodate a large variety of historical scenarios of Dene-Yeniseian prehistory and relationships among other language groups, but we hope the data presented here and discussed by various authors provide a useful summary of baseline data, current debates in the field, plausible hypotheses and tests, and directions for future research.

5.0. DISCUSSION

Even if many details remain open to debate, the quantity of evidence for Dene-Yeniseian and the compelling questions that arise from the geographic positions of the two main branches, it is clear the Dene-Yeniseian will soon play a role in many long-standing debates in the field of historical linguistics.

Of particular importance are the prehistoric relationships of intervening language groups (e.g. Chukotko-Kamchatkan, Eskimo-Aleut, and Yukaghir). We want to acknowledge the influence of Fortescue's 1998 book, *Language Relations across Bering Strait: Reappraising the Archaeological and Linguistic Evidence*, which represents a detailed synthesis of both the historical and typological linguistic evidence as well as some archaeological and physical anthropological evidence on the languages of Siberia, Alaska, and the North Pacific Rim. He presents a case for a Uralo-Siberian mesh (with four possible congeners: Uralic, Yukaghir, Chukotko-Kamchatkan, and Eskimo-Aleut), which represents the most ancient language types of Northern Europe and Asia. Moreover, we want to call attention to one insightful paragraph that contributed directly to the Dene-Yeniseian hypothesis (ibid.:214–215):

It seems that a better case for deep affinity can be made between Na-Dene and Yeniseian Ket (and perhaps further to Tibetan, as the Nostraticists believe) than between either of these and Nivkh and/or Mosan: compare the prefixed (or preposed) possessor and subject/object markers, the marked contrast between complex verbal and simple nominal morphology, the tones (tied up with the historical distinction between glottalized versus plain syllables), the presence of subordinating particles, the uvular consonants, the covert noun class agreement prefixes on verbs, and the suppletive singular/plural pairs of some verbs shared by both families. Note also the presence in Ket as well as ND of opaque morphophonemic linking elements in the verbal complex', the lack of indicative or subordinate verb forms based on participles and of vowel harmony (both unusual negative traits in Ket, given its mid-Siberian location), and the stative/active orientation of both. . . . Although Ket does not have ejectives, there are injective allophones of certain stops (and Starostin 1982, 231 suggests that certain voiced stops in Ket could have developed from pre-Yeniseian ejectives). Most significant of all are the unusual discontinuous stems or 'themes' of both families, with infixed subject and tense/aspect affixes appearing between the elements.

At the end of the book Fortescue (pp. 253–258) provides several maps that model early Eurasian and Beringian language movements. He places a "pre-Na-Dene" language in Western Beringia at 13,000 years ago and in Central Alaska at 11,000 years ago. Thus, in the cases of Yeniseian and Na-Dene the type of broad-based typological comparisons that have been advocated by Nichols (1992) and addressed broadly for Eurasia and North America in Fortescue (1998) proved to be an important heuristic stage for Vajda's research.

Taking definitions provided in Nichols 1997, Dene-Yeniseian appears to be a *language stock*, the "commonly used term for the maximal reconstructable clade" (op. cit.). A *language family* is "a proven clade of any age . . . with a clear grammatical signature and numerous lexical cognates." Athabaskan is a language family, and because it is so homogenous it is often assumed to be young. Tlingit, branching off from Athabaskan-

Eyak, appears to be more at the stock level. Nichols uses the term *quasi-stock* for a probabilistic grouping of more than one stock, which share one or more valid genetic markers but for which there are few cognates. Possible quasi-stocks include some North American language groupings such as Penutian and Hokan that have never generated enough support by stricter requirements to be proven language stocks. If Vajda's proposed Dene-Yeniseian cognates and correspondences survive further scrutiny, the grammatical and lexical evidence may exceed that for many North American language groupings proposed 90–100 years ago, such as Algonquian, Penutian, and Hokan. Several of us (including Hamp) consider that Dene-Yeniseian can be classed among the oldest known language stocks, along with Uralic, Indo-European, and Austronesian.

How will Dene-Yeniseian impact theories and measures of language change and linguistic time depth? There are several lexicostatistical approaches to language change, and these methods seem to depend on a "uniformitarian" approach, that is, that languages change at a similar rates over time, and that beyond a "fade-out point" earlier linguistic relatedness becomes irretrievable. The dating method known as glottochronology (cf. Swadesh 1971), based upon shared percentages of 100- or 200-word lists, is dismissed by some (Campbell and Poser 2008:167).

Concerning lexicostatistics and Na-Dene, Krauss (1973:950–953) is a thorough review of the sources from the 1950s and 1960s. The oft-cited estimated "dates of divergence for Na-Dene languages" are 2400 ±500 years for Athabaskan, 3400 ±500 years between Athabaskan and Eyak, and about 4500 years for Tlingit (Krauss 1973:950, 1980:11–13). Krauss stated that such dates were based both on the Swadesh lexico-statistical formula and by comparisons with other datable but unspecified historical language splits. Krauss (1973:50) states, "Eyak is in fact lexico-statistically equidistant to all Athapaskan, e.g. both Navajo and Ahtna (the closest Athapaskan neighbor to Eyak) show virtually the same percentage, 33%, with Eyak on the Swadesh-Hoijer 100-word list." A summary of New World language groupings by Kaufman and Golla (2000) employed the glottochronology+educated guess method. Kaufman and Golla (*ibid.*:51) stated: "groups with relatively shallow time depth that are widely dispersed, probably reflect recent migrations (e.g. languages of the Athabaskan branch within Athabaskan Eyak with a time depth of about 2000 years, found from Alaska to California to Texas)." Without any explanation, Kaufman and Golla state that the time depth for Na-Dene is 3500 years, a 23% reduction in the 4500-year time frame in Krauss (1973). Kaufman and Golla's array of dates for New World languages appear to be a collection of rounded off and generally shallow dates or "short chronologies." Renfrew (2000b:14) and Dixon (1997:47–49) have discussed problems with glottochronological measures and short chronologies that have tended to thwart the integration of linguistic and archaeological techniques. Kari (this volume, section 3.1) discusses how the short chronology for Na-Dene has given both archaeologists and linguists long-standing excuses for not reading one another's work. Kari proposes that conservatism with the Na-Dene is definable; that the strong signal for Dene-Yeniseian may be due to a slow rate of change for Na-Dene and by extension Yeniseian specific linguistic and ethnogeographic reasons.

Nichols (1990, 1992, 1996, this volume) has developed several tests for measurable genetic markers or descent-proving features. She does not endorse age estimates for languages derived from the original Swadesh 100-word list. Instead she has developed a model for tests of linguistic change across continents. One assumption she has applied is that after 6000 years related languages would have fissioned into new language families. At the 2008 Dene-Yeniseian Symposium, Nichols commented that the amount of evidence for Dene-Yeniseian is too large to have the antiquity (of more than 10,000 years) that is implied for an eastward land-based movement for the Na-Dene branches through Beringia. From our perspective as editors (who are not historical linguists), it appears that Dene-Yeniseian offers serious challenges to assumptions about uniform rates of language change or that a set time frame (6000, or 8000 or 10,000 years) is a cut-off point beyond which language relatedness is not recoverable (cf. Comrie 2000).

To be sure, there are robust options for advancements in Dene-Yeniseian. Already there is a generous amount of both systematic and idiosyncratic comparative evidence. If the Dene-Yeniseian language stock is accepted and can be shown to represent a land-based migration across Beringia, then Dene-Yeniseian would be the most far-reaching extension of the comparative method. If common Dene-Yeniseian is beyond 10,000 years in age, as Eric Hamp suggests, then this may cause estimates of relative time depths for language

families and stocks in Eurasia or in North America to be reassessed. In fact such reassessments may offer more productive collaborative theories of the settlement of the New World.

Consider the example of Algonquian. A century ago Sapir proposed that Wiyot and Yurok in Northern California could be shown by grammatical evidence to be related to the Algonquian languages of the northeast (see Map D). Goddard 1975 provides an overview of the small amount of grammatical evidence for Algonquian (see also Nichols, this volume, Table 3) and the difficulties in obtaining further lexical evidence. Blevins and Garrett (2007:72) write that "the connection between Algonquian and California Algonquian lies near the limit of persuasively demonstrable linguistic relatedness (Goddard 1975) but also because Wiyot and Yurok are surprisingly dissimilar for languages spoken in immediate proximity over a thousand miles from their nearest relatives." Blevins and Garrett, via internal reconstruction, establish a few more Yurok-to-Wiyot connections that can add to the small set of Algonquian reconstructions. Wiyot and Yurok have been surrounded on the north, east, and south by several Athabaskan languages and dialects for at least 1000 years. In their survey of relative dates of divergence, Kaufman and Golla (2000:50) estimate that the divergence of Algonquian occurred 3500 to 3000 years ago.

We bring up the Algonquian problem here because it is a proven language stock with only a tiny core of demonstrated cognates in 100 years, whereas in a three-year period a substantial and growing amount of evidence set for Dene-Yeniseian has been assembled. Wiyot and Yurok must have separated from Algonquian much further in the past than the estimated dates. Has Algonquian changed at a "average" pace? Has Dene-Yeniseian changed much more slowly?

What is becoming clear is that the Dene-Yeniseian stock appears to be qualitatively different than the well-known Indo-European exemplar for historical linguistic studies. Among other things, Na-Dene and Yeniseian both represent subarctic foragers. Population dynamics for these two groups and presumably their direct ancestors starkly contrast with Indo-European and Altaic. Na-Dene and Yeniseian are associated with long-term occupations in very thinly populated but very expansive boreal forest territories. In addition, Na-Dene (for which more data are available) apparently has had long-term and stable boundaries with neighboring language groups (Eskimo-Aleut and Algonquian). Dene-Yeniseian expansions, contractions, and migrations seem to be characterized by very large regional language/dialect complexes with shared internal boundaries. The unique forager mobility strategies implied by this type of long-term sociolinguistic dynamic, demonstrated for Na-Dene (Kari, this volume), and inferred for Yeniseian (from substrate toponyms), raises important questions for multiple disciplines (e.g., historical linguistics, hunter-gatherer studies, population genetics). Population expansions and migrations appear to be exclusively pedestrian, with no evidence for pastoralism or agriculture in their ancient history. Indeed, fruitful parallels to Dene-Yeniseian may be found in Uralic, which is another ancient high-latitude language stock.

The complex prehistory of Northeast Asia and Northwest North America and various migration scenarios require scholars to consider a broad range of evidence. In this sense, linguistic, archaeological, and genetic models of Dene-Yeniseian prehistory must take into account at least Tungusic and Turkic (Altaic), Yukaghir, Chukotko-Kamchatkan, and Eskimo-Aleut prehistory, and perhaps that of the Samoyedic (Uralic), Nivkh, Salishan, and Algonquian. While the recent migrations of Tungusic and Sakha (Turkic) populations into Northern Asia are well documented, Yukaghir, Chukotko-Kamchatkan, and Eskimo-Aleut groups have likely been present across northern latitudes for thousands of years.

What has taken place since 2006, culminating in the publication of these 18 articles, is unprecedented in terms of the initial academic presentation of a hypothesis for a long-distant language relationship. The linguistic connection between Yeniseian and Na-Dene postulated by Vajda's lead paper should foster increased interaction among linguists, archaeologists, geneticists, and paleoecologists to the common goal of illuminating and understanding human prehistory. We hope that this volume will also be stimulating to indigenous peoples of these regions and to the general public as we explore the heritage of Dene-Yeniseian.

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Part 1. The Evidence for Dene-Yeniseian

THE DENE-YENISEIAN HYPOTHESIS: AN INTRODUCTION

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1.0. INTRODUCTION: THE LANGUAGES AND THE HISTORY OF THE HYPOTHESIS

My aim in this paper is to present a brief introduction to the major paper in this volume by Edward Vajda. I will try to put Vajda's work in perspective, first, with respect specifically to the hypothesis of a genealogical relationship between the Yeniseian languages and the Na-Dene languages by looking at the history of claims along these lines.¹ Second, I give a brief overview of some important concepts from historical-comparative linguistics, both to illustrate relevant aspects of the methodology and as prelude to showing how Vajda's approach meets the demands of this method. Finally, I will present a small selection of the data sets considered by Vajda in his paper in this volume in order to illustrate the general principles in their application to the Dene-Yeniseian hypothesis. Readers should bear in mind throughout that I am in general very skeptical of hypotheses regarding more distant genealogical relations among languages (so-called macro-families), so convincing me of the plausibility of a proposed long-range genealogical relationship is actually quite a test for such a proposal.

In the literature there have been various proposals concerning genealogical relations between languages of the Americas and of Siberia. So far, these proposals have not succeeded in convincing the majority of specialists working on languages of the Americas nor those working on languages of Siberia, nor those working in historical-comparative linguistics. The importance of Vajda's work on the Dene-Yeniseian hypothesis is that for the first time evidence for a genealogical relationship between languages of the Americas and of Siberia has been presented (excluding, of course, the case of Eskimo, where Siberian Eskimo represents a relatively recent back-migration from Alaska to Siberia) which not only satisfies the methods of historical-comparative linguistics but also succeeds in convincing skeptics like me.

The Yeniseian languages are spoken in central Siberia and constitute a small family whose internal genealogical unity is not in doubt (see Map C in the editors' introduction). The only surviving language of the family is Ket, although even Ket itself is now heavily endangered—the number of fluent speakers does not exceed about a hundred. Yugh, a language closely related to Ket, died out in the middle of the

¹ Preliminary versions of this article were presented at the Dene-Yeniseic Symposium held as part of the meeting of the Alaska Anthropological Association in Anchorage in February 2008, at the X Encuentro Internacional de Lingüística en el Noroeste held at the University of Sonora, Hermosillo, Mexico, in November 2008, and at the 2009 Athabaskan Languages Conference held at the University of California Berkeley in July 2009. I am grateful to all those who participated in the ensuing discussions. A Spanish version presenting essentially the same material as in the present article is scheduled to appear as Vajda and Comrie (in press), and I am grateful to Edward Vajda for discussion of all major points in the article. Incidentally, I will throughout use the term *genealogical* in relation to claims about languages descending from a common ancestor; the more traditional linguists' term in this sense is *genetic*, but especially since I also engage in collaborative research with population geneticists, I am anxious to avoid any confusion deriving from multiple senses of the word *genetic*.

20th century, while Kott was documented extensively by the Finnish linguist Matthias Alexander Castrén in the middle of the 19th century. Of the other languages of the family (Assan, Arin, Pumpokol) we have only annotations from the 18th century. From a typological viewpoint, the Yeniseian languages differ strikingly from the other languages of Siberia, in particular the Uralic and Altaic languages, but also from the other so-called Paleosiberian or Paleoasiatic languages. The Yeniseian languages are tonal, have a grammatical gender system, and have an extremely complex verb morphology which relies primarily on prefixing and which is best described in terms of a template (see further example (6) below).

The Na-Dene family includes at least two branches, Tlingit and Athabaskan-Eyak, the latter dividing in turn into two sub-branches, Athabaskan and Eyak (Map D). Tlingit is the only language in its branch and is spoken in southeastern Alaska (with some speakers in the neighboring part of Canada). Eyak is also the only member of its sub-branch and was traditionally spoken near the mouth of the Copper River in Alaska—the last speaker of Eyak died in 2008. The Athabaskan languages constitute a sizable group of languages spoken in interior Alaska, western Canada, in the northwestern United States and also in the southwest of the U.S. (e.g. Navajo). Controversy surrounds the inclusion of yet another language in the Na-Dene family, namely Haida, spoken on the Queen Charlotte Islands in western Canada and some neighboring parts of the U.S. Vajda's work shows no reason to include Haida in the Na-Dene family nor in the broader Dene-Yeniseian family that he proposes.

The first observation concerning a possible similarity between the Ket and the indigenous inhabitants of the Americas was made by Adriaan Reeland in 1708 (Vajda 2001:15). But only with Trombetti (1923:486, 511) do we find an affirmation of a specifically linguistic relationship between the Yeniseian languages and the Na-Dene languages (more specifically, Tlingit and the Athabaskan languages, since at that time the membership of Eyak within this family had not yet been established), although the data cited by Trombetti are minimal and cannot be considered a proof of the genealogical affiliation of the two groups. More extensive data on a possible genealogical relationship between Yeniseian and Na-Dene are relatively recent and come from Ruhlen (1998), who cites a series of look-alikes (i.e. words that have similar forms) from the two groups, but without applying the methods of historical-comparative linguistics. Vajda's work has shown that in some cases the pairs of Yeniseian and Na-Dene words cited by Ruhlen are indeed related genealogically, but in many other instances this is not the case.

Within the group founded by the late S. A. Starostin there has been discussion of a genealogical relationship between the Yeniseian and Na-Dene languages, but within the framework of a more extensive hypothesis, the so-called Dene-Caucasian hypothesis, according to which Dene-Caucasian would constitute a macro-family containing not only the Yeniseian languages and the Na-Dene languages (the latter including Haida), but also the Sino-Tibetan languages, Burushaski (spoken mainly in northern Pakistan), the North Caucasian languages (i.e. grouping together West Caucasian and East Caucasian), and Basque. Starostin (2007) provides an etymological dictionary of the Sino-Caucasian languages; the scope of this dictionary, as can be deduced from the slightly different name for the macro-family, does not include the Na-Dene languages, although it does include Yeniseian. For the inclusion of Na-Dene, see Bengtson (2008). It is possible that the lexical evidence for Dene-Yeniseian will increase when account is taken of the totality of the lexicon of the Athabaskan, Eyak, and Tlingit languages. It is possible that some of the elements of archaic verb morphology proposed in establishing the Dene-Yeniseian hypothesis (see section 4.2) will also be found in Sino-Tibetan or other languages of the Old World. If this turns out to be the case, this evidence might, together with the much more extensive body of cognates proposed for the Yeniseian, Sino-Tibetan, and North Caucasian families by Starostin (1982; 2007), argue in favor of a relationship between Na-Dene and Yeniseian only within such a broader genealogical grouping, Sino-Caucasian or Dene-Caucasian. The series of cognates proposed by Vajda (this volume) is so far somewhat limited, hardly exceeding a few hundred protoforms available for the Na-Dene languages. For these reasons, it seems preferable to reserve judgment on the Sino-Caucasian or Dene-Caucasian grouping until more in-depth work is carried out.

2.0. SOME THEORETICAL OBSERVATIONS

When we find similarities between two languages or groups of languages, there are at least four possible explanations for these similarities. First, they could be a result of chance, as for instance with the words *unagi* 'eel' in Japanese and *unaj* 'eel' in the Haruai language, spoken in Papua New Guinea. If we have a sufficiently large number of languages and a large enough number of lexical concepts, it is almost inevitable that there will be at least some chance similarities. Second, we could be looking at a universal phenomenon, whether absolute or a tendency, as in the case of some onomatopoeic and phonosymbolic words—compare the following expressions for a cat's cry: English *meow/miaow*, Spanish *miau*, Vietnamese *meo*. In general, it is possible to identify cases of accidental similarity or of similarity due to universals by applying statistical methods to a large enough volume of linguistic data.

A third possibility is that the similarities might be due to language contact, i.e. that one language might have borrowed a word from another language, as in the case of the word *kayak* in English. Finally, the fourth possibility is that the similarity is attributable to common ancestry, i.e. the forms in the two languages are inherited from a single ancestor language, as in the case of the numerals Latin *decem*, Greek *déka*, Russian *desjat'*, etc., all meaning 'ten' and all inherited from Proto-Indo-European. In practice the most difficult problem in establishing genealogical relatedness is distinguishing between loans and cognates (words related by common ancestry).

Historical-comparative linguistics has worked out various principles in order to try to establish this distinction. For instance, we know from experience that within the lexicon, basic words are less susceptible to borrowing than is culture-specific vocabulary. The fact that English has borrowed the word *kayak* from Eskimo reveals influence of Eskimo culture on English-speaking culture. But although it is much less common to borrow words from the basic vocabulary, nonetheless there are examples of this phenomenon. Lower numerals are virtually never borrowed in European languages, whereas this is common in East and Southeast Asian languages: Japanese and Thai, for instance, have borrowed the word for 'two' from Chinese. The most salient parts of the body are rarely borrowed, but nevertheless there are exceptions; for instance, Thai *camûuk* 'nose' is a loan from Cambodian (*cramoh*).

Regular phonetic correspondences are a very important criterion in historical-comparative linguistics. If we note, for instance, that there is generally a correspondence of *f* in the Germanic languages (like English) and *p* in most other Indo-European languages (e.g. Spanish), as in *father* ~ *padre*, *fish* ~ *pez*, etc., we can conclude that the English word *paternal* cannot be related genealogically to its Spanish counterpart *paternal*, despite the formal identity or similarity. In this instance, the English word is a loan from medieval Latin, perhaps via Old French.

In addition, morphology generally provides good evidence of genealogical affiliation, although even here it is necessary to proceed with caution. The genitive suffix *-s* found in nearly all the Germanic languages is a reflex of the common ancestry of this branch of the Indo-European family, and the genitive in *-s* found in Ancient Greek comes from the same Indo-European source. Nonetheless, this suffix does not seem to be related genealogically to the *-s* genitive suffix in the East Caucasian languages; this is more likely to be chance similarity, something very probable in the case of a single morpheme, especially one so short (a single phoneme). But if there is morphological parallelism between two languages involving a complex pattern with phonetically regular correspondences, we can be almost certain that we are dealing with a genealogical relationship and not with chance or a borrowing. This can be illustrated by the conjugation of the Imperfect of the verb 'to carry' in Sanskrit and Ancient Greek, as shown in (1).²

² The rightmost column of (1) is a reconstruction of the protolanguage of these two languages taking into account only the data from these two languages. It does not consider data from other Indo-European languages, and as such it is not a reconstruction of Proto-Indo-European forms *sensu stricto*.

(1)		Sanskrit	Ancient Greek	Protoform	
	SG	1	<i>a-bhar-a-m</i>	<i>e-pher-o-n</i>	* <i>e-bher-o-m</i>
		2	<i>a-bhar-a-ḥ</i>	<i>e-pher-e-s</i>	* <i>e-bher-e-s</i>
		3	<i>a-bhar-a-t</i>	<i>e-pher-e</i>	* <i>e-bher-e-t</i>
	DU	2	<i>a-bhar-a-tam</i>	<i>e-pher-e-ton</i>	* <i>e-bher-e-tom</i>
		3	<i>a-bhar-a-tām</i>	<i>e-pher-e-tēn</i>	* <i>e-bher-e-tām</i>
	PL	1	<i>a-bhar-ā-ma</i>	<i>e-pher-o-men</i>	—
		2	<i>a-bhar-a-ta</i>	<i>e-pher-e-te</i>	* <i>e-bher-e-te</i>
		3	<i>a-bhar-a-n</i>	<i>e-pher-o-n</i>	* <i>e-bher-o-n</i>

In both languages we have, first, an identical morphological structure, as in (2), with a tense prefix (the so-called augment), followed by the root, then a theme (stem-forming) vowel, and finally a person-number suffix.

(2) Augment (*e-) – Root – Theme vowel (e/o) – Person/Number

But it is not just a question of a shared abstract structure. The morphemes involved are in almost every case related across the two languages by exact phonetic correspondences; these correspondences are listed in (3) and (4) for Ancient Greek and Sanskrit respectively.

(3) Ancient Greek
 *bh > ph
 *m > n word-finally
 *t > Ø word-finally
 *ā > ē after consonant (except r)

(4) Sanskrit
 *e, *o > a
 *s > ḥ word-finally

The only exception is the first person plural, where the Sanskrit and Ancient Greek forms are so divergent that it is not possible to reconstruct a common ancestral form.³

It is examples of this kind that convince even the most demanding linguists of the genealogical unity of the Indo-European family. We cannot expect to find such striking similarity in the case of more distant genealogical relationships, but the example of Indo-European still constitutes, from the viewpoint of comparative-historical linguistics, an ideal to which we can and should strive.

3.0. SOME TYPOLOGICAL CHARACTERISTICS OF THE YENISEIAN LANGUAGES

In this section two typological characteristics of the Yeniseian languages will be presented, with examples from Ket, which turn out to be crucial for the details of the comparison between Yeniseian and Na-Dene languages.

First, the Yeniseian languages, unlike the other languages of Siberia, are tonal. Ket has a phonemic opposition of four tones, as shown in (5), with the description of the phonetic properties of each tone to the right (Vajda 2004:12).

(5)	<i>sūl</i>	'blood'	medium long, high, level
	<i>suʔl</i>	'Siberian salmon'	short, glottalized, rising-falling
	<i>sū̀l</i>	'hand sled'	long, rising-falling
	<i>sùl</i>	'hook'	short, falling

³ Sanskrit also has a first person dual form which is simply lacking in Ancient Greek, which uses the plural form instead.

Second, the Yeniseian verb, again illustrated here by Ket, has a very complex morphological structure, with eight positions before the root and one after, as shown in (6) (cf. Vajda 2004:45).

(6)	P8	P7	P6	P5	P4	P3	P2	P1	P0	P-1
	val	incorp.	val	theme	TM	val	TAM	val	base	val
	subj	root	obj			inan		subj		num

The explanation for the various morphological positions within the Ket verb is as follows. P8 is connected with the valence (argument structure) of the verb and indexes person-number of the subject. P7 is an incorporated root. P6 is also connected with verb valence, but this time with the object. Position P5 is a thematic morpheme. P4 encodes tense and mood. P3 is linked to verb valence and indexes an inanimate argument. P2 expresses tense-aspect-mood. P1 is another prefix indexing person-number of the subject and is thus again related to verb valence. P0 is the base of the verb. The suffixal position P-1 indexes the grammatical number of the subject. Not all positions are filled in all verb forms, and the lexical specification of each verb has to include the affixes that are possible or necessary for this lexical item. In some cases, the same information can be expressed in several positions, for example the subject can be indexed in P8, P1, or both. The lexical stem can also be distributed across several positions, such as P0 and P7. For a more extensive description, see Vajda (2004:45–76).

There is a striking similarity to the structure of the verb in Navajo, as in (7) (Young and Morgan 1987:37–38; Young 2000:18–26).

(7)	P10	P9	P8	P7	P6	P5	P4	P3	P2	P1	P0
	ext	ext	iter	pl	obj	subj	int	TMA	subj	val	theme
	obj	der				3	lex		1/2	change	

In this schema, the first two positions are described as external, the first encoding the object, the second being derivational. P8 expresses iterativity, P7 plurality. P6 indexes the person-number of the object, P5 a third-person subject. P4 is an internal, lexical prefix. P3 expresses tense-aspect-mood. P2 indexes a first- or second-person subject (cf. position P5 for a third-person subject). P1 is a prefix indicating a change (increase or decrease) of valence. P0, finally, is the stem of the verb, which may also be complex, although its internal structure is not relevant here. However, it is important to note that so far, the similarity between the structure of the Ket and Navajo verbs as shown in (6) and (7) is purely typological. In the next section, we will consider the possibility of a genealogical relationship.

4.0. EVIDENCE FOR A GENEALOGICAL RELATION BETWEEN THE YENISEIAN AND NA-DENE LANGUAGES

In this section are set out a small selection from the total range of evidence presented by Vajda (this volume), concentrating on phonology, especially the tone system of the Yeniseian languages, and the morphological structure of the verb.

4.1. Tone correspondences

In the case of two of the Ket tones, it is possible to demonstrate an incontrovertible correspondence with a segmental opposition in the syllabic coda in Na-Dene languages. This article will limit itself to explaining these tone correspondences. It should, however, be noted that the other phonemes in the words cited also show regular correspondences between the two groups of languages, even in cases where the words do not appear to be similar—the important factor is that the correspondence is systematic, and not a similarity that could be accidental. These similarities are discussed further in Vajda (this volume).

The Ket first tone (medium long, high, level) corresponds to a glottalized plosive in the syllable coda in Na-Dene languages, as can be seen in the examples in (8), where PND = Proto-Na-Dene, PAE = Proto-

Athabaskan-Eyak and PA = Proto-Athabaskan.⁴

(8)	Ket	tik	'snow, ice'	PND	*t'ikʷ	'ice' (Leer 2008:19-20)
	Ket	sēj	'liver'	PND	*sənt	'liver' (Leer 2008:7)
	Ket	duil	'willow'	PA	*tš'ətʃ	'plant, bush' (Young and Morgan 1992:107)

The Ket second tone (short, glottalized, rising-falling) corresponds to a non-glottalized plosive in the syllabic coda of the corresponding Na-Dene word, as can be seen in the examples in (9).

(9)	Ket	təʔq	'finger'	PA	*ts'inc	'finger' (Leer 2008:37)
	Ket	qoʔn	'pine (tree/branches)'	PAE	*gand	'pine (tree/needles)' (Leer 2008:2)
	Ket	koʔd	'rump'	Eyak	gʷədə	'rump' (Krauss 2005:85)

It might seem contradictory that the Ket glottalized tone should correspond to a non-glottalized coda, but one should bear in mind, first, that the two groups of languages are separated by millennia of separate history, with various possibilities for sound changes giving rise to less expected correspondences. Second, the glottalized tone appears to be the default tone in modern Ket; it is the tone generally found, for instance, in loans from Russian, e.g. *hoʔp* 'priest' (< Russian *pop*).

The words for 'pine' demonstrate how the strict application of the methods of historical-comparative linguistics can lead to new predictions. The Ket word *qoʔn* has both a regular plural *qon-ij* and an irregular plural *qonn-ij* with an extra *n*. The origin of this extra *n* would appear problematic. However, if one examines the forms corresponding to the Ket singular in Athabaskan languages, one finds forms like Navajo *gad* 'juniper'. In Eyak, the form is *ganhd*. On the basis of the Athabaskan and Eyak forms, and quite independently of the Ket forms, Leer (2008) proposes the Proto-Athabaskan-Eyak reconstruction seen in (9), i.e. **gand*, with a complex coda. The Athabaskan languages have lost the nasal; in Eyak the nasal has been devoiced. Now, if one accepts that the ancestral form contained this nasal, the Ket irregular plural can be explained on the basis of an original *-nd-* giving rise to *-nn-* in intervocalic position as a result of assimilation. In the singular form, in Ket the consonant cluster in syllable-final position has been simplified by loss of the final plosive. In the irregular plural, in intervocalic position, the consonant cluster has been preserved, but the plosive has assimilated to the nasal. (The regular form *qon-ij* would then be the result of analogy with regular plural formation.)

4.2. Verb structure

In section 3 it was shown that there is a typological similarity between verb structure in Yeniseian and Na-Dene languages. In this section it will be shown that some aspects of this structure suggest a genealogical relationship between these two groups of languages. The description of modern Athabaskan (McDonough 2000) and the reconstruction of Pre-Proto-Yeniseian (i.e. the result of the application of internal reconstruction to the Yeniseian protolanguage) leads to postulating a bipartite structure for the verb in both instances. This bipartite structure comprises an auxiliary part and a lexical part, as shown in (10).

(10) Reconstruction of bipartite verb structure in Pre-Proto-Athabaskan (PPA) and in Pre-Proto-Yeniseian (PPY)

	auxiliary complex			verb root complex	
PPA	spatial/pronomial-	Aux *s(ə)-, *Gə-		(classifier-)	root -TAM *-ʃ, *-ñi. etc.
PPY	spatial/pronomial-	Aux *s-, *Ga-		(deriv. prefix-)	base *-l, *-n

⁴ In some cases, the forms have been updated with respect to the sources cited in light of more recent research. I am grateful to Edward Vajda and, indirectly, to Jeff Leer for the relevant information.

The main difference between the two is the position of the tense-aspect-mood markers, which follow the auxiliary (Aux) in Proto-Na-Dene but the root in Pre-Proto-Yeniseian. However, the forms of these suffixes are cognate. A difference of this kind, namely variation in the marking of verb categories on the auxiliary versus the lexical verb, is widespread in the languages of the world; compare, for instance, the marking of verb categories on the negative auxiliary or on the lexical verb in Uralic languages (Comrie 1981).

Another position where one finds not only a shared pattern but also cognate forms is in the auxiliary itself. The Pre-Proto-Athabaskan forms **s(ə)-*, **Gə-* (Leer 2000:102-103) and the Pre-Proto-Yeniseian forms **s-*, **Ga-* are not only in the same structural position after the spatial/pronominal prefix, but are also cognate. To sum up, the bipartite structure reconstructed independently for each of the two families shows not only structural parallels but also regular correspondences in the forms of the morphemes involved.

5.0. CONCLUSIONS AND PROSPECTS

This article has been able to provide only a small number of pieces of evidence in favor of a genealogical relationship between the Yeniseian and Na-Dene languages. The data presented here can be considered a prima facie argument in favor of the Dene-Yeniseian hypothesis: the examples of regular correspondences between the two families give rise to predictions that can be tested. Vajda presents many more data and his first article can be considered a state of the art account of the Dene-Yeniseian hypothesis. Only a broader discussion following on its publication will tell whether this hypothesis will be accepted by the linguistic community.

If the Yeniseian and Na-Dene languages are related genealogically, another question that arises is the historical relation between the two groups. Are we dealing with two branches of a family, or is there a more complex relationship among the various groups of languages that constitute the totality of the Dene-Yeniseian family? The data suggest that we are indeed dealing with two distinct branches of a Dene-Yeniseian family. There are distinct series of innovations that characterize, on the one hand, the Yeniseian branch, and on the other hand, the Na-Dene branch. In the Yeniseian branch one finds, for instance, the development of tones on the basis of the difference between glottalized and nonglottalized syllable codas and the development of a velar nasal coda on the basis of a glottalized nasal; in morphology there are plural suffixes and a series of verb suffixes that index the subject. Although there are differences among the various sub-branches of the Yeniseian family with regard to these verb suffixes, there is always a marker of plurality of animate subjects. The diagnostic innovations of the Na-Dene languages include the development of prefixes encoding valence change (position P1 in (7)) and the change of bilabial stops into velars, as in Ket *bajbul* 'kidney' (where *-ul* is a suffix indicating one of a pair), Proto-Athabaskan-Eyak **kʷəkʷ*, Tlingit *kʰax* (Leer 1996:69).

The results of linguistic research must also be compared with those of other disciplines. Geneticists, for instance, are convinced that there is a close biological relationship between the populations of the Americas and some populations of Asia, especially Siberia; both the mitochondrial DNA haplogroups (tracing the maternal line) and the Y-chromosomal DNA haplogroups (tracing the paternal line) that are found in the Americas descend from a subset of the haplogroups found in Asia (see McDonald (2005) and publications cited there). Neither the linguistic nor the genetic data provide any direct evidence of the geographical origin of the relevant populations, but archaeologists are overwhelmingly of the opinion that the Americas were the last continent to be settled by humans, who entered via the Bering Strait (see the bibliography downloadable at <http://www.saa.org/meetings/PeoplingofAmericasandPaleoindians.pdf>). If a relationship between the indigenous populations of the Americas and of Asia does not seem surprising to geneticists and archaeologists, the convincing demonstration of a genealogical relationship between languages of these two continents will be an important advance for historical-comparative linguistics.

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A SIBERIAN LINK WITH NA-DENE LANGUAGES¹

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1.0. INTRODUCTION

The Yeniseian language family of the upper and middle reaches of Siberia's Yenisei River is noteworthy for its genetic and typological distinctiveness among the other families of North Asia (Map C). It contains the extinct Kott, Assan, Arin, Pumpokol, and Yugh, as well as the critically endangered Ket, of which at the time of this writing fewer than 100 fluent speakers remain, nearly all over 50 years of age. Only Ket and Yugh were recorded in modern times. Fortunately, the indefatigable Finnish linguist M. Alexander Castrén gathered extensive data from the last five Kott speakers, including grammatical morphology (Castrén 1858). Assan, Arin and Pumpokol were preserved only in the form of word lists taken down by 18th-century travelers in passing contact with the last generation of speakers. All of these materials testify to the importance of recording even the world's most seemingly obscure languages before they disappear.

Since basic work on Na-Dene is likely better known to this readership, it might be worthwhile to introduce the essential Yeniseian sources. Werner (2005) contains a complete description of all known 18th-century documentation of Ket and its extinct relatives. Werner (1990a) offers a similarly complete account of Castrén's 19th century Kott materials, only parts of which reappear in Werner (1997a). The fundamental source on Yugh is Werner (1997b). Book-length descriptions of Modern Ket phonology and grammar include Dul'zon (1968), Vall and Kanakin (1990), Werner (1997c), and Vajda (2004). Georg's (2007) monograph on Ket phonology and morphology is particularly accessible to English-speaking readers, with a second volume on syntax to follow. Indispensable work on Proto-Yeniseian reconstruction appears primarily in Russian (S. Starostin 1982, 1995; G. Starostin 1995; Werner 1990b), though see S. Starostin 2005 for an online Proto-Yeniseian/English dictionary. A comprehensive English-language *Etymological Dictionary of the Yeniseian Languages* (Vajda and Werner, in preparation) should appear by 2011. Vajda (2001) contains a

¹ I thank Sharon Hargus, Jim Kari, Andrej Kibrik, Mike Krauss, Jeff Leer, and George Starostin for valuable comments on earlier drafts. I owe a deep debt to my Athabaskanist colleagues, without whose decades of contribution to historical and descriptive linguistics it would hardly be possible to undertake the comparisons I attempt here. I own a similar debt to Ketologists and historical linguists from the former Soviet Union, especially to the indefatigable Heinrich Werner, for crucial documentation and analysis of Yeniseian dialects and languages. Werner's work on the now extinct Yugh is similar in its importance to that of Mike Krauss on Eyak, Jeff Leer on Tlingit, or Jim Kari on Ahtna, Dena'ina, and Koyukon. I deeply thank Bernard Comrie, director of the Linguistics Department of the Max Planck Institute for Evolutionary Anthropology, Leipzig, for his extensive support and for hosting the Na-Dene Workshop in August 2006, where some of these ideas were first publicly presented. I also thank our colleagues at Leipzig, particularly Juliette Blevins and Don Stilo, as well as Eric Hamp, for their encouragement. I thank Johanna Nichols for valuable observations on typological and historical linguistics. My gratitude also extends to my colleagues in Novosibirsk and at Tomsk Pedagogical University, where I first began serious work on Ket. Finally, I thank Jim Kari and his colleagues at the University of Alaska, Fairbanks, for organizing the Dene-Yeniseic Symposium (Feb. 2008), for which the preliminary version of this article was prepared.

complete, annotated bibliography of all published and unpublished materials relating to Yeniseian peoples or languages, current through 1998, including previous claims relating Yeniseian to Na-Dene and other families (Vajda 2001:15–17, 357–9).

The earliest claim the Yeniseians share a special link with Native America actually dates as far back as 1708, when Adriaan Reeland suggested the Yenisei Ostyaks, as the Ket were then known, were lost cousins of North American tribes (Vajda 2001:15). Amazingly, this predated by nearly a century Thomas Jefferson's famous pronouncement in 1789 that Native Americans originated from North Asia (Jefferson 1984:227). The first person to claim a linguistic link specifically between Yeniseian and Na-Dene was the Italian Alfredo Trombetti (1923), who made his claim based on a handful of lexical resemblances between Ket, Kott, Athabaskan, and Tlingit. Eyak was then generally unrecognized as a Na-Dene language despite the fact that already by 1805 the Russian Nikolai Rezanov had linked Eyak, Tlingit, and Athabaskan (cf. Krauss 2006 for the full saga on the discovery, loss, and rediscovery of Eyak over the past two centuries). After Trombetti, a number of other linguists and laymen have claimed or speculated about a connection between Yeniseian and Na-Dene, usually with Haida included as part of Na-Dene; additional Eurasian isolates and families have been proposed as relatives to either Na-Dene or Yeniseian or to both. These hypotheses are not investigated here, though some of these proposals look promising (for the issues involved see Yeniseian, Na-Dene, and Historical Linguistics, this volume). Leaving aside the issue of what constitutes proof of genetic relationship, the formal beginning of Dene-Yeniseian linguistics dates to Trombetti's proposal in 1923 of the specific link being argued for here.²

Random similarities in vocabulary are generally deemed insufficient to demonstrate language relatedness. A list of lookalike words can be compiled, even using basic vocabulary, between any human languages. Nor can typological parallels, even involving uncommon traits such as a rigid prefixing verb structure, be taken as a reliable diagnostic of genetic relatedness in the absence of a system of actual cognate morphology. The only generally accepted way of demonstrating the existence of a language family is to demonstrate cognate morphological patterns together with cognate roots or stems of basic vocabulary sufficient in number to establish interlocking sound correspondences. Lexical similarities in the absence of grammatical evidence, or grammatical similarities without systematic sound correspondences in basic vocabulary, leaves doubt as to the origin of the similarities in questions (cf. Campbell (1997) and Campbell and Poser (2008) for a thorough treatment of the issues involved in demonstrating genetic relatedness). All widely accepted language families show lexical and grammatical homologies to an extent permitting at least partial phonological and morphological reconstruction of an ancestral proto-language. Though generally not stressed by historical linguists, a demonstrable genetic relationship also provides data useful for tracing the internal historical development of each member language. Word lists or typological comparisons cannot

² The present article tries to credit all prior contributions to what might in retrospect be called Dene-Yeniseian studies. Much of the historiographic documentation is already available in Vajda (2001). I am neither the originator of the idea that Yeniseian has North American relatives, nor the discoverer of the first DY cognates or typological parallels. Alfredo Trombetti (1923), the first to propose the connection, appears to have proposed the first Dene-Yeniseian cognate: Ket *de'ŋ* and Athabaskan *diné* 'people'. Moscow linguist Sergei Nikolayev suggested a few more in 1991 (Nikolayev 1991), a publication overlooked in Vajda (2001). Johanna Nichols's (1992) monograph *Language Diversity in Space and Time* is important for its broad geographic examination of typological diversity and genetic relations. Michael Fortescue's (1998) *Language Relations across Bering Strait* first identified unusual morphological traits shared specifically by Yeniseian and Na-Dene but absent from other Northern Hemisphere languages. Merritt Ruhlen's 34 proposed cognate sets, published the same year (Ruhlen 1998), represent the first refereed publication that specifically argues for a genetic link between Yeniseian and Na-Dene (including Haida). Ruhlen's sets contain at least eight matches that the system of sound correspondences I posit here supports as DY cognates: head, stone, foot, shoulder/arm, birch/birchbark, old, fallen snow, and burn/cook; others from his list could eventually be confirmed, as well, since more work needs to be done on DY sound correspondences. In 1998, when Ruhlen's article was first published, the cognates for "birch/birchbark" struck me as particularly noteworthy, given that words for 'birch' and 'birchbark' are core vocabulary in all boreal language families (though the possibility cannot be discounted that the Yeniseian words for 'birchbark' derive from North Asian language contact; cf. S.Starostin 1995:301).

be used in this way. The unavoidable usefulness of a proven genetic connection between languages is perhaps the best confirmation of its validity. If Yeniseian is demonstrably related to Na-Dene, the evidence should be able to help solve Na-Dene internal problems by furnishing hitherto unknown external comparative data. Similarly, Na-Dene comparanda should provide answers to questions in the development of Yeniseian languages that defy resolution based on internal comparison alone. One aim of this article is to show that this is indeed the case—first by examining the prefixing verb morphology of both families, then explaining sound patterns in cognate vocabulary.

The Yeniseian verb complex evinces a system of morphological homologies with the oldest layer of Athabaskan-Eyak-Tlingit verb prefixes. Section 2 begins by demonstrating that Yeniseian verb morphology does not closely resemble other Old World prefixing languages. Section 2.2 provides an overview of specific morphological homologies between Yeniseian and Athabaskan, Eyak, and Tlingit. Successive subsections describe the tense/mood/aspect system (2.2.1), pronominal elements (2.2.2), shape prefixes and incorporated body part nouns (2.2.3), and the pre-root classifier prefixes (2.2.4). Section 2.3 shows that the morphological homologies extend to the way both families derive action nominals from finite verbs. Action nominals are called infinitives in Yeniseian and gerunds in the Na-Dene literature. Section 3 discusses cognates in basic vocabulary and the system of sound correspondences they reveal. This section begins by examining patterns of coda reduction (3.1) and the parallel emergence of phonemic tone in Yeniseian and some Athabaskan languages (3.2–3.3), before turning to sonorant (3.4) and obstruent correspondences (3.5). Section 3.5 also attempts to include exhaustive citation of instances where previous scholars have proposed the same cognates being argued for here. Section 4 briefly summarizes the evidence supporting the conclusion that Yeniseian and Na-Dene share a common linguistic origin. The value of the comparison for helping understand the historical development of both Yeniseian and Na-Dene is highlighted along the way.

My conclusion is that the body of morphological and lexical evidence assembled here demonstrates a genetic relationship between the two language families, or, at the very least, represents a promising hypothesis worthy of further work and critical attention. Whether this relationship should be characterized as a "Dene-Yeniseian" family or is itself only part of a larger family involving Sino-Tibetan and possibly other Old World languages is a topic that deserves serious future investigation. Because the homologies identified between Yeniseian and Athabaskan-Eyak-Tlingit are lacking in Haida, a language sometimes regarded as belonging within Na-Dene, the genetic affiliation of Haida is not addressed here.

Finally, a word about transcription and sources is in order (see also Appendix A). The comparisons that follow make extensive use of the Proto-Na-Dene (PND), Proto-Athabaskan-Eyak (PAE), Pre-Proto-Athabaskan (PPA),³ and Proto-Athabaskan (PA) reconstructions devised over many decades by Athabaskanists Victor Golla, Jim Kari, Mike Krauss, Jeff Leer, Keren Rice, and others. Citation of sources for proto-forms appearing repeatedly in the article is generally reserved for the lexical tables in section 3. The symbol ~ before a proto-form indicates that its author regards it as approximate. An m-dash before a noun in Na-Dene (Eyak *-sahd* 'liver', PA **-la* 'point, end') indicates inalienable possession, a feature not documented for Modern Ket.⁴ Several of my techniques of transcribing Na-Dene forms represent standardizations not used, or not used consistently, in the original sources. A circumflex over a PA or PPA vowel indicates constriction resulting from a glottal stricture in the original PAE auslaut (e.g., PAE **-sənt* > PA **-zât* 'liver'). Nasalization is transcribed using superscript [̃]: PA **-tš̃î* 'wolverine'. The glottal mark (apostrophe) is placed last in any obstruent transcribed with multiple graphic symbols (*kʷ*, *tšʷ*, *kʷ*, etc.). Some aspects of the transcription used below

³ Leer (1979:3) states that PA is the Athabaskan language immediately prior to separation in separate languages and that PPA is "the more hypothetically reconstructed stage of the language previous to certain important phonological and structural changes."

⁴ In word lists of the extinct Arin, Kott and other southern Yeniseian languages, nouns denoting body parts, kinship and the like were more often than not recorded together with a possessive prefix. It is possible that in Proto-Yeniseian such nouns were likewise obligatorily expressed together with a possessive prefix. Most kinship and body-part vocabulary recorded in the 18th and 19th centuries were accompanied by a possessive prefix.

differ between Yeniseian and Na-Dene (see Appendix A for a tabular comparison of the vowel system with others in Na-Dene literature). I follow standard Athabaskanist practice of transcribing palatoalveolars using digraphs (tš, dž) but use č and ž for Yeniseian. In a similar nod to disparate linguistic traditions, I transcribe the palatal glide as [y] in Na-Dene but [j] in Yeniseian. Proto-Yeniseian (PY) forms generally follow reconstructions first worked out by Moscow linguist Sergei Starostin (1982), republished with additions in 1995 (S.Starostin 1995), and later updated online by his son, George Starostin (cf. S.Starostin 2005).⁵ Unless stated otherwise, the PY forms cited below derive from these publications, while any suggested Pre-Proto-Yeniseian (PPY) forms are more speculative and belong entirely to me. I also generally cite actual forms from the Yeniseian daughter languages, while exhaustive inclusion of S.Starostin's PY reconstructions appears only in section 3.5.

2.0. VERB AFFIXES

2.1. Verb prefixes, typology, and genetic linguistics

Ket prefixing verb structure differs strikingly from the surrounding Uralic, Turkic, Mongolic, and Tungusic languages of Inner Asia and Siberia. During the past two centuries, linguists have proposed linking Ket to other Northern Hemisphere families with a prefixing verb, notably Burushaski, Abkhaz-Adyghe (Northwest Caucasian, West Caucasian), Nakh-Dagestanian (Northeast Caucasian, East Caucasian), Sumerian, and Na-Dene (Athabaskan-Eyak-Tlingit). For most linguists, however, the position of Ket in Inner Eurasia remains as enigmatic as that of Basque in Europe, Zúñi in the American Southwest, or Burushaski in South Asia.

This section compares verb structure in other prefixing language families with that of Yeniseian and Na-Dene, both of which are noted for their rigid series of verb prefixal classes. While the prefixing verb structures found throughout the world show considerable typological diversity, Yeniseian and Na-Dene share a number of specific morphological traits. It will be argued that this set of homologies is not due to coincidence but rather derives from a common genetic origin. The notion that Yeniseian shows any special linguistic affinity to Southern Eurasia is not born out by the details of its verb structure. The comparisons below are rather intuitive, however, and it is possible that new historical research into other prefixing Old World verb templates such as that found in Burushaski or in some Tibeto-Burman languages, for example, might reveal additional parallels to finite verb structure in Yeniseian and Na-Dene.

Yeniseian languages have a strongly prefixing verb in an area of the world otherwise dominated by suffixation. The Modern Ket verb template appears in Table 1.

TABLE 1. Modern Ket verb structure

P8	P7	P6	P5	P4	P3	P2	P1	P0	suffix
new subj. person agr clitic	incorporated noun or adj. root, or new verb base	obj agr.	thematic consonants	conjugation marker (q, s, i, a, o)	inanimate marker b	past-tense or imperative consonant (l or n)	1p, 2p subject agr	verb base	animate subject plural

Vajda (2007, 2009) shows that the Modern Ket verb innovated a new lexical root position at the left edge of the verb complex (position 7) in accommodation to the suffixing languages spoken all around it: the Samoyedic languages Selkup, Nenets, and Enets; various South Siberian Turkic languages and dialects; and western dialects of Evenki. It is plausible that some or all of these languages had a steady effect on realigning Yeniseian morphological typology, since marriage partners often came from these peoples. The new position 8 subject markers in Modern Ket are special clitics rather than true prefixes (first remarked

⁵ I thank George Starostin for his advice on adding Sergei Starostin's Proto-Yeniseian reconstructions to the present article, and for his painstaking critique of the article's preliminary version.

in Reshetnikov and G.Starostin 1995). These markers often encliticize to the preceding word or disappear altogether in certain phonetic contexts (the rules for which appear in Vajda 2004:74). In all productive Ket finite verb patterns a lexical root normally begins the phonological verb form, just as in the neighboring Samoyedic, Turkic and Tungusic languages. The oldest layer of verbs, however, is invariably prefixing and root-final, and this is true of all documented Yeniseian languages, though most of the languages have innovated subject number agreement suffixes and Kott and Assan have innovated suffixes used to mark subject person and number agreement.

Comparison with extinct Yeniseian languages shows the Modern Ket verb likely developed from the model shown in Table 2.

TABLE 2. Proto-Yeniseian verb prefixes (see Table 11 for a more detailed model)

morphemes outside the phonological verb	P4	P3	P2	P1	base
verbal complements (adverb, object NP, etc.)	thematic consonant, including shape prefix, incorporated body part noun	3p. animacy marker ?d - anim. b - inanim.	tense, mood, aspect marker combination: q, s or i, a, o + l or n	1/2p subject agr., perfective/stative prefix ja, or imperative prefix Ket d-, Yugh d', Kott č- before vowel-initial base	

The prefixing structures of Modern Ket and Proto-Yeniseian are quite different from other prefixing verbs of the Old World. In Tables 3-5 are verb templates from three languages (Sumerian, Burushaski, and Abkhaz) that have sometimes been linked to Yeniseian as part of previous hypotheses about the family's external genetic connections.

TABLE 3. Sumerian verb structure (based on Rubio 2007:1139)

modal prefixes	connective prefix (possibly meaning 'also, 'then')	conjugation (tense/aspect) prefixes	dative (indirect object pronominal agreement)	dimensional prefixes (locative, ablative, etc.)	2, 3p agreement (non-agent)	root	pronominal suffixes (agent agreement)

TABLE 4. Burushaski verb structure (based on Tikkanen 1995:91)

negative	d-thematic prefix	person number class agr. prefix	causative, benefactive	root	distributive pl. subject/action suffix	1p subject agr. suffix	durative non past	optative, participle, converb, infinitive	2,3p or plural subject agr. suffix	interrogative

TABLE 5. Partial template of Abkhaz verb affixes (based on Hewitt 1979)

direct obj prefix	indirect obj. prefix	subject prefix	causative	root	Suffixes expressing: negation, tense/mood/aspect, stative/dynamic, finite/non-finite verb form

The presence of an uncommon typological feature, such as prefixes arranged in a rigid series of position classes, does not by itself indicate genetic relationship. Templatic prefixing languages can and do differ strikingly from one another, Table 6 shows another well-known prefixing verb, that of Bantu.

The interdigitation of pronominal and tense/mood/aspect prefixes in Bantu, though likewise quite distinct from either Yeniseian or Na-Dene, is nevertheless typologically somewhat closer to both than either is to the other prefixing languages of Eurasia or the Americas.

TABLE 6. Ha (Bantu, Tanzania) verb morphology (Harjula 2004:86)

locative clitic	TAM	subject prefix	several slots for TAM distinctions	object prefix	root	derivational suffix	TAM	locative clitic
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As can be seen, prefixing verb morphologies are structurally quite diverse. The next section demonstrates that the overall closer structural affinity displayed by Yeniseian and Na-Dene among the prefixing languages examined above extends much deeper to include intricate systems of specific morphological homologies.

2.2. Na-Dene and Yeniseian prefixal verb morphology compared

All Na-Dene languages have a strongly prefixing verb structure, a hallmark distinguishing them starkly from the morphology of adjacent languages, including Haida. Geographically more distant North American languages with strongly prefixing verbs, such as Algonqian and Caddoan (Melnar 2004), show a completely different arrangement of prefixes and differ from Athabaskan, Eyak, and Tlingit as strongly as the prefixing languages elsewhere in Eurasia do from Ket. Modern Navajo verb structure, shown in Table 7, provides an illustration of the type of prefixation found in Na-Dene languages.

TABLE 7. Position classes in the Modern Navajo verb (cf. descriptions with right-to-left numbering in Young and Morgan 1987:37-8, and Young 2000:18-26)

	10	9	8	7	6	5	4	3	+ 2	1	0
"outer objects" (incorporated postpositional construction, indirect obj. reciprocal, etc.)	outer derivational prefixes	iterative prefix	distributive plural /da/ (more than 2)	direct object	3rd sbj.	"qualifiers" (derivational prefixes)	"conjugation" prefix relating to tense/mood/aspect (si, ni, yi)	1st, 2nd sbj.	"classifier" (=valence change prefix) Ø, d, t, l	verb stem = set of root + TAM suffix allomorphs	
	disjunct prefixes			conjunct prefixes		conjugation+sbj.		classifier + stem			

The generalized Athabaskan verb model shown below in Table 8 illustrates the probable structure out of which Modern Navajo developed. This model, shorn of the more recently developed disjunct (leftmost) zone of prefixes, shares essentially the same core structure with Eyak (Table 9) and Tlingit (Table 10). Note that all three tables represent my own generalizations based on information from Krauss (1965, 1969), Kari (1976), and Leer (1991, 2000) and are not true reconstructions. There exists no published reconstruction of the Proto-Athabaskan verb, let alone of Proto-Na-Dene.

TABLE 8. Generalized Athabaskan model showing oldest prefix zones

derivational or thematic prefixes of various sorts	oldest prefix positions						verb stem (root + TAM suffix)
	objects and deictic pronominal prefixes	lexical "qualifier" prefixes, including *n -round *d -long *qu -area	tense/mood/aspect marker *s(a), *ca, *na	speech-act-participant subject agreement	perfective-stative prefix ni	classifier Ø, d, t, l	

TABLE 9. Eyak verb (based on Krauss 1965)

derivational or thematic prefixes of various sorts	oldest prefix positions							verb stem (root + TAM suffix)
	objects and deictic pronominal prefixes	shape or anatomical prefixes (from incorporated body part nouns), and other elements	tense, mood, aspect gə (prefix s(a) has moved to the right of the subject prefixes)	1sg, 2sg, 2pl subject agreement	tense mood prefix s(a)	stative ji	classifier t ~ Ø ta ~ ti da ~ di (i < stative prefix)	

TABLE 10. Tlingit verb (based on Leer 1991)

derivational or thematic prefixes of various sorts	oldest prefix positions						verb stem (root + TAM suffix)
	objects and deictic pronominal prefixes	incorporated nouns	tense/mood/aspect ga, yu (yu is cognate with Athabaskan-Eyak s(a))	distributive	subject agreement	classifier (i < stative prefix) ta ~ ti da ~ di sa ~ si, etc.	

The oldest morphological layers of the Athabaskan, Eyak and Tlingit verb show striking homologies. The verb complex is headed by a syllable consisting of a lexical root modified by ancient tense/mood/aspect suffixes. This is preceded by what is commonly called a "classifier"—a prefix deriving from the partial amalgamation of three distinct morpheme positions that in the modern languages usually expresses differences in transitivity. The 1st and 2nd person subject agreement morphemes appear in the same position in all three templates. The basic tense/mood/aspect prefixes and suffixes are cognate and likewise occupy homologous positions in all three templates with only two minor adjustments. In Eyak the tense/mood prefix s- has migrated forward to occupy a position between the subject markers and the classifiers (Krauss 1965). The perfective/stative prefix, which in Proto-Athabaskan still occupies its original position between subject and classifier, has in Eyak and Tlingit transferred its expression through progressive vowel assimilation to the classifier, so that it generally no longer appears as a separate morpheme position. Some of the shape prefixes (qualifiers) to the left of the tense/mood/aspect markers in Athabaskan are cognate with Eyak and Tlingit incorporated nouns in the same position.

These shared patterns provide a strong indication of the common genetic origin of Athabaskan-Eyak-Tlingit (henceforward simply "Na-Dene"). Recent research by Leer (cf. Leer 2008b and especially Leer, this volume) should remove all doubt as to the genetic relatedness of Tlingit to Athabaskan-Eyak. Leer demonstrates extensive new sound correspondences in cognate vocabulary that complement the better-known homologies in verb morphology. The characteristic system of Na-Dene verb affixation is unknown elsewhere in the Americas. Other New World prefixing morphologies are completely different from the Na-Dene model.

Returning to Yeniseian, which in both its modern and ancestral forms differs greatly from other Old World prefixing verb structures, it can be demonstrated that the oldest morphological strata in the Yeniseian verb strongly resemble Na-Dene in many respects. This core similarity is only superficially obscured in Modern Ket by morphological fusion and by the later addition of new valence positions and incorporated elements on the left in Table 11 (cf. Table 1 above for a position-class model of the Modern Ket verb).

TABLE 11. Proto-Yeniseian verb morphology (detailed model)

obj. agr. (pro-clitic or separate word)	prefix positions				verb base			anim.-pl. subj agr.
	incorporated body-part nouns, spatial and shape prefixes, including *n - round, *ʒ - long, *pʰ - flat	3p inan.*w-anim.*d- (anim. preceded by gender/number agr.)	tense, mood, aspect combination AUX + suffix *s > s, i, a vs. *qa > qo, o	1p, 2p subj. agr. *l vs. *n	imperative prefix *ʒ or perfective-stative prefix *jə	verb-deriving prefix *ʒ, also possibly *ʔ	verb root	

The prefixal classes and functions shared by Yeniseian and Na-Dene are as follows. Spatial prefixes, at least some of which are clearly derived from incorporated body part nouns, precede tense/mood/aspect prefixes that probably originated as auxiliary verbs. The TAM prefixes are followed by pronominal elements expressing agreement with a speech-act-participant subject. Subject prefixes are followed by a perfective/stative prefix (referred to in Yeniseian studies as the resultative, passive-resultative, or stative-resultative prefix) that appears in many verbs expressing a state resulting from a prior action. To the right of this prefix appears the verb base itself, the main lexical component. The base may be a bare root, though some bases show signs of having been augmented by a verb-deriving prefix (in section 2.2.4 I will argue that prefixes of this sort are homologous with elements that gave rise to the Na-Dene classifier system, as is the imperative prefix directly before the verb root). Only two morpheme positions show signs of being suffixed after the verb root. The first is a morpheme that appears together with the perfective/stative prefix in verbs denoting states resulting from a prior action and will be called the perfective/stative suffix, since the two affixes seem to work as a sort of circumfix around the verb root in stative verbs of this sort. In section 2.2.1. I will argue that the perfective/stative prefix and suffix combination in Yeniseian is homologous with the perfective/stative prefix and suffix identified for Proto-Na-Dene in Krauss and Leer (1981) and Leer (2000). The second suffix position inherited from Proto-Yeniseian is an animate-class plural subject agreement marker that has no analog in Na-Dene. It seems to have developed in Pre-Proto-Yeniseian alongside the rise of noun plural suffixes; animate nouns as well as finite verbs with animate plural subjects generally take the same plural suffix *-n* in both Ket/Yugh and Kott/Assan.

These similarities go beyond mere typological coincidence in that they can be shown to involve actual cognate morphemes. Not only is the basic interdigitation of morpheme classes extremely close, but the systems of morpheme shapes occupying each position class also appear cognate in many instances. The next several subsections explore Dene-Yeniseian homologies in verbal morphology, beginning with the system of tense/mood/aspect affixes (2.2.1), pronominal elements (2.2.2), and shape prefixes (2.2.3). Section 2.2.4 examines the classifier morphemes of Na-Dene, showing that most of the elements that coalesced to form this morphological structure have cognates in Yeniseian, though the classifier system itself is a unique Na-Dene innovation. Finally, section 2.3 shows that the intricate morphological recipe for deriving action nominals—the Yeniseian infinitives and Na-Dene gerunds—from finite verb stems is basically identical in both families. Affixal categories of the leftmost (outermost) prefixal positions of the verb, which presumably are of more recent origin, are not compared with their potential Yeniseian cognates here, since the purpose of this section is to determine whether the oldest layers of finite verb morphology in both families derive from a common prototype.

2.2.1. The Dene-Yeniseian tense/mood/aspect system

The similarities between Yeniseian and Na-Dene verb morphology are more intricate than cursory inspection suggests. To understand them as a system one must start by considering that the elaborate prefixal strings typical of the modern languages developed out of a more analytic structure. Evidence suggests a bipartite phrasal verb consisting of an auxiliary followed by a lexical verb root, each of which hosted its own prefixes and suffixes. Leer's analysis of Na-Dene negative and irrealis morphology (Leer 2000) suggested that at least some Athabaskan tense/mood prefixes originated as auxiliary verbs. McDonough (2000)

observed that Navajo essentially still operates on a bipartite arrangement whereby finite verb forms are constructed by joining a tense/mood and subject agreement portmanteau together with a stem consisting of classifier, root, and tense/mood/aspect suffix. The same is true of Modern Ket verb morphology, where conjugated forms minimally consist of two syllables—the first conceivably derived from an old auxiliary, the second being the verb base, which in the oldest vocabulary invariably contains the verb word's basic lexical root. In both families, a peg prefix or other device is normally needed to satisfy the minimum two-syllable requirement in cases where a finite verb form would otherwise be monosyllabic.⁶ Ket adds *bin* (from *bin* 'self') to keep the verb stem from becoming the first syllable, as in *bimbus* 'it melts' (< *bin-b-us*); the peg is not needed in the past-tense form *b-il-us* 'it melted'. Sometimes a subject clitic, which normally does not syllabify onto the following verb, provides the first syllable, as in *dujdoq* 'he flies' < *du=j-dog*.⁷ Similar rules exist in Na-Dene to prevent the verb stem from appearing word-initially, echoing the original auxiliary + stem structure of the elements that later coalesced to form the verb complexes of each family.

The bipartite origin of Na-Dene verbs is most clearly demonstrated by the fact that TAM categories minimally require a tense/mood prefix (the original auxiliary) and an aspect suffix that merged with the root to create the stem-set allomorphs characteristic of Modern Athabaskan. This dual morphological expression has persisted in the more agglutinative verb strings of modern Yeniseian and Na-Dene languages, but with the difference that in Yeniseian the productive aspect suffixes attach to the auxiliary and appear as prefixes inside the modern verb form (Table 12).

TABLE 12. Bipartite verb structure in Yeniseian and Na-Dene with shared perfective/stative (P/S) circumfix in the stem and different hosts for aspect suffixes **-ʔ* and **-ŋi* (**-ŋyi*)

auxiliary complex	stem complex
Proto-Na-Dene ⁸ (shape or pron. prefix)-AUX * <i>xʔi</i> -, * <i>gə</i> -	P/S.pref.-classifier-ROOT+P/S or other.aspect.suffix verb stem, with * <i>-ʔ</i> , * <i>-ŋi</i> , etc.
Proto-Yeniseian (shape or pron. prefix)-AUX+aspect.suffix * <i>s</i> -, * <i>ga</i> - + * <i>-l</i> or * <i>-n</i>	P/S.pref.-deriv.prefix-ROOT+P/S.suff verb base (with P/S affixes)

The Proto-Na-Dene aspect marker **ŋi* (**ŋyi*)⁹ yielded PA **ŋi* and Modern Eyak *yi*. Leer (2000) aptly named it 'perfective/stative' since it occurs as a sort of circumfix in verb forms expressing a state created by prior action but is absent in stative verbs like 'be long' or 'be located' where no causal action is inferred. Yeniseian

⁶ The sole exception in Yeniseian appears to be certain singular forms of the verb 'S eats inanimate-class O' in Southern Ket *dīp* 'I eat it', *kūp* 'you eat it', *dūp* 'he eats it', *dāp* 'she eats it' and Yugh *dīf* 'I eat', etc. These forms lost their final syllable, which happens to be the verb base (-a) through a phonological change (cf. section 3.2); cf. Central Ket *dība* 'I eat it', *kūba* 'you eat it', *dūba* 'he eats it', *dāba* 'she eats it'. Modern Eyak also allows monosyllabic verb forms (M.Krauss, p.c.)

⁷ In morpheme divisions of Ket or Yugh verbs, the sign = demarcates the boundary between a subject clitic and the following phonological verb word; this position series is a Ket/Yugh innovation not found in Kott, Assan, Arin, or Pumpokol, even though the morpheme shapes themselves are ancient and found elsewhere in Yeniseian (as predicate agreement suffixes, for example). Kott/Assan innovated a new subject person/number agreement slot as a suffix on the complete opposite side of the verb complex, following the already existing animate pl. subject agreement suffix; see ex. (2) in section 2.2.2 for contrasting Ket and Kott paradigms of the 'animate-class subject lies down'.

⁸ I thank Jeff Leer for allowing me to cite these Proto-Na-Dene forms, which reflect his latest unpublished research.

⁹ Athabaskanist transcriptions of the non-anterior nasal contained in the perfective affix vary from palatal to velar, referring to a phoneme that contrasts with the dental or alveolar **n*. Krauss and Leer (1981) reconstruct fronted velar **ŋʷ* for the non-alveolar nasal phoneme in Proto-Athabaskan, as does Leer (2000). My suspicion is that the nasal in question in Dene-Yeniseian was originally labialized velar **ŋʷ* that became palatalized before front vowels. In Yeniseian this sound lost its nasal quality in most phonological environments. A labialized velar nasal would be structurally parallel to the labialized velar obstruent series posited for Proto-Na-Dene.

has a cognate prefix in the same place in the verb complex that likewise expresses a state created by a prior action. The Yeniseian perfective/stative prefix is productive in both Ket/Yugh and Kott, showing that it belongs to the oldest layer of the verb morphology: Kott *b-a-l-a-kit* 'it was (in a state of having been) rubbed'; Ket *t-a-b-a-kit* 'it is (in a state of having been) rubbed'.¹⁰ Its proto-form was most likely PY **ja-*, given the fact that *ja-* rather than *la-* appears in Ket not only after vowels (*a-ja-dop* 'it is plugged'), but also after tense/mood prefix *s-*, where it requires an epenthetic vowel: Ket *il-u-k-s-aj-a-bet* 'it is broken'. As in Na-Dene, the perfective-stative affix appears twice, as prefix and suffix, forming a sort of circumfix in the verb stem. In Na-Dene the suffix also marks perfective aspect in active verbs. In Yeniseian the perfective/stative suffix has allomorphs *-ej*, *-e*, *-i*, *-j*, with nasal *-ŋ* preserved mainly after uvulars. Just as in Na-Dene, the Yeniseian perfective/stative suffix appears in verbs conveying active events that naturally entail a resultant state, such as 'lie down', 'break', 'fall', 'become stuck', 'fly away', etc., though Ket and Yugh, in contrast to Na-Dene, have reinterpreted its perfective/stative morphology to a large degree. The prefix in Ket has been reanalyzed in active verbs as a 3p subject marker to replace the zero expression for 3p subjects inherited from Dene-Yeniseian (Ket *d-a-ja-daq-ŋ* 'he gets stuck'). The suffix survives most often in plural forms, where it has been reanalyzed as a plural marker (Ket *-doq* 'one subject flies' vs. *-doq-ŋ* 'multiple subjects fly'; also *-daq* 'one subject falls' vs. *-daq-ŋ* 'multiple subjects fall'), though in other verbs it has been retained in singular forms as well, with no clear reason for this pattern (cf. Ket *-loq-ŋ* 'S shivers'). Identification of this hitherto mysterious *-ŋ* as a perfective/stative marker helps explain why it occurs in verbs where plurality is already marked elsewhere, most spectacularly in Kott forms such as *al-an-te:n-aŋ-an-toŋ* 'they lay down once' (< *te:n* 'anim. S lies down'), where plurality would appear to be marked redundantly four times. The full conjugations of active intransitives with relics of perfective/stative affixal morphology can be found in Krejnovich (1968:53–57) for Southern Ket and Verner (1990b:156–172) for Kott. The *Etymological Dictionary of the Yeniseian Languages* (Vajda and Werner, in preparation) will identify all cases where Yeniseian has retained the perfective/stative prefix or suffix in one guise or another.

The Na-Dene perfective/stative prefix **ni-* and suffix **-ni* appear homologous with Ket/Yugh prefix *ja-* and suffix *-ej* or *-ŋ*, though the pattern regulating the loss or retention of nasality remains to be worked out. The phonetic variability of the suffix can be seen in Ket dialectal forms of perf./stative verbs with the meaning 'S is (in a state of having been) made': *-ja-bed-ej*, *-ja-bed-eŋ*, *-ja-bet*, and in the cognate Yugh form *-ja-bè:ʰtʰ*, where the suffix has been absorbed into the root **-betʰ* 'make', leaving pharyngealization and falling tone (the same typically occurs when plural, adjectival, or infinitive nasal suffixes are absorbed into the root, as will be discussed further in section 2.2.5). Another unsolved question is why the Yeniseian perfective/stative morpheme appears as *n* ~ *ni* after the tense/mood marker in active verbs but as *-ej*, *-j*, *ŋ* after the verb root. A likely explanation is that *n-* (probably originally palatal **ni*) developed through assimilation after the tense/mood affix consonant **xʷ* (phonetically palatal [ç]). This is but one of the questions requiring a precise answer before the Dene-Yeniseian language link can be regarded as firmly demonstrated.

The two most ancient aspect suffixes—the **-t* progressive and **-ni* perfective (i.e., perfective/stative) introduced in the preceding paragraph—are cognate in both families. So are the two basic tense/mood prefixes, which probably derive from auxiliary verbs. The next several paragraphs discuss each of these pairs in detail, beginning with **xʷi* and **ga* and the modern tense/mood affixes that derive from them.

Table 13 uses Ket and Navajo forms alongside Eyak and Tlingit to illustrate how tense/mood markers in Yeniseian and Na-Dene originated from the same pair of morphemes.

TABLE 13. Cognate Yeniseian and Na-Dene tense/mood prefixes

DY auxiliary	PPY > Ket	Navajo	Eyak	Tlingit
* <i>xʷi-</i> (telic?)	* <i>si-</i> (> <i>s, i, ʌ, a</i>)	<i>si-</i>	<i>s-</i>	<i>ŷu-</i>
* <i>ga-</i> (atelic?)	* <i>ga-</i> (> <i>qo, o</i>)	<i>yi-</i> (< <i>yi</i>)	<i>gə-</i>	<i>ga-</i>

¹⁰ It is not clear whether the perfective/stative prefix also appears in the past tense of transitive verbs in Kott: Kott *b-a-l-a-kit* 'he rubbed it'. Pre-root [a] in past-tense forms was normally recorded as short, while the vowel in stative verbs was regularly transcribed by Castrén as [ˆ], a symbol used elsewhere to convey lengthened [aː] or [aː].

As a full form, the **ga-* marker is a relic in Yeniseian, occurring in a handful of past-tense forms, such as Kott *ha-i-tou* 'you came' vs. present-tense *i-tou* 'you come' (Verner 1990b:157 shows the full conjugation). The opposition inherited from Dene-Yeniseian **xʷi-* vs. **ga-* is transparent only in a tiny handful of Modern Ket verbs meaning 'kill':¹¹ Ket *d=us-s-ej* 'he kills it' vs. *d=us-q-ej* 'he killed it'; *d=aŋ-s-ej* 'he kills them' vs. *d=aŋ-q-ej* 'he killed them', etc. Elsewhere, **ga-* has reduced to *o-* in Ket through two successive phonological changes. The first was a purely phonetic rule operating only in Ket/Yugh that labialized [a] to [o] adjacent to a uvular correlating with PND **g* (which presumably had become a voiced fricative in Proto-Yeniseian). The second rule truncated the uvular articulation after another consonant; uvular reduction in this environment occurs across Yeniseian. Uvular elision did not occur in basic Ket 'kill' verbs, since no consonant preceded the marker **qo-* within the phonological verb: *t=qo-d-ej* 'he killed me', *t=qo-k-ej* 'he killed you', *t=qo-daŋ-ej* 'he killed us', *t=qo-kaŋ-ej* 'he killed you all'. The uvular was presumably retained in *d=aŋ-q-ej* 'he killed them' through analogy to *d=a-q-ej* 'he killed him', *d=i-q-ej* 'he killed her', a pattern later extended to derived 'kill' verbs such as *d=us-q-ej* 'he killed it' (in the sense of 'killed it on a hunt').¹² Elsewhere, the uvular onset of the tense/mood marker in question dropped after consonants phonologically internally, so that other verbs with this past-tense conjugation marker have the form *o-* in Ket and Yugh, e.g. Ket *d=us-o-l-bet* 'I rowed'.

Evidence of vowel labialization in Ket and Yugh in the environment of a uvular correlating with PND **g* can be seen outside the verb morphology, as well: cf. Ket *qo'n* 'conifer branches' and PAE **gand* 'spruce and pine needles'. The same rule changed **ag* to Ket *oq*, as in Ket *-doq* 'fly' (cf. PA **-t'ag* 'fly'). Modern Ket non-labialized sequences [qa] and [aq] correlate instead with PND glottalized uvular **aq'* and **q'a*, as is evident from comparing Ket *-daq* 'throw, propel' with its Proto-Athabaskan cognate **-t'aq'* 'throw, propel (elongated object)'; similarly, Ket *-qan* 'boil', Kott *au-gan* 'boil', Č-*au-gan* 'burn' correlates with PA **da-q'an* 'burn', where the original difference in anlaut articulation apparently prevented labialization of the following vowel. Since initial glottalized obstruents are not likely to have survived into Proto-Yeniseian, it is more likely that the probably voiced Proto-Yeniseian reflex of originally non-glottalized **g* affected the quality of the adjacent low vowel. What is important to note here is that this labialization rule did not apply in Kott: cf. Kott *fataga i:naŋ* 'I fly' vs. Ket *-doq* 'fly', Yugh *-dox* 'fly'.¹³ Kott [a] correlates with Ket/Yugh [o] adjacent to certain uvular articulations outside the verb system as well: cf. Kott *pagan*—Yugh *boxon* 'mittens', Kott *hapar*—Ket *qovat* 'back, spine', and Kott *hau*—Ket *qo*, Yugh *xo* 'horn', though in many of these cases no Na-Dene cognate is available to confirm whether the uvular in question indeed correlates with PND **g*. Kott past-tense **ga-* would be expected to yield *a-* instead of *o-*, and this is indeed the case, not only in the rare forms where the full prefix survives (as in the Kott form *ha-i-tou* 'you came' mentioned earlier), but also in cases where the velar was truncated by a preceding consonant, as in Kott *b-a-l-a-tar-aŋ* 'he shook it'. Labialized conjugation marker shapes *o-* or *u-* in Kott present- or past-tense verb forms do occur but these arose instead through absorption of the inanimate-class prefix **w-* following a thematic consonant, as in *ho:lafiaŋ* 'I turned it' < **h-w-a-l-a-fi-aŋ*.¹⁴ Yeniseian-internal patterns involving uvulars and labialization support the explanation

¹¹ In connection with these archaic verbs I would like to thank the long suffering Ket expert, Maria Irikova (Kellog village), who in May 2005 spent hours dutifully pronouncing at my request every grammatical form of Ket 'kill', after which she politely avoided me for the next day and a half.

¹² The retention of original *q* < **qo* in the paradigms of kill-verbs might also be connected with the loss of past tense marker *n* before the original consonant of the root *-ej* ~ *-ey* 'kill' (cf. PAE **-še'g* 'hunt O'), since the presence of the uvular came to serve as the primary past-tense marker in these verbs. The original perfective marker *n* shows up in imperative forms, where the imperative prefix *d-* (< PY **ʒ*) that normally appears before vowel-initial roots is truncated instead: *anéj* 'kill him!' (presumably from PPY **a-n-d-xeg*); cf. past tense (*d-*)*áqej* 'I killed him' (< PPY **a-qa-n-xeg*); in these forms the prefixes **ʒ* and **n* appear to have truncated directly before anlaut **x*, which itself later disappeared in Proto-Ket-Yugh.

¹³ The Kott verb base meaning 'jump', which S.Starostin (1995:223) identifies with 'fly'—cf. Kott *ašto:ky* 'to jump', also the Ket base *-doq* in verbs meaning 'jump', lunge', would seem to contradict this pattern; however, Kott 'jump' also appears unlabialized in *itʰakŋ* 'I jump', *antʰikŋ* 'I jumped', *antʰak* 'jump!', suggesting that the labialization in the other forms could be secondary.

¹⁴ The origin of the labialized conjugation vowel from inanimate-class *b-* in Kott was first noticed by the talented

that Ket/Yugh past-tense *o-* and its rare allomorph *qo-*, as well as Kott past-tense *-a-* and its rare allomorph *ha-* all ultimately reflect a conjugation marker shape cognate with PND **gə-*, with the original unlabialized vowel *a* preserved in the past tense of many Kott verbs.

Turning now to the other auxiliary element, Leer identifies the Athabaskan *si-* prefix as deriving from PND **xʲi*, phonetically a palatal fricative [çʲ] (Leer, p.c). The Eyak form is *sə-* or *s-*, while Tlingit has *ʃu-*.¹⁵ In Yeniseian, it yields the recognizable allomorphs Ket/Yugh *s-*, Kott *š-* or *č-* in something like a third of present-tense forms. In the remaining present-tense forms, and in all past and imperative forms, **xʲi-* yielded *j*, *i*, *ɛ*, *ɑ*, or *∅* depending on the original phonology of the surrounding prefixes. Before a non-aspirated stop and when not followed by a prefix beginning in a non-aspirated stop, **xʲi-* yielded sibilant *s-*, as in *d=at-s-a-daq* 'he goes downriver on the ice', *d=igda-k-s-aq* 'he travels down to the riverbank', and *a-k-s-saal* 'he spends the night'. When preceded by a non-aspirated stop but followed by a prefix beginning in a voiced consonant, it either reduced to *ɛ-* (*d=at-ɛ-d-daq* 'I go downriver on the ice', *d=at-ɛ-n-ɛ-daq* 'he went downriver on the ice'), elided through syncope (*d=igda-k-l-aq* 'he went down to the riverbank', or appeared as *i* (*a-k-i-n-saal* 'he spent the night'). The sibilant portion never appears before the past-tense and imperative affixes *-l* and *n* because these sounds were voiced sonorants in Proto-Yeniseian (G.Starostin 1995 plausibly reconstructs them as **r* and **n*). These and other voiced consonant-anlaut prefixes caused **xʲi-* to voice to **ji-*, which later reduced to *i-* or *ɛ-* depending on the phonological environment, or to *∅* where general rules of vowel syncope apply (Vajda 2004). The secondary loss of the initial voiced *j-* is in keeping with the fact that Ket and Yugh syllables never begin with the sequence [ji]. After a fricative, affricate, or aspirated stop, **xʲi-* yielded allomorph *a-*, regardless of what prefix followed. This allomorph (pronounced [a, ɛ, ɛ] depending on dialect) is not subject to the general truncation rules that apply to /i/. In such cases, the original consonant anlaut of **xʲi-* seems to have been absorbed into the preceding consonant's continuant phase, affecting the form of the following vowel. Allomorph *a-* occurs after Ket thematic *d* or *h* (< PY **ž* and **p*, the latter presumably aspirated): *al-d-a-l-do* 'chop it down!', *du=h-a-ta* 'he (a masculine-class tree) stands'. Phonological verb-initial **xʲi-* yields *j-* dialectally or is realized as a lengthening of the subject clitic vowel: *du=j-doq* ~ *dū=roq* 'he flies'. Another example is *dū=-d-ej* 'he kills me': cf. *d=əŋ-s-ej* 'he kills them', where the sibilant allomorph *s-* appears as expected after stop *ŋ*). This interpretation of the distribution of tense/mood marker allomorphs *s-*, *i-* and *a-* contradicts previous treatments, including my own. Vajda (2003, 2004, 2007) treated the modern opposition between vowels *i-* and *a-* as original, with *s-* an allomorph only of *i-*. In fact, all three tense/mood-marker

Moscow linguist Kirill Reshetnikov while researching his dissertation on Yeniseian verb morphology (Reshetnikov 2000). He told me about his unpublished findings during a discussion in Moscow in July 2006. The correctness of his analysis is demonstrated by the fact that /o/ < /ba/ occurs also in the present tense, where it obviously has no parallel with the Ket past-tense conjugation marker shape /o/, cf. Kott *ho:fiəŋ* 'I turn it' < **h-w-a-fi-əŋ*) and stative-resultative (*ho:la:fi* 'it is turned' < **h-w-a-l-a-fi*), but not in the corresponding imperative (*halfi* 'turn it!' < **h-a-l-fi*), since inanimate-class prefix **w-* (which appears as *b* where not truncated in Kott indicative forms) invariably disappears as part of Yeniseian imperative formation. The seeming appearance of present-tense conjugation vowel /a/ and past-tense /o/ in the productive Kott pattern of present-tense *-a:k* but past-tense *-olo:k*, as well as in two groups of transitive verbs discussed by George Starostin in his treatment of Kott verb morphology (G.Starostin 1995:132–133) can be explained in the same way. Transitive verbs lacking the semantically expected *b-* object marker but showing no labialization of /a/ in either tense originally contained the conjugation marker **xʲə-* in both tenses; here **b-* fused with **xʲə-* to produce /a/, analogous to what happened in the Ket verb *d=ul-a-ky* 'I wash it' < **d-ul-d-b-s-ky*. Such verbs are the conjugational equivalent to Athabaskan *si-*perfective / *si-*imperfective verbs. Ket verbs with present-tense /a/ but past-tense /o/ originally contained present-tense conjugation marker **xʲə-* and past-tense **ga-* (with labialization of original /a/ in these past-tense forms again coming from the 3rd-person marker rather than the uvular). Kott verbs of this pattern are often though not always atelic; conjugationally, they are equivalent to Athabaskan verbs with *si-*imperfective and *yi-*perfective forms. It is also possible that the 3p animacy classifier participated in Kott patterns involving /a/ vs. /o/ in cases where the verb form appears to lack an animate-class object marker (cf. section 2.2.3 for more on animacy classifiers).

¹⁵ The present article follows Leer (this volume) in rendering the Tlingit velar approximant [u] as *ɥ*. This sound has also been spelled *w* or *y* in Tlingit orthography (cf. Naish and Story 1973:349).

shapes *s-*, *i-* and *a-* derive from the same ancient auxiliary **xʲi-* through an originally allomorphic distinction based on the phonetics of the surrounding prefixes.¹⁶ Also, it is important to note that Ket/Yugh *s* that correlates with Na-Dene **s* (in contrast to **xʲ*) does not elide or become *i* or *ɛ* in the phonetic environments described above.

The modern distribution of Yeniseian and Na-Dene cognates derived from **ga-* and **xʲi-* suggests these two morphemes originally expressed some contrast involving telicity (the presence or absence of a built-in end point in the verbal event), though the evidence is unclear as to how this opposition originally interacted with tense and mood categories. Ket reflexes of **ga-* are limited to about half of the past-tense forms, while the various reflexes of **xʲi-* appear in present-tense forms, imperatives, and in the remaining past-tense forms. Telic events are more often associated with past-tense *i-* (< **xʲi-*), while atelic situations are expressed using past-tense *o-* (< **ga-*). The original semantic contrast between *i-* (< **xʲi-*) and *o-* (< **ga-*) survives only in Ket/Yugh past-tense forms, where verbs denoting repeated actions, states, or activities with no natural end point virtually always contain *o-* rather than *i-*.¹⁷ Some instances where telic verbs contain past-tense *o-* may have arisen through analogy. Labialization in Modern Ket has become a sort of generalized indicator of past tense in association with any present-tense vowel *a-*, including the adjacent 3p agreement markers *a-* and *aŋ-*, which regularly become *o-* and *oŋ-* in past-tense forms. A more curious exception involves *qo-* in the 'kill' verbs discussed above, some of which are used to convey single or multiple events. In these verbs, the expression of single action seems to be the original meaning, a fact that demonstrates why it is not possible to assign a firm function to the original DY **xʲi-* or **ga-* morphemes.

The general mutual exclusivity between Yeniseian tense/mood prefixes *s-/i-/a-* vs. *qo-/o-*, whatever its ultimate functional basis, has clear parallels in Na-Dene (cf. Krauss 1969). Jim Kari (1979), demonstrated that Proto-Athabaskan atelic **ya-* (from earlier Proto-Na-Dene **gə-*) and telic **s-* (< **xʲi-*) represent a fundamental division in active verbs. Young (2000:69) noted that in Navajo verb themes, *si-*perfectives (<

¹⁶ This is the topic of an article in progress, "New insights into Ket verb morphophonology" (Vajda, in preparation), which will describe more fully how Ket conjugation marker forms [s], [i], and [a/ɛ/ɛ] derive from **xʲ-* through regular phonological interaction with the preceding thematic consonant and following prefix. This conclusion significantly contradicts my original assumption, presented at the Dene-Yeniseic Symposium in February 2008, that **ga-* correlates not with past-tense *o-* (a morpheme left unexplained in my earlier analysis), but rather with the Ket present-tense configuration *ya* in such verbs as *di=ya-daq*. In reality, the syllable *ya* contains the thematic consonant *y* (probably from **x*, which normally disappears word-initially in Ket, but here is kept to help provide the verb form's needed first CV syllable). This guttural element, which actually has nothing to do with the tense-mood system, is then followed by the *a-* allomorph left by **xʲə-* after an original fricative—in other words, by the conjugation marker opposite to **ga-*. A better understanding of Yeniseian thematic consonants, conjugation markers, and uvular and velar proto-sounds has led to the new conclusions presented here. The identification of /s/ as a conjugation marker is one of my few disagreements with the superb, pioneering treatment of Ket verb morphology by G.Starostin and Reshetnikov (1995), who identify /s/ as a marker of intransitivity. My interpretation finds support in such pairs as Ket *da=baŋ-s-a-don* 'she falls to the ground' and *baŋ-b-a-don* 'it falls to the ground', where the change of subject and concomitant appearance of inanimate-class marker *b* (< PY **w*) is the only structural difference between the two forms. I should note, in passing, that G.Starostin and Reshetnikov (1995) were the first to perceive agreement marking and tense/mood/aspect expression as the two fundamental inflectional systems in the Yeniseian verb—a structural trait that Yeniseian continues to share with Na-Dene languages. Out of deference for these and other specialists in Ket verb morphology, the arguments presented here should be taken as provisional pending the full publication of my latest treatment of Yeniseian verb prefix morphophonology, upon which they are based, since this treatment will differ in significant respects from the descriptions published in Vajda (2004) and elsewhere. Suffice it to say that the arguments for cognacy between Yeniseian and Na-Dene conjugation markers presented here pivot crucially on the identification of Yeniseian present-tense /s/ as a conjugation marker and also on the recognition of the widespread past tense vowel /o/ as arising from PY **qa* (ultimately from **ga-*) through regular sound changes.

¹⁷ The sole systematic exception is a class of iteratives innovated in Ket by augmenting the incorporate, but leaving the conjugation marker unchanged, e.g., *da=sulej-u-k-s-a* 'it becomes red (once)' → *da=sultijjij-u-k-s-a* 'it becomes red (repeatedly)'. This shows that Ket conjugation markers have become lexicalized stem elements that only partially reflect original distinctions based on telicity.

**xʷi-*) never pair up with *yi-* imperfectives (< **ga*), except among semelfactives, which combine *si-* perfectives with *yi-* imperfectives. The Tlingit perfective prefix *yū-* (< **xʷi-*) is in complementary distribution with the imperfective prefix *ga-*, the cognate to Yeniseian *(*q*)*o-*, the past-tense conjugation marker in virtually all Ket statives and iteratives.¹⁸

The one striking difference between the core TAM systems of Yeniseian and Na-Dene involves the location of the cognate progressive *-l* and perfective *-n* suffixes. Na-Dene adds them root finally, with the perfective suffix on the root co-occurring with a perfective/stative prefix before the root in verb forms expressing a state resulting from a prior action, just as in Yeniseian. Leer (1979) demonstrated how these suffixes fused to the ancient verb root to produce the characteristic allomorphs that Athabaskanists call 'aspectual stem sets'. Except for the perfective/stative suffix already discussed, Yeniseian suffixes these markers to the auxiliary rather than to the root and therefore lacks Athabaskan-style stem allomorphs. The contrast between the L-progressive and N-perfective suffixes itself is homologous in the two families, and the two suffix forms themselves appear to be clearly cognate. Yeniseian *-l* (probably PY **r* or voiced lateral **l*) appears in the past tense and imperative forms of all stative and iterative verbs, while nasal perfective *-n* appears in many verbs denoting single complete actions or transitions to a new state. The fact that *-l* appears inexplicably in the remaining single-event verbs in Yeniseian is possibly an echo of some earlier, spatial classificatory function. Although it is conjecture to suggest at this stage, the semantically anomalous lateral marker in question could be a remnant of the †-classifier reinterpreted as a tense-mood marker (as will be shown in section 2.2.4, the †-classifier seems to be virtually absent in Yeniseian, a key problem to be resolved in the comparisons being made here). In Modern Ket the distribution of progressive *-l* and perfective *-n* has been lexicalized, with most verbs requiring either *-l* or *-n* in all past tense indicative and imperative forms. But there are a few doublets where the original aspectual contrast, first noted by Krejnovich (1968), is clear:

- (1) *hantet* 'Subject broke it (once)' *haltet* 'Subject broke it/them (several actions)'

Though appearing as prefixes in Yeniseian, **-l* and **-n* functionally mirror the contrast between the Athabaskan progressive suffix **-†* and perfective **-ñi*.¹⁹

The progressive and perfective suffixes are clearly ancient in Na-Dene, with cognates in Athabaskan, Eyak and Tlingit identified by Krauss and Leer in various publications. Leer (1979) demonstrated that the Athabaskan progressive and future stem-set allomorphs originated from the root syllable's merger with an *-†* suffix, while the perfective stem allomorphs involve merger with a nasal suffix. Note that Eyak perfective *-†* apparently derived through diffusion of the progressive marker *-†* since Athabaskan *-ñi* normally corresponds to Eyak voiced *-l*. The Eyak forms of the perfective and progressive suffixes appear in Krauss (1965:171). The Tlingit suffixes are described in Leer (1991:154) and (2000). The Yeniseian cognates are added in Table 14.

TABLE 14. Cognates in Yeniseian and Na-Dene aspect suffixes

DY suffix	Yeniseian	Proto-Ath.	Eyak	Tlingit	Proto-Na-Dene
~*† (progressive)	l, r	*†	†	n	*†
~*ɲ (perfective/stative)	n	*ñ	†	y	*ñi (or *ɲi)

In the modern Na-Dene languages these suffixes normally appear in the form of morphophonemic

¹⁸ Naish and Story (1973:350) label *ga-* the 'imperfective' prefix, but Leer (1991:108) points out that it actually expresses a variety of semantically disparate functions (future, potential, hortative, and contingent modes). Tlingit *ga-* is thus mainly characterizable on the basis of its mutual exclusivity with the perfective prefix *yū-*, with which it is in complementary distribution in the same position class.

¹⁹ It might be useful to note here that the similarity between Yeniseian **-n-* in example (1) and the common Athabaskan mode prefix **na-* in virtually the same place in the verb form is purely coincidental, the latter being an Athabaskan innovation based on reanalysis of the nasal coda of certain incorporated nouns, as discussed by Leer in Berkeley (2009).

modifications of the verb root rhyme. In Yeniseian they are overtly present in most past tense or imperative forms, but occur as prefixes in the verb string as a whole, as shown earlier in Table 11. Other Na-Dene aspectual suffixes identified by Leer (1979)—**k* customary, **t* semelfactive perfective, etc.—appear to lack Yeniseian cognates, though more work in understanding Modern Ket verb base alternations such as *-aq* 'put or give once' but *-o* 'put or give multiple times' could lead to the discovery of additional aspect-related suffixes that survive in the modern languages only as modifications of the verb root rhyme. As mentioned earlier, the perfective suffix has also left its trace as modifications of the Modern Ket verb base rhyme, much as in Modern Athabaskan, though the differences in question are lexical rather than grammatical in function.

The tense/mood markers **xʷi-* / **ga-* and the aspect suffixes **-†* / **-ñi* still form the basis of tense/mood/aspect expression in both families. Nearly every Ket verb belongs to a tense/mood class defined by how these two sets of morphemes interact (Vajda 2007). The same is true of how Na-Dene conjugation classes such as Navajo *si-* (< **xʷi-*) and *yi-* (< PND **ga-*) interact with the imperfective (< **-†*) and perfective (< **-ñi*) stem allomorphs to create the different grammatical forms of individual verbs.

The widespread mutual exclusivity between the modern reflexes of DY **ga-* and **xʷi-* across Yeniseian and Na-Dene—alongside the homologous perfective/stative circumfix and **-†* progressive vs. *-ñi* perfective contrast—shows that the core tense/mood/aspect system of both families is fundamentally similar in a way that cannot be explained by chance resemblance or typological coincidence. The fact that aspect suffixes **-†* and **-ñi* attach to the auxiliary complex in Yeniseian but to the root in Na-Dene further supports the view that the prefixing verb complexes in both families developed on the basis of a common pattern of auxiliary + content verb root, with each element originally hosting its own affixes.

Another potentially cognate Dene-Yeniseian affix could provide additional evidence for a bipartite finite verb string. There are also a number of motion verbs in Ket that take an unexplained *d-* prefix on the verb root to express distributive meaning. Krejnovich (1968:172) provides examples of plural subject forms of the verb 'subject makes a quick round trip up into the forest' with an unexplained prefix *d-* appearing before the verb root in plural forms. This *d-* is conceivably cognate with the Proto-Athabaskan distributive plural proclitic **dâ-* placed before the tense/mood markers, or with the Tlingit distributive plural prefix *daga-* ~ *daɣ-* found after the conjugation prefixes and closer to the verb root (Naish and Story 1973:349). Yeniseian uses what appears to be the same morpheme as a distributive plural suffix in nominal morphology as well (Ket *-da*, Yugh *-d̥a*).

Each of the remaining prefix classes in the oldest layer of Yeniseian and Na-Dene verb morphology likewise involves cognate morphemes as well as structural parallelism. The next three sections discuss pronominal agreement affixes, shape prefixes, and the morphemes that developed into the Na-Dene pre-root classifier complex. It will be argued that some of the morphemes that gave rise to the Na-Dene classifiers have Yeniseian cognates, but the classifier complex as a productive grammatical means of marking transitivity-change is a Na-Dene innovation, absent in Yeniseian, except for the uniquely Yeniseian innovation of using the *d-* component to help form imperatives from active verbs. Section 2.3 demonstrates how the pattern for deriving non-finite forms of verbs—the Eyak gerund and Yeniseian infinitive—is shared by both families.

2.2.2. Dene-Yeniseian homologies in personal pronouns

All universally accepted language families display at least some cognates in basic pronouns. Given the intricate system of homologous TAM affixes between Yeniseian and Na-Dene, one would expect the agreement markers interdigitated among them to show cognacy as well. The Proto-Yeniseian personal pronoun forms reconstructed by S. Starostin (1983, 1995) and G. Starostin (1995) facilitate this comparison, despite the fact that questions remain about the proto-forms of certain Na-Dene pronouns. Part of the problem is that the first and second person pronouns, as well as their verb-internal agreement morphs, appear to have contained sounds in Proto-Na-Dene that were highly mutable, unlike the famously stable 1st person singular *m* of Indo-European, by contrast. The 1st person singular subject agreement prefix forms for Athabaskan, Eyak and Tlingit show a unique correspondence, for which Leer (2008b), following Krauss (1969), uses a dollar sign (\$)

rather than an actual phonetic symbol. The original sound was most likely *x^w, which became *x before vowel /i/ (Leer, p.c.). The Proto-Athabaskan 1st person plural pronoun shape is less clear.²⁰

On the Yeniseian side, the issue of 1sg. proto-forms likewise presents its own set of problems. G. Starostin reconstructs two distinct 1sg. morphemes: *₃ on the basis of Ket/Yugh *ā-d* 'I' vs. Kott/Assan *aj* 'I', and 1sg. **ŋ* on the basis of Ket/Yugh possessive *-b-* vs. Kott/Assan *-ŋ-*. The problem is that the sound correspondences in both of these cases are virtually unique to these 1sg. forms. Ket/Yugh *d* and Kott/Assan *j* correspondences are limited to the 1sg. pronouns and to the nouns Ket/Yugh *dū-l* 'child' and Kott/Assan *d'al ~ jal* 'child' and Ket/Yugh *ulad* 'rib' and Kott *ulaj* 'rib' (S. Starostin 1982, 1995). Here Kott *ulaj* 'rib' likely derives from *ul* 'handle' + *ar* 'bone', with liquid dissimilation, probably removing this item as evidence for the correspondence. Because the correspondence between Kott/Assan *ŋ* and Ket/Yugh/Pumpokol/Arin *b* is unique to the 1sg. morphology, Vajda and Werner (in preparation) treat Kott/Assan 1sg. *-ŋ* as a reanalysis of the generic possessive element *-ŋ* found in several oblique case forms of Ket/Yugh personal pronouns rather than as an original PY 1st person marker: PY **a₃* (1sg.) + *ŋ* (generic possessive formant) > Kott *aŋ* > *ŋ* 'my'. In Ket/Yugh, PY **a₃* + **ŋ* yielded the Modern Ket form *abaŋ*, found in oblique forms such as *abaŋa* 'to me', *abaŋal* 'from me', with the apparent development of PY *₃ into Ket/Yugh *b* also unique to this morphological structure. If this interpretation is correct, it would suggest that the original 1sg. morpheme, reconstructed for PY as *₃, may in fact have contained a labial feature. Once again, such an interpretation is unique to the item in question and so far cannot be shown to reflect a broader pattern.²¹

Another problem is proliferation of new agreement morphology in Yeniseian. As already mentioned, Pre-Proto-Yeniseian seems to have innovated an animate plural agreement suffix, found in Ket and Kott after the root or after the perfective/stative suffix in forms that retain this element. The original subject person agreement marking position located directly before the verb base was retained only in some active intransitive verbs, where it seems to have merged with the perfective/stative prefix position. The various Yeniseian daughter languages then innovated new person/number agreement positions that duplicated the agreement marking of the original subject prefixes. Ket/Yugh innovated subject person-marking proclitics at the leftmost edge of the verb. Kott innovated subject person/number markers that were suffixed after animate plural suffix *-in*, likewise resulting in multi-site subject agreement marking. The rise of new subject marking positions at the opposite ends of the verb in two primary branches of Yeniseian (Ket/Yugh and Kott/Assan) gives the false impression that the verb in these languages is structurally very diverse, whereas in reality nearly every major detail of Ket and Kott verb morphology is essentially parallel. Vajda (2004 and elsewhere) has called the resultant proliferation of Modern Yeniseian agreement patterns 'actant conjugations' or 'agreement marker configurations' and has attributed their rise to accommodation of the areally bizarre root-final Yeniseian verb to the root-initial suffixing patterns prevalent everywhere else in landlocked North Asia.

Example (2) compares a fragment from the Kott and Ket paradigms of the originally cognate verb 'animate subject lies down' to illustrate the differently innovated multisite subject marking patterns. The Kott forms (2a) show a new series of Uralic- or Turkic-like agreement suffixes (position -3). Ket has a new series of proclitics (position 8) that never form a syllable on the phonological verb since all productive patterns of verb formation in Modern Ket place a content morpheme in the initial syllable, as in the neighboring Samoyedic, Tungusic and Turkic languages. In both languages the original pre-root subject prefixes remain in the same position 1, but generally only in active intransitive verbs where they have merged with and absorbed the old perfective/stative prefix position, with the PY perf./stative prefix **ja-* reanalyzed as a third-person subject agreement marker (Kott *ā-*, Ket *ja-* or *l-*).

²⁰ Regarding the 1st person plural, Krauss (1969:82) writes, "It is in fact impossible to reconstruct any first personal plural pronoun common for PAE or even PA for all of Athabaskan." The Eyak verb does not use any verb-internal prefix to mark the first person plural subject.

²¹ I anticipate that further work in demonstrating a labialized velar series of consonants in Proto-Yeniseian will make it possible to show that the 1sg pronoun consonant that appears as *d* or *b* in Ket/Yugh and *j* in Southern Yeniseian is indeed cognate with Na-Dene 1sg **x^w*.

(2a) Kott 'animate subject lies down' 3p.anim³-SBJ¹-lie.down⁰-Perf/Stative¹-PL²-SBJ³

I lie down	<i>i:te:naŋ</i>	< * <i>i¹-te:n⁰-aŋ³</i>
you (sg.) lie down	<i>i:te:nu</i>	< * <i>i¹te:n⁰-u³</i>
he/she lies down	<i>d'āte:n</i>	< * <i>d³-ā¹-te:n⁰</i>
we lie down	<i>onte:naŋantəŋ</i>	< * <i>oŋ¹-te:n⁰-aŋ¹-an²-toŋ³</i>
you (pl.) lie down	<i>onte:naŋantəŋ</i>	< * <i>oŋ¹-te:n⁰-aŋ¹-an²-oŋ³</i>
they lie down	<i>d'ānte:naŋan</i>	< * <i>d³-āŋ¹-te:n⁰-aŋ¹-an²</i>

(2b) Southern Ket 'animate subject lies down' SBJ⁸-thematic⁵-TENSE⁴-SBJ¹-lie.down⁰

I lie down	<i>t=taritn</i>	< * <i>d¹=t⁵-a⁴-d¹-tn⁰</i>
you (sg.) lie down	<i>k=tayutn</i>	< * <i>ku⁸=t⁵-a⁴-ku¹-tn⁰</i>
he lies down	<i>t=tajətn</i>	< * <i>du⁸=t⁵-a⁴-jə¹-tn⁰</i>
she lies down	<i>da=tajətn</i>	< * <i>dā⁸=t⁵-a⁴-jə¹-tn⁰</i>
we lie down	<i>t=tarəŋten</i>	< * <i>d¹=t⁵-a⁴-dəŋ¹-tn⁰</i>
you (pl.) lie down	<i>k=tayəŋten</i>	< * <i>ku⁸=t⁵-a⁴-kəŋ¹-tn⁰</i>
they lie down	<i>t=tajəŋten</i>	< * <i>du⁸=t⁵-a⁴-jəŋ¹-tn⁰</i>

A comparison of Ket and Kott verb morphology illustrates how the reconstruction of a PY 2sg. affix is also fraught with difficulty, if Kott 2sg. *i-* is regarded as representing the original 2sg. subject agreement marker. In verbs that require multi-site subject marking, Ket uses the pre-root prefix *ku-* as well as the clitic *ku=* (often reduced to *-k* encliticizing to a preceding word), while Kott uses the suffix *-u* and pre-root prefix *i-*. G. Starostin (1995) has plausibly reconstructed **aw* for the free-standing 2sg. pronoun, based on Ket *ū-* and Kott *au* 'you' (singular), and *-[k]u* for the subject marker. The latter reconstruction, however, does not take into consideration the form of Kott 2sg. *i-* as a subject agreement marker. Because tense-mood markers in the Kott verb may have interacted phonologically with the pre-root subject marker (in position 1), it is not possible at this stage to determine the actual form of the position 1 affixes in Kott.

Alongside these crucial unresolved problems with the proto-forms of Yeniseian 1sg. and 2sg. pronouns, the comparisons in Table 15 below show that other portions of the pronominal morphology of Yeniseian and Na-Dene are clearly cognate. Table 15 juxtaposes pronominal forms in four Yeniseian languages (Werner 2005) with Proto-Athabaskan (Krauss and Leer 1981), Eyak (Krauss 1965, 1969), and Tlingit (Leer 1991:58). The Proto-Yeniseian forms, excepting the 1st and 2nd singular subject prefixes,²² follow G. Starostin (1995:162). The Proto-Yeniseian subject prefixes given in Table 15 are those found directly before the verb base and not suffixes or proclitics innovated later by individual daughter languages. Question marks in the Arin and Pumpokol columns indicate the required pronoun forms went unrecorded. The varying 3rd person pronoun forms for Kott and Arin are dialectal forms recorded by 18th-century travelers; those for Athabaskan also reflect geography, with **adən* supported by many northern languages, and **wī* ~ **wə-n* for Apachean (cf. Modern Navajo *bi*) and Pacific Coast Athabaskan.

²² The 1st and 2nd singular prefix forms shown in Table 15 as the original Yeniseian subject prefixes represent those found vestigially in basic Ket and Kott verbs, including Kott *i-ten-aŋ* 'I lie down', *i-ten-u* 'you (sg.) lie down' (ex. 2a), and possibly also in certain Ket active intransitive verbs such as *dijdoq* 'I fly', *kujdoq* 'you (sg.) fly', where singular forms appear to have only one subject prefix, while the plural forms have two. These prefixes were replaced as productive subject agreement markers by Ket proclitics *d¹=* (1st singular) and *ku=* (2nd singular) and Kott suffixes *-ŋ* and *-u*, conceivably after global sound changes caused the original singular speech-act-participant agreement prefix shapes to lose their phonological distinctiveness. PPY may have contained a 1sg. marker **x^w* that yielded not only Ket *d* / *b* and Kott *j*, but also the Kott subject prefix form *i-* found in basic intransitive verbs. An original PPY 2sg. prefix form of **ŋ^wi-* could have reduced PY **i*, yielding a correspondence similar to that found in the perfective/stative prefix (Na-Dene **ŋ^wi-* and PY **jə-*). Unfortunately, this interpretation remains speculative without much more work on Dene-Yeniseian sound correspondences.

TABLE 15. Personal pronouns in Yeniseian and Na-Dene

	PY	Ket	Kott	Arin	Pump.	PA	Eyak	Tlingit
1st singular (cognacy difficult to assess, given problems in reconstruction; cf. fn22)								
free pronoun	*ʔaʒ	ad	aj	aj, ja	ad	*ʂi~xʔi	xu	χád
subject prefix	?	i-, di, ba	i-, ŋ	?	?	*ʂ- ~ xʔ-	x(*)-	χa-
1st plural (cognacy not evident, except possibly in the plural portion)								
free pronoun	*ʔaʒŋ	atn	ajŋ	aiŋ	adiŋ	~*dane	əəyag	ʔuhán
subject prefix	*ʒŋ-	dəŋ-	an-	?	?	*ʔ-D ²³	∅	tu-
2nd singular (cognacy not evident unless PY *i- cognate with ND *ñi-, yi-, ī-)								
free pronoun	*ʔaw	ū	au	au	ue	*ñan	ʔi	waʔé
subject prefix	?	i-, ku-	i-, ku	?	?	*ñi-	yi-	ī-
2nd plural (PY plural component *oŋ possibly cognate with ND ən ~ á'n)								
free pronoun	*ʔawoŋ	əkŋ	aoŋ	aŋ	aiánŋ	*nəχ(*)əŋ	ləxi	ji'h(*)á'n
subject prefix	*[k]oŋ-	kəŋ-	on-	?	?	~*χ(*)-	ləχ-	ji(-)
3rd singular (PY *w is cognate with ND *wə ~ ʔu ~ hu)								
free pronoun	*ʔwV	bū	uju	au	?	*wi ~ wə-n	ʔa	hú
subject prefix	∅	ha-tu	ha-tu	?	?	*ʔadən	∅	∅

Na-Dene and Yeniseian plural pronouns appear to share a nasal plural suffix. On the Yeniseian side, suffixes of the shape -n or -ŋ typically mark plurality in nouns as well as pronouns. Because plural noun suffixes are not found in Proto-Na-Dene, it remains unclear whether the final nasals in the Tlingit 1st and 2nd person pronouns have any connection with the nasal plural endings of Yeniseian. No Eyak 1pl. subject prefix appears in the published materials. The Proto-Athabaskan 1pl. reconstruction *ʔ-D-, where D represents the d-classifier element, was suggested by Jeff Leer (p.c.). Given the disparity within Na-Dene, it is difficult to reconstruct any shared Dene-Yeniseian 1pl. morphemes.

The auslaut /d/ of Tlingit χád 'I' and Ket, Yugh, Pumpokol ad 'I' is a chance resemblance, as is probably the /w/ in Tlingit waʔé 'you (sg.)' and the high back rounded vowel in the Yeniseian 2sg. free-standing pronouns (Ket/Yugh ū 'you (sg.)', Kott au 'you (sg.)'). It is rather the initial χ in Tlingit χád 'I' and the final é in Tlingit waʔé 'you (sg.)' that are cognate with the Athabaskan and Eyak 1st and 2nd singular pronouns and conceivably with PY agreement markers (see footnote 22).

Free-standing 3rd person pronouns in Yeniseian show cognacy with Na-Dene. Modern Ket/Yugh bū 'he, she' contains PY *w and appears cognate with Na-Dene 3rd person pronouns deriving from the same sound. Yeniseian b regularly corresponds to Athabaskan b in cases where both derive from earlier *w. There is also PY *wen 'one's own' that may be cognate with Athabaskan *wə-n. The first syllable of Kott and Arin hatu, where 3p. pronominal root ha is followed by possessive affix -tu (cf. Ket bu-da 'his'), may be cognate to Tlingit hú 'he'. Note that Ket/Yugh bu 'he, she' is a contraction of earlier *buha, as attested by the earliest recordings of Ket, made in the 18th century, which contain forms like buhoŋen for 'they' (cf. modern būŋ 'they').

There is also a notable structural homology in the relative location of speech-act-participant vs. 3rd person agreement prefixes in the two families. Markers of 3rd person agreement in Yeniseian and Na-Dene stand before the conjugation prefix, while the 1st and 2nd person markers follow it. The structural parallels are shown in Table 16.

TABLE 16. The oldest person agreement positions in Na-Dene and Yeniseian

	auxiliary complex	root complex
Na-Dene:	3p agr.-AUX-1/2p agr.	perf./stative pref. classifier-root-TAMsuffix
Yeniseian:	3p agr.-AUX-TAMsuffix	1/2p agr. or perf./stative pref.-verb root

²³ The symbol *D in this reconstruction represents the valence-lowering d-component of the classifier, apparently innovatively used in PA to express plurality.

As already discussed, it remains to be seen to what degree these positional homologies involve actual cognacy in the agreement morphemes occupying them. One of the key problems yet to be solved in demonstrating a Dene-Yeniseian language link lies in making progress comparing the basic pronominal morphology. The Yeniseian inanimate-class and animate-class markers to the right of the conjugation markers may be cognate with the b- and y- 3rd person deictic markers known famously from Navajo and other Athabaskan languages, though the original shape of the animate marker in Yeniseian is difficult to determine due to its complex morphophonemic interaction with adjacent prefixes. In the oldest layer of Kott verbs, 3rd person agreement was expressed by a prefix b for inanimate-class subject, which contrasted with d in present-tense forms with animate subjects. Example (3) gives an example of 3p intransitive-verb subject forms in Kott. Note that the animacy marker seems to be missing in the past tense form.

(3)	d-a-fel, 'he/she grows'	b-a-fel, 'it grows'
	3anim-pres-grow	3inan-pres-grow
	al-a-fel, 'he/she grew'	b-al-a-fel, 'it grew'
	past-perf.stative-grow	3inan-past-perf.stative-grow

The phonetic shape of the Yeniseian animacy marker requires two important corrections to my earlier published descriptions. Vajda (2007) identified Kott d in forms such as those shown in (3) as the form of the animacy marker. However, as pointed out by George Starostin (p.c.), this does not account for the fact that the consonant in question disappears in the past-tense forms. In the new analysis presented here, the shape d is interpreted as having resulted from an amalgam of the 3rd person animacy marker with the following conjugation marker (< *xʔi, see section 2.2.1 above). This explains why the resulting sound d disappears in past-tense forms before the voiced aspectual prefix l- or n-, since conjugation marker s- (< *xʔi) likewise loses its fricative quality in this environment. Also incorrect was my earlier identification of Ket thematic d in such verbs as d=ul-d-aj-kŋ 'I wash him' as an animacy marker (cf. Vajda 2004, 2007), an analysis correctly rejected by Georg (2007:260-262).²⁴ The apparent disappearance of this marker in forms with inanimate-class objects (such as Ket d=ul-a-kŋ 'I wash it'), results from morphophonemic reduction, whereby what can be reconstructed as a sequence of thematic d + inanimate-class b + conjugation marker s (< *d-w-xʔi) regularly reduces to a vowel pronounced ʌ in the speech of my Southern Ket informants, recorded elsewhere dialectally as a, ä, or i. Thematic d- appears in forms such as d=ul-d-ij-kŋ 'I wash her' not because it represents the Proto-Yeniseian animacy marker, but simply because the given morphophonemic environment did not cause its reduction. The original conjugation marker s-, which elides in the presence of either /d/ or /b/, retains its consonantal shape only after the stop ŋ in the plural object form d=ul-d-aŋ-s-kŋ 'I wash them' (cf. Werner 1997c:199). Therefore, the consonants (Ket d, Kott d) identified in (Vajda 2007) as animacy markers do not represent the true shape of the morpheme that expresses 3p animacy in contrast to inanimate-class b. Also, as will be shown below, the true animacy marker follows rather than precedes the 3p animate gender and number agreement markers.

Vajda (in preparation) will present the rules of prefixal interaction that determine the diverse allomorphs of the Yeniseian animacy marker. These allomorphs depend on the adjacent prefixes and vary so greatly in their phonology that a proto-form is difficult to determine (the convention *d used in Tables 2 and 11 above as the animacy marker shape is merely provisional). In Ket present-tense forms, it appears as /j/ between the masculine (a) or feminine (i) agreement marker and the verb root: d-aj-git 'I search for him', d-ij-git 'I search for her'. In past-tense forms it causes the feminine agreement marker to appear in the allomorphs did, iru, or it (depending on the precise phonetic environment), rather than simply as i, e.g. ditlitaj 'I dragged her', diruntet 'I hit her', dboditnam 'I led her away' (the /d/ in the last form deriving from long-distance assimilation of thematic k, which is normally pronounced y intervocalically: *dboyitnam. Vajda (2004 and elsewhere) regarded

²⁴ Stefan Georg is a leading specialist on Yeniseian and other Inner Asian languages and the first scholar outside the former Soviet Union to perform linguistic fieldwork with Ket native speakers in their north-central Siberian home.

the /d/ and /t/ segments in such verb forms as “morphotactic augments”, semantically empty elements that merely served to disambiguate otherwise homonymous affixes occupying genuine morpheme positions in the verb. Although these elements undoubtedly do serve such a function in the modern language, it is now clear they have a semantic origin. The fact that they regularly disappear in the imperative forms—*iltan* ‘drag her!’, *intet* ‘hit her!’, *ku:nam* (< *ku-y-i-n-am*) ‘lead her!’—shows they parallel inanimate *b* in function, since the inanimate marker likewise elides in imperative forms. It should be mentioned that if the two morphemes in question are indeed cognate with the *b-* vs. *y-* prefixes of Athabaskan, then Athabaskan does not seem to have any analog to the disappearance of Yeniseian 3p animacy/inanimacy markers in imperative forms. In general, the characteristic PY imperative formation, which involves loss of subject affixes and animacy markers, as well as the addition of a prefix cognate with the valence-reducing *d-* component of the classifier, is one of the hallmarks of Yeniseian as a distinct taxon, distinguishing the family as a whole from Na-Dene, where the *d-* component of the classifier never marks tense/mood distinctions of any kind.

The same system of 3rd person animacy-related prefixal allomorphs is evident in Yugh, with the added feature of pharyngealization contributing to the animacy marker’s shape in the past-tense forms. Table 17 gives morpheme breakdowns of the verb forms to indicate that the position of the animacy marker (conventionally indicated by “J”) followed rather than preceded the actual 3rd person animate agreement markers. In contrast to animate-class arguments, inanimate-class subjects or objects were indexed only by the inanimacy marker *b* without a preceding gender or number agreement prefix:

TABLE 17. Yugh verbs with 3p animacy markers (allomorph forms shown in bold, animate marker position shown as “J”, *di* = 1sg subject clitic, *ir* = past tense, *čan* = drag)

present tense: ‘I drag O’	past: ‘I dragged O’	imperative: ‘drag O!’
animate-class object		
him <i>dajčan</i> (<i>di=a-J-čan</i>)	<i>dò:ʳčan</i> (<i>di=a-J-ir-čan</i>)	<i>ā-rčan</i> (<i>a-ir-čan</i>)
her <i>dijčan</i> (<i>di=i-J-čan</i>)	<i>didʰi:ʳčan</i> (<i>di=i-J-ir-čan</i>)	<i>ī-rčan</i> (<i>i-ir-čan</i>)
them <i>daŋačan</i> (<i>di=aŋ-J-čan</i>)	<i>doŋo:ʳčan</i> (<i>di=aŋ-J-ir-čan</i>)	<i>aŋā-rčan</i> (<i>aŋ-ir-čan</i>)
inanimate-class object forms (provided for comparison)		
it <i>dipčan</i> (<i>di=b-čan</i>)	<i>dibīrtetʰ</i> (<i>di=b-ir-čan</i>)	<i>ī-rčan</i> (<i>ir-čan</i>)

Note also that the highlighted sound segments such as /j/ in *dajčan*, /a/ in *daŋačan*, and /ʰ/ in *dò:ʳčan* are not pure allomorphs of the animacy marker, but rather derive from its amalgamation with the following tense/mood prefix.

It would be speculative to conclude at this point that the 3rd person Yeniseian animacy/inanimacy markers represented in the morpheme breakdowns of Table 17 as *J-* vs. *b-* are cognate with the Athabaskan 3rd person markers *y-* (= palatal *j*) and *b-* (< PA **yə-* and **wə-*), given all of the unresolved questions surrounding the original functions and proto-forms of these morphemes. The Yeniseian morphemes classify the animacy of either the intransitive subject or the object in many basic verbs, while the contrast between Athabaskan *y-* and *b-* signals something quite different: whether or not the 3rd person argument is the topic. Nevertheless, the identical location of these two pairs of markers in the verb, as well as their connection with 3rd person reference, is noteworthy.

Na-Dene also has the impersonal pronominal prefix **kʷ-* (> Eyak *kʷ-*, PA **tʰ-*) used verb-internally as well as prefixed to nouns to mark such categories as indefinite subject, object, or possessor marker. This morpheme is cognate with Ket/Yugh generic 3rd-person possessive *d-* found productively with postpositions and other postposed relational modifiers, where it is followed by a marker expressing gender (cf. Ket *d-i-ŋal* ‘from her, *d-a-ŋal* ‘from him’). It also appears sporadically and sometimes optionally as a derivational prefix in noun morphology, e.g., Ket *amas* ~ *damas* ‘thorn’, *ū-l* ‘pole, handle’ ~ *dū-l* ‘handle (of something)’; *alla* ‘half’ ~ *dalla* ‘half of something’. The same pronominal element also appears in the innovative Ket/Yugh subject prefixes *da-* ~ *də-* ‘she’ and *du-* ‘he’ (Ket *də-doq* ‘she flies’, *dū-doq* ‘he flies’), as well as in predicate agreement

suffixes of the same shape (Ket *sin-də* ‘she is decrepit, old’, *sin-du* ‘he is decrepit, old’). Thus, although 3rd person and impersonal pronominal markers are cognate in Yeniseian and Na-Dene, their functional distribution has undergone a variety of independent changes in each family.

In concluding this discussion of pronominal elements, it is worth emphasizing that Dene-Yeniseian differs from established families (as well as from some more speculative ones) in the relative inscrutability of its pronominal morphology. Cognacy in basic pronouns has tended to be one of the first pieces of evidence cited in proposing genetic relationships. In the case of Dene-Yeniseian, evidence of the genetic connection comes more obviously from other subsystems of the verb complex, as well as from basic vocabulary. In fact, understanding Yeniseian pronoun morphology from a historical perspective may require perspectives gained from an already well-demonstrated external genetic connection, rather than pronominal forms helping to demonstrate the connection beforehand. Given the emphasis often placed by historical linguists on personal pronouns, the diverse and rather unstable phonological forms of Yeniseian and Na-Dene pronouns seem to be a major reason this particular genetic connection was not seriously investigated much earlier. Because 1st and 2nd singular Ket pronouns and agreement affixes bear little obvious resemblance to those in Na-Dene, practically no one bothered to look further.

2.2.3. Dene-Yeniseian shape prefixes

The verb in both families contains lexical prefixes located between the object position and the conjugation (tense-mood-aspect) prefixes. These prefixes are intricate and belong to a number of historically distinct morpheme positions, making the zone in question one of the most interesting portions of the verb complex. In Yeniseian the prefixes in question are single-consonant morphemes that in the literature have been referred to as ‘determiners’ (Krejnovich 1968), ‘preverbs’ (G.Starostin and Reshetnikov 1995; G.Starostin 1995), ‘adpositions’ (Vajda 2003, 2004), or ‘thematic consonants’ (Vajda 2007). The homologous Na-Dene prefixes are generally known as ‘qualifiers’, following Kari’s (1989) influential deployment of Jetté’s term for these morphemes. In both families the prefixes may concatenate. Some appear to derive from anatomical nouns, while others are etymologically as well as semantically opaque. Yeniseian-internal evidence suggests at least two ancient groups of thematic consonants, positioned in a specific order. Leftmost is a class of incorporated postpositions preceded by a possessive pronoun that became an object marker when incorporated into the verb string. The second set is not associated with a preceding object marker. Some of the latter are shape or anatomical prefixes. Vajda (2003:72–79) earlier argued that some Yeniseian thematic consonants derive from incorporated body part nouns (notably Ket *t-* Yugh *č-* < PY **c[i]ʰg* ‘head’) with prefixes in Na-Dene likewise deriving from the cognate PAE **-tsiʰ* ‘head’.

While far more work is needed on Yeniseian thematic consonants before a fully meaningful comparison of these prefixes with the Na-Dene qualifiers is feasible,²⁵ three prefixes reflecting the shape of the absolutive argument of the verb appear to have Na-Dene cognates. The comparisons made below make crucial reference to Krauss’s (1968) pioneering article on noun classification in the Athabaskan and Eyak verbs, which is accomplished by a combination of verb stems and noun-class conjunct prefixes. There are also verbs with thematic prefixes in this zone deriving from words for ‘head’ or ‘eye’. While shape and anatomical prefixes of this sort remained productive in Eyak, Athabaskan has innovated new patterns of verb stem variation to express noun classification. Only a few Athabaskan languages continue to use shape prefixes productively, though vestigial evidence for these prefixes is spread quite widely across the family (Krauss 1968). For Modern Dakelh (Carrier) Poser (2005) describes the productive use of three shape prefixes: *n-* ‘round’, *d-* ‘stick-like’, and *xʷ-* ‘areal, spatial’ (the latter having a productive Navajo cognate in the form of *h-* or *hw-*). Before comparing these prefixes to Yeniseian thematic consonants, it should be noted that the area prefix, which derives from PAE **qo-* ‘area, event’, originated in the zone farther to the left of the other two (Krauss

²⁵ George Starostin, the first to reconstruct the shapes of some of the Yeniseian thematic consonants based on a comparison of Kott and Ket (Starostin 1995), rightly cautions on the difficulty of assigning original meanings to these elements in Proto-Yeniseian (G.Starostin, personal communication). The comparisons in this section should be taken as preliminary.

1968, Thompson 1993) and is productive everywhere in Athabaskan.

Yeniseian appears to possess cognates to these prefixes. Modern Ket has the following three prefixes: *n-* 'round, around', *d-* 'long shape, along', and *h-* 'area, surface', presumably derived from Proto-Yeniseian **n*, **ʒ*, **p*, given the available cognates in Yugh and Kott. Below are examples of Ket, Kott, and Yugh verbs with shape prefixes:

(4) *Yeniseian stems containing spatial/shape prefixes*

- Ket: *-n-a-b-hil* 'subject cuts it around the edges' (e.g., birchbark or rawhide)
-1SG.SBJ-AROUND-PRES-3N.OBJ-CUT
- Ket: *-n-a-b-do* 'subject hews, chisels it' (a round object)
-ROUND-PRES-3N.OBJ-chop
- Ket: *-d-a-b-do* 'subject hews, chisels it' (a long object, such as a log)
-LONG-PRES-3N.OBJ-chop cf: Ket *-a-b-do* 'subject cuts it off' (no shape specified)
- Ket: *-h-a-b-to* 'subject puts object onto a surface, erects object'
-FLAT.AREA-PRES-3N.OBJ-put
- Ket: *-h-a-b-daŋŋ* 'subject glues object to a surface'
-1SG.SBJ-FLAT.AREA-PRES-3N.OBJ-glugue
- Ket: *-h-a-tes* 'subject stands up', Yugh *-f-a-tes* id., Kott: *-f-a-taj* id.
-1SG.SBJ-FLAT.AREA-PRES-occupy,perpendicularly
- Kott: *-d̄-a-ti* 'subject hits with long object, such as a whip'
-LONG-PRES-hit cf: Kott *-a-ti* 'hit' (instrument shape unspecified)

Possible Na-Dene cognates to this triple set of shape prefixes appear in Table 18.²⁶

TABLE 18. Cognate Yeniseian and Na-Dene shape prefixes and incorporated nouns

expression	Ket/Yugh/Kott	Athabaskan	Eyak	Tlingit
(round, around)	<i>n</i> / - / -	<i>*nə-</i>	<i>ləχə-</i> (< <i>laχ</i> 'eye')	<i>wa'c</i> 'eye'
(long, along)	<i>d</i> / <i>d̄</i> / <i>č</i> (?)	<i>*də-</i>	<i>də-</i>	?
(area, surface)	<i>h</i> / <i>f</i> / <i>f</i>	<i>*qə-</i>	-	<i>qu-</i>

In Modern Ket, shape prefixes are largely fossilized stem elements characteristic of the oldest layer of the vocabulary and not used in any productive stem formation pattern. Attestations of the round-shape prefix *n-* are limited to Ket, where it occurs in a tiny handful of verbs.²⁷ The possible examples of long-shape *d-* in Kott are rare and also show a non-canonical sound correspondence with Ket and Yugh. Na-Dene *d* normally corresponds to Ket *d*, Yugh *d̄*, and Kott *č*. In verbs with the presumed long-shape prefix, however, Kott has *d̄* rather than *č*, as shown in *-d̄-a-ti* 'S whips O'. If the Kott example does indeed represent the

²⁶ Mike Krauss (p.c.) cautions that the meaning 'long shape' for PAE **də-* is not clearly traceable to the proto-language, since the prefix in question has other semantic associations, as well. For genuine PAE noun classificatory prefixes Krauss reconstructs **də-* (found in verbs having to do with a variety of concepts, including 'fire', 'bright', 'oral', 'noise', as well as 'wood', 'round and solid') and **nə-* (found in verbs having to do with the 'head' or 'face', and not derived from PAE 'eye'). It is not clear whether the Modern Carrier prefix *n-* 'round shape' derives from the PAE anatomical prefix **nə-* ~ **nəχ-* 'eye', 'berry-like' or from the noun classificatory prefix **nə-*.

²⁷ Ket and Yugh show other uses of thematic *n-* following an object marker that have nothing to do with round shape: *a-n-s-ut* 'he is constipated', *d-a-n-b-u* 'I give it to him (iterative)'. Round-shape *n-* never follows the object marker and is probably a different morpheme. Note also that the Athabaskan *n-* qualifier sometimes is associated with long, ropelike shape, which doesn't seem to have any echo in Yeniseian.

long-shape prefix, the appearance of *d̄* rather than *č* could conceivably reflect the phonetic effect of the conjugation marker that originally followed, though this remains conjecture without a fuller account of the morphological processes in question. Otherwise, the extant Kott materials do not contain verb forms showing even potential cognacy with the Ket-Yugh long-shape prefix. It should be noted, however, that the Athabaskan *d-* qualifier has functions other than 'long shape', since it also appears in a number of verbs expressing sound or the agency of fire. This appears equally true for Yeniseian, and it is unclear whether we are dealing with one cognate prefix or several. For example, Kott has one instance where thematic *č-* (the cognate of Ket *d-*, Yugh *d̄-*, and therefore of Athabaskan *d-*) occurs in a verb meaning 'burn': Kott *č-au-gan* 'to burn'. This verb is semantically opposed to the unprefixated Kott *au-gan* 'to boil'. Similarly, Ket has a number of verbs of sound where thematic *d-* appears, e.g., Ket *da-d-a-j-dun* 'she shouts (once)' (Krejnovich 1968:78). It thus remains unclear whether these various semantic functions of thematic *d-* in Yeniseian and Athabaskan derive from a single morpheme or from several homophonous morphemes.

The areal prefix **qə-* found in Athabaskan and Tlingit seems to pair up with the thematic consonant (preverb) reconstructed as PY **p-* by George Starostin (1995:168) on the regular sound correspondence between Ket *h*, Yugh *f*, and Kott *f*. In section 3.5 below it will be argued that the Proto-Yeniseian labial plosives **b* and **p* regularly correlate with gutturals (i.e., velars or uvulars) in Proto-Na-Dene, where labial plosive phonemes are entirely lacking (cf. section 3.5.2.7). If this correspondence is correct, it supports the proposal made in this section that PY **p-* and PND **qə-*, both of which denote a surface or area in contrast to a round or long shape, are cognate.

The prefix zone in question—Athabaskan qualifiers and Yeniseian determiners (or "thematic consonants")—contains other morphemes besides shape prefixes. In fact, shape markers represent a minority of the prefixes found in this zone in both families. For this reason, these markers are not the best evidence of genetic relatedness, given their simple shapes and the difficulties of assigning original meanings to them. Much work remains to be done in comparing the remaining Athabaskan qualifier consonants with potential cognate prefixes among the Yeniseian thematic consonants. The present paper also does not investigate cognacy among object prefixes or incorporated nouns and other stems. Although some of the incorporated elements themselves appear cognate,²⁸ the process of incorporating these positions into the verb probably is not.

2.2.4. *Origin of the Na-Dene classifiers*

The famous Na-Dene classifiers—a set of intricate morphological structures placed directly before the verb stem to signal valence increase and decrease—have no analog in other Native American families. Nor do they exist anywhere else, as far as is known, even though, as this section attempts to show, certain individual classifier components have Yeniseian cognates. The unique formal complexity and semantic specificity of the classifier system would seem sufficient to establish Tlingit-Eyak-Athabaskan as a valid genetic unit among the world's languages. This concurs with the present article's main conclusion: that Yeniseian is related to Tlingit-Eyak-Athabaskan (Na-Dene) as a whole, and not more closely to either Tlingit or Athabaskan-Eyak.

During the mid 1990s, when I first began to investigate the already long-existing hypothesis that Yeniseian and Tlingit-Eyak-Athabaskan were genetically related, I was particularly keen on examining Ket verb-base anlauts, where certain consonant alternations seemed to suggest that vestigial classifiers might be present in Yeniseian. As it turns out, while Yeniseian shows no sign of ever having contained a fully grammaticalized system of valence increase and decrease prefixes placed verb-root initially, individual

²⁸ One probable cognate is Ket/Yugh *an* 'thought', which in its incorporated form *en-* is found in the verb 'S forgets' (e.g., Southern Ket *en-di-suk* 'I forget'), and Athabaskan elements of the same meaning, such as Ahtna noun *-iine* 'mind, thoughts', incorporated into verbs as *-yni-*, as in Ahtna *niynik'ezed* 'he is thinking'. Since the incorporate slot has a large stem inventory in Ket and since well-documented Alaska Athabaskan languages have more than 100 somewhat distinct incorporate inventories, there is good likelihood of finding more such cognates. (I thank Jim Kari for making these observations.)

components of the Na-Dene classifier system do have plausible cognates in Yeniseian.

A preliminary word about classifier morphology might be useful here. Krauss (1969) showed that the Na-Dene classifier system originated through partial amalgamation of three distinct morpheme classes. The first is a *y*-component (or *i*-component) derived from the vowel of the perfective/stative prefix already discussed above as being present in Yeniseian. The second is a *d*-component derived from a prefix *də-*, which usually signals valence decrease of various types; the present article transcribed this morpheme in verb formulas as *D-*, following Leer (2008b and elsewhere). The third is an *ʔ*-component of undetermined origin that usually expresses valence increase. Classifiers in all modern Na-Dene languages are used productively to express transitivity increase and decrease of various sorts. There are also verbs with more lexicalized uses of these morphemes in which *ʔ*- appears even though no grammatical valence increase is involved, and others where *d-* does not signal intransitivity. Non-grammatical uses of classifiers include the obligatory presence of *d-* in transitive verbs meaning 'drink' or of *ʔ-* in intransitive verbs such as *yakti* 'he is talking' (Young 2000:29). While such cases have also been tied semantically to valence increase and decrease on a lexical level (see Kibrik 1993 and 1996 for a superb functional description), the fact that they tend to occur in basic vocabulary suggests that the grammatical valence changing functions in Na-Dene may have arisen from earlier, lexically more idiosyncratic uses. However, because classifiers clearly operated as a productive valence marking mechanism already in Proto-Na-Dene, the origin of the non-valence **də-* and **ʔ-* prefixes has remained a mystery.

One additional piece of evidence has recently surfaced that might shed light on the origin of *ʔ-*. Leer (2008b) used Tlingit data to show that the *ʔ-* component of modern Athabaskan and Eyak actually represents two formerly distinct elements—*s-* and *ʔ-*—both of which may have originally functioned as genuine classifiers of shape or number. These elements remain phonologically contrastive in Tlingit, despite much reshuffling of the original system, but seem to have fallen together in Athabaskan-Eyak. Leer suggested that some of the non-valence uses of Athabaskan-Eyak *ʔ-* might reflect this earlier *s*-component. Leer (2008b) amended Krauss's original terminology by referring to the *ʔ-* and *s-* prefixes together as "the series component". He also showed conclusively that the original order of the three components was: (1) *y*-component, (2) series component (Tlingit *s* or *ʔ*, Athabaskan-Eyak *ʔ*), and (3) *d*-component.

Except for the Tlingit series component *s-*, the other Na-Dene classifier components have plausible cognates in Yeniseian. Yeniseian thus offers potentially valuable external evidence regarding the individual functions of these morphemes prior to their amalgamation into a grammatical valence increase and decrease marking system. Yeniseian evidence also suggests a possible reason for the respective ordering of the *ʔ-* and *d*-components in Na-Dene.

The origin of the *y*-component in Na-Dene is already clear from internal evidence. Krauss and Leer (various publications, notably Leer 2000) explain how it arose from an assimilatory effect on the classifier vocalism created by the preceding perfective/stative morpheme. I argued in section 2 above that the Na-Dene perfective/stative prefix **ɲi-* occupies an identical position in the verb as the Yeniseian stative/resultative prefix **jə* (Modern Ket *jA-* ~ *A-*), though demonstrating cognacy requires better evidence of a regular correspondence between PND **ɲ* and PY **j* in anlaut position. In Yeniseian, the stative/perfective prefix merged with the subject prefix slot and eventually was reinterpreted as a third-person subject agreement marker in certain Ket and Yugh intransitive verb conjugations (Vajda 2004). It did not develop any productive grammatical interaction with Yeniseian morphemes cognate with the *d-* and *ʔ-* components of the Na-Dene classifier.

The origin of the *d*-component is less clear from the Na-Dene internal evidence. Vajda (2006) suggested it derived from a 3rd person possessive prefix **də-* and was originally tied to the expression of actions performed by the subject's own body. These include the natural production of sound, actions like drinking, and so forth. The auto-instrumental function of this prefix possibly has an echo in many Athabaskan languages, as exemplified by Ahtna or Koyukon, which uses the prefix *də-* to signal reflexive possession: *də-qe* 'his/her own foot' (Kari, p.c.) as well as in the generic 3rd person possessive *də-* of Tlingit: *də-x'u*s 'his/her foot', *də-gáts* 'his/her buttocks', etc. These pronominal prefixes probably represent the same morpheme

that yielded the *d*-component of the Na-Dene classifier. The Ket and Yugh generic 3rd person possessive marker *d-* in Ket/Yugh *da-ki*'s 'his foot', *da-ko*'t 'his buttocks', *d-ki*'s 'her foot', *d-ko*'t 'her buttocks' would seem an obvious cognate to this prefix. However, the rules of sound correspondence between Yeniseian and Na-Dene (section 3.5) show that Na-Dene pronominal *d-* cannot be cognate with *d-* in these Ket and Yugh prefixes, since Na-Dene **d* corresponds to Yugh *dʃ* rather than *d*. As already discussed above in section 2.2.2, the Yeniseian *d-* element in Ket/Yugh *da* 'his', *di* 'her', is instead cognate with the PAE impersonal possessive prefix **kʷ-*.

The Yeniseian cognate to the *d*-component of the Na-Dene classifier is productively found performing a function quite different from its uses in Na-Dene. It regularly occurs as the imperative prefix before vowel-initial verb roots. This prefix takes the forms Ket *d-*, Yugh *dʃ-*, and Kott *č-* (< PY **ʒ-*), representing the regular correspondence to Na-Dene **d*. As mentioned earlier, Yeniseian imperative formation involves the deletion of all active subject agreement markers, and it is not implausible that this usage developed on the basis of an earlier valence-decrease function. It is important to note that the Na-Dene classifiers never alternate to express imperative vs. indicative meaning.

The *d*-prefix in Yeniseian also occurs vestigially in the anlaut of a number of verb bases denoting body position or the production of sound. Some of these verbs appear to have Na-Dene cognates which also consist of classifier + root. One such verb base is Ket *-doq* 'animate subject flies', which contains the same root as the perfective/stative base **jə-oq-ŋ* 'inanimate subject hangs suspended (e.g., Ket *bim-b-oqŋ*, a verb used to refer to the position of a snag under the water in the river). The base form *-doq* in verbs meaning 'anim.-class subj. flies' is cognate with PA **-tʰag* 'fly', for which Jeff Leer reconstructs the PPA verb string **nə-D-ʰag* 'fly', where "D" represents the *d*-classifier. The fact that the Yugh cognate has the form *-daχ*, with *d-* rather than the *dʃ* is expected since ND *tʰ* corresponds to Ket/Yugh *d*. Also, as mentioned in section 2.2.1, the labialization of [a] to [o] in Ket and Yugh occurs regularly adjacent to **g*; the PPA thematic prefix **nə-*, however, does not appear in Yeniseian.

Possible survivals of the *d*-classifier in Yeniseian also include certain verbs of sound, such as 'laugh' shown in Table 19, though there is no Yeniseian-internal evidence to point to an initial lateral in the original verb root.

TABLE 19. Yeniseian-Athabaskan cognate base 'laugh' showing auto-instrumental *d*-

Ket	Yugh	Kott	*Proto-Athabaskan	<	*Pre-Proto-Athabaskan
<i>d</i>	<i>dʃ</i>	<i>č</i>	<i>*dl</i>		<i>*D-ʰoq</i> (D = <i>d</i> -classifier component)
<i>-daχ</i>	<i>-dʰaχ</i>	<i>-čak</i>	<i>*-dlʰoq</i>		<i>*d-ʰoq</i>

Ket verbs containing what appear to be vestiges of the *d*-component belong to the category of "auto-instrumental actions"; in other words, they describe events performed by the subject using his or her own body as the instrument. This auto-instrumental function is also characteristic of transitive verbs of drinking, which in Na-Dene contain a *d*-classifier. An auto-instrumental lexical origin of the *d*-component of the classifier from a pronominal element meaning *one's own* is the most likely hypothesis for its origin, and the Yeniseian comparanda, though at present quite meager, would seem to corroborate this.

Yeniseian evidence might also eventually shed light on the origin of valence increase in Na-Dene, though Yeniseian cognates to the Tlingit *s-* classifier consonant are not in evidence, and potential cognates to *ʔ-* are too rare at present to be convincing. It is likely that such consonantal prefixes simply elided before the consonant onset of Yeniseian verb roots. Vajda (2006) suggested that at least some instances of the Na-Dene *ʔ*-classifier represent an ancient prefix used to derive verbs from adjectives or stative verbs, a sort of lexical precursor to grammatical valence increase, since active verbs represent a sort of increase in valence in comparison to adjectives and stative verbs. Possible evidence from Yeniseian for this sort of derivation is found in one verb-base doublet where the prefixed form denotes an activity, while the non-prefixed form denotes a more passive, or less active state. Note that Arin (Werner 2005:163) seems to have generalized the originally active form to express stative 'see' as well as active 'look' (Table 20).

TABLE 20. Possible Dene-Yeniseian cognates to †-component of the classifier

	stative	active
Ket:	-t-Ø-ŋ 'see'	-ŋ-q-o 'look', 'search', 'try to see'
Yugh:	-t-Ø-ŋ 'see'	-ŋ-χ-ŋ 'look'
Arin:	-ng-l-ŋ 'see'	-ne-l-u 'look', -ne-l-um 'bear witness'
cf. Proto-Ath.:	-γa-Ø-ʔe'n 'see, glimpse'	-ne-†-ʔe'n 'look at'

The rare, semantically opaque thematic prefixes Yeniseian (Arin) -ŋ and PA *-ne- also are potentially cognate in these verbs.

Before continuing with the topic of what Yeniseian might reveal about the development of valence-increase functions in Na-Dene †-, let us first summarize the comparative evidence for verb-deriving prefixes in Na-Dene and Yeniseian. Table 21 shows the Yeniseian reflexes of the *d*-element observable in verbs such as 'scold' and 'laugh', as well as possibly reflexes of the †-element in active/stative pairs such as 'look' vs. 'see':

TABLE 21. Yeniseian verb-root anlaut prefixes and Na-Dene classifier elements

original base	Ket	Yugh	Kott	Arin	PY	Na-Dene
(stative verb?)	q	χ	g	ʎ	*†	*† (transitivity increase)
(noun)	d	dʰ	č	ʔ	*‡	*də (transitivity decrease)

In Yeniseian, the pre-root verb prefixes shown in Table 21 merged with the root to create the modern verb base. Except for the productive use of the *d*-element in imperative formation, these prefixes survive as fossilized thematic elements. They never developed the productive grammatical valence-change functions found in Na-Dene.

It is worth noting that all of the verbs with potential Yeniseian cognates to the classifier consonants involve Na-Dene roots with initial glottal stop. Presumably these morphemes were also prefixed to verb roots with different anlauts, as well. Another verb stem that show the same anlaut correspondence as that of the 'see'/'look' verbs in Table 21 is PA *-lən, 'flow' (derived from PPA *-hən), and Ket -qun 'flow', Yugh -χun 'flow'. Unfortunately, Ket anlaut *q* may derive from several sources, so that without cognates in Arin or other extinct southern Yeniseian languages it is not possible to build a strong case that this particular instance of root anlaut *q* involves cognacy with the Na-Dene †-classifier. Finding more Yeniseian evidence for these prefixes will require a better knowledge of verb root morphophonemics than is currently available. It is possible that consonantal prefixes altered the form of the original Yeniseian verb root anlaut consonant in some cases. Also, it is not always clear which instances of anlaut *d*- or *q*- in Modern Ket verb bases represent a fossilized prefix and which are original root anlauts, though it is worth mentioning that more than a quarter of the known Ket verb bases begin with one or the other of these consonants (cf. the list of bases provided by Georg 2007:217), suggesting the presence of a prefix in at least some of them.

Returning to the mystery of the origin of valence-increase marking in Na-Dene, Leer (2008b) suggests that the †- and *s*-series consonants derive from two (or possibly more) ancient nouns preposed to the verb root to classify the action somehow in spatial terms. The identification in Yeniseian of possible lexico-derivational uses of a prefix cognate with the †-component of the Na-Dene classifier suggests this morpheme originally derived activity verbs from stative verbs or adjectives and could have developed by analogy into a more general valence-increase marker in later Na-Dene.

It is also possible that the generalization of valence-increase function in series marker †- received its primary motivation through reanalysis based on this morpheme's homonymy with the -† instrumental suffix/postposition found outside the verb in Na-Dene nominal morphology. Because its pre-root position coincidentally placed it directly after the subject agreement markers, the †-series consonant could have been reanalyzed as an instrumental suffix associated with the preceding subject position. In such a scenario, the valence-increase function of the †-classifier, perhaps already suggested by the use of shape-classifying morphemes to derive action verbs from adjectives or stative verbs, would have received further impetus

through analogy with the causative meaning imparted by the homonymous instrumental suffix in nominal forms. However, the fact that subject markers and the pronouns associated with postpositions represent different pronominal classes would seem to argue against this.²⁹

Yeniseian shows no evidence of an instrumental suffix added to the speech-act-participant subject morphemes verb-internally. However, the †-instrumental suffix itself does exist outside the verb in Yeniseian nominal morphology, where it likewise derives nouns meaning tools, demonstrating the ancientness of this type of word formation. Examples include Ket *sul*, Yugh *sù:†* 'holding hook', probably derived from PPY **suk* 'motion back, halfway, hook-shaped' (cf. Modern Ket *sū* 'half', 'back') + instrumental -†. The falling tone and pharyngealization in Ket *sul*, Yugh *sù:†* 'holding hook' presumably developed from the loss of the original root coda. Yeniseian 'holding hook' provides a convincing example of a cognate root combined with a cognate suffix when compared with Na-Dene: cf. PA *šâχ-† 'hook' (Krauss and Leer 1981:194), which likewise derives from a base meaning 'hook shaped' plus the instrumental suffix †. Another parallel involves Ket *huul* 'mallet, hammer' in comparison with the Kott verb root -*fut* 'grind, pound into powder', where the presumed coda *† in PPY would have regularly yielded a lengthened vowel and coda *l* in Modern Ket. Compare possible cognates in Koyukon Athabaskan *χot* 'club', *χot†* 'strike with elongated object' (Jetté and Jones 2000:243), where the † coda in Athabaskan 'club' is reconstructed as containing the instrumental suffix: PPA *χat†-[†], Eyak *χat†*†. There are also cognate multi-morphemic derivations meaning 'mat': Eyak *te†* 'mat', Ket *at†*, Yugh *ater* 'bedding' < *at* 'placed downward' + *†*al* 'mat'; also Ket *qat†*, Yugh *χatar* 'mat' < *χad or *χaj 'fur' + *†*el* 'mat'. Eyak *te†* 'mat', PA *†*el* 'mat', and Ket/Yugh *†*el* 'mat' probably derive from a shared Dene-Yeniseian verb root *†*te* 'lie, be in position' nominalized by the instrumental suffix -† (see Krauss, ms., for a discussion of the Eyak morphology). Another Yeniseian noun that appears to contain the instrumental suffix is Ket *tat†* 'fire drill (a device used to spark fire through friction)', presumably derived by adding instrumental suffix -† to *tad* ~ *ted* 'across',³⁰ though in this case no Athabaskan cognate is evident. In other cases it is conceivable that the instrument suffix could have yielded falling tone/pharyngealization in Yeniseian. This appears to have happened in the Ket/Yugh root -*an* in verbs meaning 'hang', 'tie up', 'tether' and its derivative noun Southern Ket *àŋ*, Central Ket *àŋa*, Yugh *à:ŋ* 'rope', where falling tone presumably originated from an absorbed fricative, as would have existed in the derivation *an* 'hang, tie' + † 'instrumental suffix'.

These comparisons are sufficient to show that the instrumental suffix is shared by both families and conceivably could have played a role in the reanalysis of the original verb-deriving †-prefix as a valence-increase marker in Pre-Proto-Na-Dene.

If Na-Dene did reanalyze the morphologically unrelated †- prefix as a verb-internal instrumental suffix, it would explain why †- came to precede *də*- in the developing Na-Dene classifier complex. The morpheme *də* originated as a pronominal prefix on the verb root, while †- came to be seen as a suffix on the preceding subject pronoun position. The amalgamation of suffixal and prefixal elements into the modern classifier complex might also help explain this marker's unique morphophonological edge properties. Non-transitivizing uses of the series components † and *s* in Proto-Na-Dene would represent survivals of the original classificatory qualifier prefixes that existed prior to the process of reanalysis. Pre-Proto-Yeniseian, by contrast, inherited only the non-valence marking uses of *† and did not innovate a productive valence marking system from them. Thus there are no classifiers in Yeniseian, even though Yeniseian does possess morphemes cognate to some of the classifier components.

Further elaborating our reconstruction of a bipartite model for the Proto-Yeniseian and Proto-Na-Dene verb, we can now posit a third affix-attracting nucleus in the form of the subject complex, located between the auxiliary verb and the lexical verb word (Table 22).

²⁹ I thank Andrej Kibrik for pointing this out.

³⁰ Note that Modern Ket coda -*tl* (pronounced [tʰ]) originates from *d* + *l* (*tad*-†) across a morpheme boundary or from syllable collapse, as in Ket *qat†l*, Yugh *χatar* 'woven mat' < *qad 'fur' + *†*el* 'mat'; cf. Eyak cognate *te†* 'mat', ultimately from *te*: 'lie' + † instrument suffix). Original affricate *†*l* in coda position yields Ket/Yugh final *l* with lengthened vowel, as presumably in PPY *†*ut†* > PY *†*puul* > Ket *huul*, Yugh *fuul* 'hammer, sledge hammer'.

TABLE 22. Original position of elements that gave rise to the Na-Dene classifiers

	<i>auxiliary complex</i>	<i>subject complex</i>	<i>verb base complex</i>
Na-Dene:	3agr.-AUX	1/2pronoun-stative-(instrumental *ʔ)	< classificatory *ʔs+root-TAMsuffix possessive *da+root-TAMsuffix active-verb deriving *ʔ + root auto-instrumental *ʔ ₃ + root
Yeniseian:	3agr.-AUX-TAMsuffix	1/2agr. and stative-resultative	

It is unclear whether the morphemes that developed into speech-act-participant subject markers were originally suffixed to the preceding auxiliary, or were independent phonological words, special clitics, or prefixes on the following lexical verb root. The fact that the auxiliary in Yeniseian is separated from the subject markers by the TAM-suffix (progressive *-l* vs. perfective *-n*) suggests that the classifier elements were not originally suffixes on the auxiliary in the proto-verb complex. Most likely they were special clitics or separate phonological words capable of attracting their own affixal elements. The perfective/stative prefix, for example, later became amalgamated with the subject prefix position in Yeniseian.

There is no evidence that an instrumental ʔ suffix was ever used in either Na-Dene or Yeniseian after verb-internal subject pronouns, though this suffix was used outside the verb complex in both languages to build instrument nouns. This suggests that the element marked “instrumental ʔ” under Na-Dene in Table 22 does not represent an actual inclusion of the instrumental suffix into the verb complex but nevertheless could have effected through reanalysis the evolution of classificatory ʔ (originally a prefix on the following verb root) into a grammatical valence-increase prefix. The issue of whether Yeniseian had cognates to the series components of the Na-Dene classifiers *ʔ- or *s- remains an open question, particularly with regard to *s-. Either such morphemes once existed in ancient Yeniseian but were largely lost through phonological attrition, or the morphemes in question were an innovation in Pre-Proto-Na-Dene without parallel on the Yeniseian side. I anticipate that additional evidence will support the former explanation.

2.3. Action nominal derivation

As was first noted on the second day of the Dene-Yeniseic Symposium (Fairbanks, Feb. 27, 2008), the homologies shared by the Eyak and Yeniseian verb extend to the pattern for deriving action nominals from finite verb stems. The comparanda in this section are the forms Ketologists traditionally call infinitives and Michael Krauss has called gerunds (see Krauss 2008 for key information on Eyak gerund morphology). The oldest detectable method of deriving them in both families involves adding a thematic prefix in the determiner/qualifier position to the verb root and dropping all intervening morphological material, which includes tense-mood and agreement markers, as well as classifier elements. An illustrative example from the Yeniseian side is the Ket finite verb *tqisadil* ‘he puts himself in’ (e.g., into a sled harness) and its semantically corresponding non-finite form *qīl*, which could be translated into English as either ‘to place inside’ or ‘placing inside’. This form is built by combining thematic *q-* ‘inside’ directly onto the root element of the composite base *d-il* ‘place, put’, deleting the morpheme positions separating these elements in the finite form *du=q-s-a-dil*. The conjugation marker *s-*, 3rd person subject marker *λ-*, and base anlaut *d-* (conceivably a prefix cognate to the *d-* component of the Na-Dene classifier) are all dropped to derive the Ket infinitive *qīl*.

Eyak gerunds built in an analogous way total about 80 distinct forms. Yeniseian and Eyak both derive their non-finite forms through an identical retention vs. truncation of elements from specific finite verb morpheme positions. In addition to the morpheme position truncations mentioned above, Eyak gerund formation also involves adding a prefix and suffix. This pattern reveals another striking parallel between Yeniseian and Na-Dene, since evidence from the extinct Yeniseian languages supports the existence of a prefix and a suffix inherited from Common Yeniseian that appear cognate to the affixes used in Eyak gerund formation. The next paragraph describes the Eyak gerund prefix and suffix, while the following one discusses their Yeniseian cognates.

In forming gerunds, Eyak adds the syllable ‘is-’ in cases where the finite verb contains no prefix. In cases where the corresponding finite verb contains a prefix not deleted by the gerund formation rule, ‘is-

generally does not appear in the gerund form, though exceptions such as *laχ-is-xa*’s ‘fearing’ suggest that the vowel /i/ of ‘is-’ is part of the gerund prefix and not an epenthetic element.³¹ In general, however, ‘is-’ does not appear if a thematic prefix from the finite verb string is available to be added to the gerund form. Compare ‘is-qa’ ‘shouting’ with *də-tux* ‘spitting it, spitting on it’, where thematic prefix *də-* seems to obviate the need to add ‘is-’.

Many Eyak gerunds also contain a suffix, absent from the corresponding finite forms. This suffix appears as voiced *-l* (presumably from earlier **n*) after a vowel or sonorant, e.g., *k’u-tsi^m-l* ‘singing something’, ‘is-qe^{-l}’ ‘boating’, ‘is-da^{-l}’ ‘sitting’ (referring to one person), and ‘is-te^{-l}’ ‘lying down’ (referring to a single animate being). Obstruent-final stems optionally add voiceless fricative *-ʔ* or no suffix at all. Fricative *-ʔ* occurs in ‘ilə-tac^{-ʔ}’ ‘trout fishing (with a hook)’, while *də-tux* ‘spitting it, spitting on it’ provides an example of a suffixless Eyak gerund. Some obstruent-final stems were recorded in both variants. For example, both suffixless *yəχ* ‘is-we^{-χ}’ and suffixed *yəχ* ‘is-we^{-χ-ʔ}’ mean ‘swimming about’. The latter two forms include the adverb *yəχ* and the perambulative suffix *-χ* expressing habitual action. The gerund made from the non-habitual verb is ‘is-we^{-l}’ ‘swimming’, which takes the voiced suffix *-l* since without perambulative *-χ* the stem *-we* ‘swim’ ends in a vowel. It should be noted that Eyak sonorant *l* regularly developed from earlier **n* and only in the unique case of the gerund suffix does sonorant *l* alternate with voiceless fricative *ʔ*. The origin of this alternation is not clear.

Because the gerund is absent in Modern Athabaskan as a productive morphological category, the Yeniseian-Eyak parallel is quite striking. Leer (p.c.) has pointed out two possible gerunds as archaisms in Navajo: *yis-dá* ‘sitting’, *yis-dah* ‘being out of breath’, attested in combination with *nisin* ‘to think, have in mind, want to’: *yisdá nisin* ‘to like sitting up (said, for example, of a baby)’ and *yisdah nisin* ‘to be out of breath’ (Young and Morgan 1987:655, 770). It is not clear whether either form contains a gerund suffix. The available descriptions of Tlingit action nominals, which Leer calls “gerundives” (Leer 1991:491–494, Leer 2000:127–130), do not mention the use of any characteristic prefix or suffix.

Yeniseian infinitival morphology involves affixes cognate to both the Eyak gerund prefix ‘is-’ and suffix *-l/-ʔ*. Just like Eyak gerunds, Kott infinitives regularly require prefix *ši-* in cases where the corresponding finite verb lacks a prefix that would prevent the verb root from standing word-initially. Castrén’s Kott materials contain about 30 such forms. Most belong to the core vocabulary, suggesting the prefix itself is ancient. Examples include *ši-ten* ‘to lie down’, *ši-čəŋ* ‘to crumple, to tan (a hide)’, *ši-git* ‘to row’, *ši-kit* ‘to rub’, *ši-gap* ‘to drink’, *ši-ti* ~ *ši-te* ‘to beat’. Kott infinitives without the prefix, such as *au-gan* ‘to boil’, originally began with a thematic consonant; the Yugh cognate infinitive *λ-χan* ‘to boil’ and the corresponding Ket finite form *u-χ-a-qan* ‘it boils’ reveal the presence of thematic prefix *y*, probably from PY **x*, which elided word-initially everywhere in Kott as well as Ket/Yugh, remaining only in Arin (cf. S.Starostin 1982).

The Kott infinitive prefix *ši-* is generally absent in Ket and Yugh, languages that, in contrast to Kott and Eyak, do allow root-initial infinitives. It is not clear why the gerund prefix is lacking in Ket and Yugh cognates to Kott root infinitives, e.g., Ket *kīt*, Yugh *kīt* ‘to rub’ vs. Kott *ši-kit* ‘to rub’. Although it is conceivable that this prefix is a Kott innovation not inherited from Proto-Yeniseian, its occurrence with many basic verb roots suggests it is ancient and that Ket and Yugh somehow lost it. The latter conclusion is also supported by a few rare cases where Ket infinitives do contain the prefix *si-*, not found in the corresponding finite verb. One such form is Ket *sibagdeŋ*, ‘to pull’, recorded alongside the unprefixed synonym *bagdeŋ*, ‘to pull’. Another possible example is the Ket infinitive *siqo* ‘to load (a bullet in a gun or an arrow to a bowstring)’, which corresponds to finite verb forms built with the base *-qo*, a morpheme also meaning ‘fill’ or ‘full’ (e.g. Ket *ti-di-qo* ‘I load’).

There is also evidence for a Common Yeniseian infinitive suffix **-əŋ* that is likely cognate with the Eyak gerund suffix that developed from an earlier nasal of some sort. This element is absent in Kott but occurs in a number of basic Ket verbs, including Ket *ilij* ‘to eat’, *ejij* ‘to eat’, as well as in the forms *sibagdeŋ* ~ *bagdeŋ*, ‘to pull’, already mentioned in the discussion of the action nominal prefix *si-*. There are also rare recordings

³¹ Leer (p.c.), on the other hand, views only the sibilant portion /s/ as the gerund prefix proper, regarding /i/ as a peg element cognate with PA peg prefix **hə-*, where *h* represents a zero onset.

of southern Yeniseian infinitives, notably Assan *taŋn* 'to see', which contain the same suffix (cf. Kott *tʰaŋ* 'to see', and the Ket base *-oŋ* used in verbs of seeing, where the suffix is likewise absent). Although most basic Ket infinitives at first glance show no sign of containing a suffix, the prosody of Ket and Yugh monosyllabic infinitives strongly suggest the original presence of a suffix that is absent in the corresponding finite verb forms. Compare falling-tone infinitives such as Ket *dàŋ*, Yugh *dà:ʰŋ* 'to crumple, crush'; Ket *tàr*, Yugh *tà:ʰtʰ* 'to hit, beat'; Ket *bèr*, Yugh *bè:ʰtʰ* 'to make'; Ket *dòx*, Yugh *dò:ʰx* 'to fly' with corresponding finite forms lacking this feature: Ket *dindoq*, Yugh *dĩndoŋ* 'he flew', etc. While falling tone is regularly leveled in complex Ket verb forms, Yugh falling tone and its accompanying vowel length and pharyngealization normally remain in complex words, and their presence in a Yugh infinitive but not in its corresponding finite verb stem has a morphological basis. Conjugated Yugh stems containing pharyngealization and falling tone derive these features from an element belonging to the stem, as can be seen when the Yugh falling-tone finite verb stem *-sà:ʰr* 'spend the night' is compared with its Kott cognate *-šagal*. Because falling tone in the Yugh stem derives from reduction of the intervocalic guttural attested as part of the stem in Kott, it remains in all conjugated forms, e.g., Yugh *a-k-sà:ʰr* 'he spends the night', *a-k-in-sà:ʰr* 'he spent the night', etc. Pharyngealization and falling tone in infinitives such as Yugh *dò:ʰx* 'to fly' or *dà:ʰŋ* 'to crush, crumple', on the other hand, cannot be shown by internal comparison to have originated from any element of the verb stem; cf. Kott *ši-čaŋ* 'to tan (a hide)'. That these features are absent in the corresponding finite verb forms (*dũ·bdʰaŋ* 'he crushes it', Yugh *dũ·doŋ* 'he flies') suggests they represent an element present exclusively in the infinitive. Identifying an absorbed infinitive suffix as the source of this falling tone is supported by instances where suffixed infinitives alternate with suffixless forms with falling tone. One example is Yugh *dà:ʰm ~ dʰamuŋ* 'to bark'. An identical alternation between falling tone and nasal plural suffix occurs in Ket and Yugh nouns. This falling tone could easily have come from an elided nasal suffix, as shown by the fact that nasal plural suffixes in a number of basic nouns are absorbed into the syllable in like fashion to yield falling tone (e.g., Southern Ket *dēs* 'eye', *dēs* 'eyes', *hũj* 'belly', *hʌj* 'bellies'), whereas in other nouns the nasal plural suffix remains (*ēs* 'god', *ēsáŋ* 'gods', *u:l* 'arm', *u:ləŋ* 'arms'). The failure of Kott to retain an infinitive suffix appears connected with the retention instead of the prefix in root forms such as *ši-puj* 'to pull'.

It might be noted that Modern Ket and Yugh have innovated new morphological means of deriving infinitives, such as by adding the suffix *-at* after causative prefix *q-* (Ket *v̄n-q-at*, Yugh *ʌχan-χ-atʰ* 'to make someone do cooking'). However, the new infinitive suffixes tend to be transparently associated with iterative or causative meaning, are found in secondary vocabulary, and lack cognates in southern Yeniseian languages. They appear to have been innovated in Proto-Ket-Yugh to replace the original infinitive suffix **aŋ*, which had ceased to be productive and had largely reduced to a prosodic signature in the preceding syllable.

The proto-form of the Eyak gerund suffix *-l ~ -t* was likewise probably a nasal of some kind, since the Eyak lateral sonorant *l* originated from PAE **n*. The voiceless lateral fricative allomorph *-t* that appears optionally after obstruent codas could represent a unique case of devoicing, since *-l* and *-t* are not sounds normally associated phonologically in Eyak. Still unexplained is the apparently optional choice between fricative *-t* or zero in Eyak closed stems, nor why some open stems have zero instead of the expected *-l*. Similarly unexplained are Ket and Yugh monosyllabic infinitives with neither a suffix or falling tone (e.g., Ket *də'q*, Yugh *də'χ* 'to live', Ket *kīt*, Yugh *kīt* 'to rub', and a few others); perhaps these could be viewed as an analog to zero-suffix Eyak gerunds. Without a full accounting of these patterns, the form of a shared Dene-Yeniseian action nominal suffix, though such a morpheme seems to have existed, eludes precise reconstruction.

Table 23 shows the characteristic formula used to derive infinitives/gerunds from a finite verb formula. This highly specific pattern is almost certainly inherited from a common proto language, despite problems in reconstructing exact proto forms for the two affixes specific to the derivation. The action nominal prefix symbol **S-* represents the ancestral morpheme that gave rise to the attested Athabaskan *yis-*, Eyak *'is-*, Kott *ši-*, and Ket *si-*, while symbol **-N* represents the form of the action nominal suffix attested as Eyak *-t* or *-l* and Ket/Yugh *-ŋ* or falling, pharyngealized tone.

TABLE 23. Shared DY formula for deriving action nominals from finite verbs
prefix *S- (or other thematic stem prefix) + **verb root** + **suffix *-N**, with omission of any intervening tense-mood and agreement prefixes as well as any classifier prefixes

The Yeniseian and Eyak comparisons provide strong evidence that the intricate formula for deriving action nominals from finite verb strings was inherited by both families from a common prototype.

A brief comparison of how action nominals are used syntactically in both families might be useful, though gaps in the documentation on the Yeniseian side permit only a partial comparison. The action nominals generated by the rule in Table 23 function very similarly in Eyak and Ket/Yugh syntax, the only languages where the extant material permits a comparison above the level of the morphological word. In the phrasal morphology of both languages, action nominals may add a possessive pronominal prefix to identify a core participant in the action. To express that an action involved a patient/object, Eyak finite verb forms add the indefinite possessor marker *k'u-* 'someone's, something's'. Because this prefix occupied the zone requiring incorporation into the gerund, it likewise appears in the corresponding non-finite forms, rather than the prefix *'is-*, e.g., *k'u-tsi-n-l* 'singing of something' and *k'u-χe-l* 'carrying of something on one's back'. To convey similar information with infinitives, Ket and Yugh add a possessive person/number/gender prefix such as *da-* 'his', *d-* 'her', *na-* 'their', etc. (recall that the *d-* element of this prefix is cognate with Eyak indefinite *k'u-*, as explained in section 2.2.2 above). Unlike the Eyak prefix, however, the Ket and Yugh infinitival pronominal prefixes are ambiguous with respect to the agent/patient distinction. A form such as Ket *da-qīl* 'his placing inside' may refer either to the agent ('his placing of some object inside another object') or to the patient ('his being placed inside of something by someone else') whenever the infinitive in question corresponds semantically to a transitive finite verb.

It is unclear how pronominal possessive prefixes of this kind would have interacted with the Kott infinitive prefix *ši-*, since the extant documentation of Kott lacks examples paralleling Ket *da-tàr*, 'his beating'. It is not possible to be sure whether a possessive prefix would have replaced the infinitive prefix *ši-*, as happens in Eyak when *k'u-* replaces *'is-*. Would the Kott equivalent to Ket *da-tàr* 'his beating' have been constructed as **a-ti* (with elision of *ši-*, parallel to Eyak) or as **a-ši-ti*, with the two prefixes concatenated? The most likely answer comes from Ket, where possessed forms such as *da-bagden* (meaning 'his being pulled' or 'his pulling of something else') are amply recorded alongside *sibagden*, which is not attested with possessive prefixes.

In comparing infinitive/gerund morphology across the two families, it is instructive to acknowledge the irreplaceable value to comparative linguistics from earlier documentation made of the now extinct Kott, Yugh and Eyak. The last speaker of Eyak, in fact, passed away while I was working on this article. Without the work on Kott by M. A. Castrén (1858), on Yugh by Heinrich Werner (1997b), and on Eyak by Michael Krauss, who collected nearly all of the extant Eyak gerunds and provided an invaluable morphological analysis (Krauss, 2008), the comparisons made here would hardly have been possible, and a striking piece of evidence for Dene-Yeniseian would never have come to light.

2.4. Summary

Examining the oldest layers of Yeniseian and Na-Dene verb morphology reveals a network of interacting sub-systems extending even to the pattern used in deriving non-finite forms. They suggest that the modern verb complexes in Yeniseian and Na-Dene originated from a common prototype consisting of a more analytic combination of auxiliary verb plus main verb, each hosting its own affix positions. The parallels go beyond general structural typology to encompass cognate affixes, as well. The putative cognate morphemes display close functional/semantic matches. They obey regular sound correspondences that operate in lexical roots and in grammatical morphology. To explore these correspondences more fully, the next section examines cognates in basic vocabulary. Here we find yet another system of systems in the form of interlocking sound correspondences involving consonants, vowels, and prosodic phonemic features such as glottalization, pharyngealization, and melodic tone.

3.0. DENE-YENISEIAN SOUND CORRESPONDENCES

All universally accepted language families are evidenced not only by morphological homologies of the type described in section 2, but also by cognates in basic vocabulary sufficient in number to establish systematic sound correspondences. These correspondences must operate uniformly across different cognate sets, except where a rule can be posited to account for exceptions to the pattern. For example, if /k/ corresponds to /h/ in one pair, it should correspond to /h/ in other pairs, unless /k/ corresponds instead to /g/ in the environment between vowels. Equally important, the other sounds found in the words exemplifying the correspondence between /k/ and /h/ (or intervocalic /g/) should likewise correspond systematically with the same sounds in other pairs. Lists of putative cognates without clear identification of such interlocking sound correspondences are insufficient for concluding anything about genetic classification.

This section aims to show that Yeniseian and Na-Dene share a modest but sufficient number of lexical cognates (about 100 roots or simple words, so far) to begin positing such a system of sound correspondences, even though I have so far subjected to rigorous comparison with Yeniseian only the few hundred Na-Dene lexemes for which reconstructed proto-forms exist. I have also examined the vocabulary of Modern Navajo and, to a lesser extent the Ahtna, Dena'ina, and Koyukon materials available in Kari (1990, 2007) and Jetté and Jones (2000). A more fine-grained comparison of Yeniseian vocabulary with individual Athabaskan languages as well as Eyak and Tlingit could yield more cognates to improve the partial set of sound correspondences offered here. During the next two years I plan to examine every documented Yeniseian word in connection with my work on the *Etymological Dictionary of the Yeniseian Languages* (Vajda and Werner, in preparation), after which this material can be subjected to a thorough comparison with Na-Dene forms amassed in Jeff Leer's "Comparative Athabaskan Lexicon" (see link at Leer 1996). This work should yield a more rigorous proposal of Dene-Yeniseian sound correspondences, with possible corrections to the preliminary one offered here. What follows in the remainder of this section of the present article is merely a first attempt to apply the comparative method to a rather limited portion of basic vocabulary in the two families.

Despite these limitations, the lexical comparisons undertaken below, like those of the verb morphology in the preceding section, are intended to illustrate how Na-Dene comparanda might help answer questions about the internal development of Yeniseian languages. The order of presentation is from most difficult to most straightforward. I start with sound correspondences that can be detected based only on somewhat sophisticated knowledge of the phonologies and morphologies of the languages being compared rather than casual inspection. These mainly concern the development of coda clusters and prosodic features. Only afterward do I move on to discuss the more straightforward onset consonant correspondences. This seemingly counterintuitive approach was chosen because, in the case at hand, Dene-Yeniseian cognates demonstrating complex sound laws in the rhymes of syllables often have plausible onset correspondences, whereas the cognates demonstrating onset correspondences often look much less like cognate words until the sound laws accounting for their vowel nuclei and codas have been made clear.

Section 3.1 begins by discussing a number of key rules of coda consonant and coda cluster reduction. Section 3.2 explains the rise of phonemic tone in modern Yeniseian on the basis of non-tonal elements of the syllable rhyme that are demonstrably present in Proto-Na-Dene or at least Proto-Athabaskan-Eyak. Subsections treat Yeniseian tonogenesis in syllables with short vowels and original obstruent codas (3.2.1), long vowel syllables (3.2.2), and syllables ending in a vowel or sonorant (3.2.3). Section 3.3 moves on to discuss additional tonal complications that developed in some of the Yeniseian daughter languages based on elision of intervocalic consonants or final syllables. Section 3.4 discusses sonorants (nasals and approximants). Finally, section 3.5 encompasses the remaining obstruent onset correspondences. By this time, examples containing many of these onset correspondences will have already appeared in the earlier sections on syllable rhymes. Previous publications in support of a genetic relationship involving Yeniseian and Athabaskan/Eyak/Tlingit (Trombetti 1923, Nikolayev 1991, Ruhlen 1998, Bengtson 2008) contain several items that the preliminary system of sound correspondences attempted here can support as genuine cognates. I generally

reserve mention of previously published Dene-Yeniseian cognates until section 3.5, when the full evidence in support of them has been laid out. Section 3.5 also contains the bulk of the Yeniseian proto-forms, which are based chiefly on the work of S. Starostin (1982, 1995, 2005); the earlier sections contain mainly forms attested in the daughter languages.

Along the way I point out areas where the fruitfulness of these Yeniseian and Na-Dene comparisons depends crucially on prior discoveries by Athabaskanists regarding Na-Dene historical phonology and morphology. In the phonology, these include Krauss's explanation of the origin of Athabaskan tones (cf. Krauss (2005) for the most recent publication of this seminal article), as well as Krauss's breakthrough in understanding Athabaskan-internal correspondences involving a labialized velar proto-series of obstruents (Krauss 1964) and Krauss and Leer's (1981) seminal treatment of Na-Dene sonorants. In morphology, noteworthy studies include Young and Morgan's (1943, 1987), Kari's (1976, 1989) and Leer's (1979, 2000) treatments of Athabaskan verb affix morphophonology, and finally Leer's most recent advances in discovering hitherto undetected sound correspondences linking Tlingit, Eyak, and Athabaskan; all Proto-Na-Dene reconstructions are from Leer (2008b and this volume). Without these invaluable materials, no amount of comparing Yeniseian with Athabaskan, Tlingit, or Eyak, could have produced meaningful results. I owe a similar debt of gratitude to my Ketologist colleagues in Siberia, Moscow, and Germany, including Stefan Georg for his broad knowledge of Siberian areal phenomena, Sergei and George Starostin for their pioneering reconstructions of Proto-Yeniseian (S. Starostin 1982, 1995, 2005; G. Starostin 1995), and especially to Heinrich Werner for his seminal treatment of the tones and virtually every other aspect of Yeniseian phonology, grammar, and lexicon (cf. Vajda 2001 for annotations of Werner's more than 100 publications).

3.1. Patterns of coda simplification in Proto-Yeniseian

In the development of Na-Dene, as perhaps in many language families, codas tended to reduce more than onsets. The same is true of Yeniseian, but the reductions yielded different final consonants and also produced different effects on the preceding vowel. These differences prove to be surprisingly systematic, however. Perhaps most striking is the fact that glottalized obstruent codas after a short vowel in Proto-Athabaskan-Eyak regularly correspond to a Modern Ket high-even tone on a half-long vowel, transcribed throughout this article by a half-long mark /·/, as in *tī·k* 'fallen snow'; cf. the PND cognate **t'ik'* 'ice, frozen snow' from Leer (2008b). Original short vowels not preceded by a glottalized obstruent appear in Ket with abrupt tone and an optional glottal stricture, transcribed here with an apostrophe /' / as in Ket *tā'q* 'finger'; cf. the PA cognate **-ts'əg* 'finger'. This correlation is only one facet of Yeniseian tonogenesis, about which more is said in section 3.3. For now it is important to note that while the glottalization feature of consonants disappeared everywhere in Yeniseian, in several types of syllable structures the obstruent's original glottal articulation left systematic effects on the syllable prosody.

Comparing Yeniseian/Na-Dene cognates can help reconstruct the original coda that gave rise to the different phonological outcome in each family, and often elucidates the reason behind apparently disconnected morphological idiosyncrasies. The origin of certain irregular noun plurals in Modern Ket finds explanation in light of the external evidence provided by Na-Dene. Evidence from Na-Dene comparanda sometimes sheds light on idiosyncrasies in Yeniseian morphophonology in cases where an original coda element elided in the singular, but left its trace in the suffixed plural form.

3.1.1. Simplification of coda clusters beginning in a nasal

All coda clusters consisting of a nasal + obstruent seem to have simplified in Early Yeniseian. Modern Ket words with such clusters invariably derive from the recent loss of a final syllable vowel. This is most common in the Southern Ket dialect, as seen in the nominalization *kans* 'something bright in color' (< *ka'n* 'bright' + nominalizing suffix *-si*) and the word *qu'nt* 'ant', which appears to contain the remnant of another morpheme (perhaps **tū·d'* 'swarming insects'). Such words normally correlate with disyllables in the phonetically more conservative Central Ket dialect, where the pronunciations such as *kan-si* and *qu'n-*

tə reveal that the second consonant of the Southern Ket coda cluster was originally the onset of a second syllable. Coda clusters do not seem to have existed in Common Yeniseian at all (cf. S.Starostin 1982), so that the process of coda simplification must have occurred earlier.

The clusters in question simplified differently in each family, affording an example of how external comparative evidence can help trace the internal development of a language family. Jeff Leer has recently discovered Athabaskan-Eyak internal evidence for root final clusters *nt'* and *nd* in Proto-Na-Dene, codas that are not observable in any modern Na-Dene language (Leer 2008a, also this volume). One word that ended in such a cluster is 'liver', for which Leer (2008a) posits the PAE form **-sənt'* on the basis of PA **-zāt'* and Eyak *-sahd*³² with Eyak /h/ correlating with a lost nasal. In Eyak the nasal after a short-vowel nucleus presumably devoiced and reduced to a breathy phase before the apical obstruent, the breathiness being otherwise inexplicable in the Eyak cognate.

By contrast, Ket cognates to these roots retain the coda nasal, yet show no direct evidence of final /t'/ or /d/ (cf. Modern Ket *sēŋ* 'liver'). Yeniseian morphophonemic evidence, however, indirectly suggests the earlier presence of an additional consonant after the final nasal in some of these words. Another cognate pair of this type is Ket dialectal *qo'n ~ ho'n ~ g^ho'n* 'conifer' (generic term), also 'conifer branch, needles' and PAE **gand* 'spruce or pine needles' (> Navajo *gad* 'juniper', Sekani 'white spruce', Eyak *ganhd* 'spruce needles'); cf. also Ket *baŋgón ~ baŋgá* 'dwarf juniper' (< *ba'ŋ* 'earth' + *qo'n* 'conifer'). The original word probably referred generically to conifers and their characteristic foliage, used traditionally by the Ket as tent flooring and bedding. The Ket plural sporadically shows an excrescent /n/: *qonn-ij ~ qon-ij* 'conifer trees, spruce branches' (cf. Porotova 2002:187). There is also the curious form *qondu* 'conifer branches used for tent flooring' (Porotova 2002:199), where *du* more likely derives from the root **dox* 'cut, hew' and is not a vestige of original coda -d. Another cognate pair where Yeniseian shows a coda nasal, and Na-Dene a final obstruent, with also the expected vowel breathiness in Eyak, include the Yeniseian roots in adjectives and verbs meaning 'dark', 'lost', 'obscured from view' (Ket *qon-*, Yugh *χon-*, Kott *hōn-*). These appear cognate with PA **q^was* 'cloud' and Eyak *q'ahs* 'cloud' (Krauss 2005:91), where Eyak /h/, just like in the words for 'liver' discussed earlier, presumably correlates with an original nasal. In Yeniseian, the original coda possibly shows up in certain forms of the Ket compound verb 'S gets lost', e.g., *qones-a-t-aq* 'he gets lost'; cf. the zero-animate-class subject marked form *qon-t-aq* 'it gets lost', where the original fricative coda presumably elided directly before /t/.

Evidence exists that Na-Dene also simplified coda clusters consisting of a nasal and a velar or uvular stop. Unlike **nd*, **nt'*, **ns*, which simplified differently in each family, clusters such as **ng*, **ng* appear to have simplified in both families by preserving the final guttural and leaving only sporadic evidence of the preceding nasal. One example is the word for 'conifer resin', which shows an aspirated vowel in Eyak (*gahc* 'pitch'), the characteristic signature of a former nasal segment; there is also a nasal vowel in the single Athabaskan language Kaska: *dzé^h ~ dzé^x* 'pitch' (Krauss 2005:100). Compare Ket *dīk*, Yugh *dīk* and Proto-Yeniseian **žik* 'conifer resin' (S.Starostin 1995:310), where no evidence of the nasal remains. Another is 'finger', for which Leer (p.c.) reconstructs PAE **-ts'inc* 'finger' on the basis of Eyak *yə-ts'i^hhg* 'little finger' and other sporadic forms showing evidence of a former nasal before the final uvular. Again no evidence of an original nasal remains in Yeniseian: cf. PY **tə'q* 'finger' (S.Starostin 1995:283). Yet another example is the word for 'head', which Leer (this volume) reconstructs as PND **-k'e/i(i)ŋ'*. In Na-Dene, evidence for the nasal shows up sporadically when this root combines with other morphemes, e.g., Tlingit *šan-tú* 'inside the head', and Eyak *-tsi^w-* 'neck'. Here, however, there may be evidence in Yeniseian too for the original nasal, though it is absent from Yeniseian 'head' when pronounced in isolation: Northern Ket *tui*, Yugh *čū*, PY **c[i]g* 'head' (S.Starostin 1995:214). Leer (2008b, this volume, #26a) reconstructs an ancient compound

³² Yeniseian 'liver' also shows up in other words denoting vital organs, such as Ket *bensij ~ mensij* 'lungs' (probably from **wen* 'double' + **sej* 'vital organ'). My earlier draft of this paper suggested that Ket *sejnij* 'stomach' (in the sense of 'internal organ') contained evidence of the original root syllable coda: **sejt + ij*. However, as G.Starostin has pointed out (p.c.), this word could conceivably be a compound of **sej* and **nij*. Neither etymology adequately explains the semantics of the second component *nij* or *ij*.

meaning 'hair of the head': PND **-k'e/i(i)ŋ'* 'head' + **χa()**w* 'hair, fur', found in all branches of Na-Dene. The same compound may have survived in Yeniseian as PY **cəŋe* 'hair of the head' (as reconstructed by S.Starostin 1995:213–214), yielding Central Ket *təŋə*, Yugh *čəŋ*, Kott *heŋai*. If the second syllable of this word derives from the original Yeniseian word for 'fur', 'hair'—a morpheme yielding Kott *hei*, Arin *qaj* 'fur coat', Central Ket *qā^wde*, and Yugh *χā^wt* 'fur' (the latter two probably with collective suffix *-də*)—this would provide Yeniseian evidence of the nasal + guttural coda clusters Leer has posited for Early Na-Dene. Interestingly, Tlingit and Athabaskan words for 'hair of the head' do not actually preserve evidence of the nasal element in 'head' (Leer 2008b). If the Yeniseian etymology for 'hair of the head' given here is correct, it indicates that the simplification of nasal + guttural must have occurred separately in each family, though generally yielding similar results in loss of the nasal and retention of the final guttural.

Although these are only a handful of words, parallel evidence from internal reconstruction and external comparison supports the existence of original coda clusters that later simplified independently in Yeniseian and Na-Dene. In the case of cognates involving final /t'/ or /d/, Yeniseian evidence directly confirms Leer's (2008a) reconstruction of the initial nasal element of the coda cluster, which he originally made using Na-Dene internal evidence alone.

3.1.2. Coda affricate reductions in Yeniseian

Putative Na-Dene/Yeniseian cognates indicate that affricates reduced to continuants in coda position in Yeniseian. Proto-Na-Dene coda **tʃ* corresponds to Ket *l*: Ket *hā^wl* 'bend' vs. PPA **wa^wtʃ* 'hang suspended' (Young and Morgan 1992:46). Note, however that Modern Ket retains coda cluster *tʃ* in cases where this cluster derives from *d + tʃ* (e.g., Ket *tatʃ* 'fire sticks') or from recent syllable contraction, as in *qatʃ* 'mat', *axatʃ*, 'anvil', *aqpatʃ* 'diaper', etc.; cf. Yugh *qater* 'mat' and *axater* 'anvil', where the second vowel still remains. Proto-Na-Dene coda **ts* and **tʃ* reduce to /s/ in Ket/Yugh and /š/ in Kott: Ket *hā^ws* 'round shape, shaman's tamborine, disc (of full moon)' vs. PPA **wa^wts* 'round shape' (Young and Morgan 1992:49). The fate in Yeniseian of original codas **tʃ* and **tʃ* (i.e., *č* and *č'*), if such sounds were indeed part of the Proto-Yeniseian coda inventory, is not clear. Southern Ket *qū^wt* 'wolf' and Northern Ket *qū^wti*, if cognate to Tlingit *gu^wdž* 'wolf' and Eyak *gu^wdžih* 'wolf',³³ which lack Athabaskan cognates, would seem to point to these affricates reducing to /t/.

3.1.3. Partial collapse of the velar/uvular opposition in coda position

Modern Ket has no syllable rhymes of the type *-iq*, *-uq*, or *-uq*, with final uvular after a high vowel. Na-Dene cognates with these rhymes correlate with velar codas in Ket: cf. PPA **džə^wq* 'conifer resin, pitch' (Krauss 2005:100) but Ket *dīk*, Yugh *dīk*, Kott *čik* 'conifer resin, pitch'. The original uvular quality of the coda is sometimes preserved in related Yeniseian vocabulary, such as in the perfective/stative verb stem Ket *h-daqq*, Yugh *f-d'axŋ* 'subject sticks to a surface'. This suggests that coda uvular stops may have become velars everywhere in Yeniseian (or at least in the better attested Ket and Yugh) after a high vowel. Uvulars became velars after front vowels in Ket, too, so there is no Modern Ket rhyme *-eq* either (*-iq* being disallowed by both rules). In Modern Ket, coda *k* and *q* are phonemically opposed only after the vowels /a/, /o/, and /ə/. Note, however, that coda **k* and **g* (unaspirated *k*) seem to have merged with uvulars after back vowels. This rule accounts for the coda correspondence between Ket *lā^wq* 'squirrel pelt' and the PPA variable coda root **lak' ~ *lag'* in PPA **dā-lak'-i ~ *dā-lag-i* 'tree squirrel'; the high tone in Ket suggests an original glottalized coda. Modern Ket velar codas as well as velar anlauts before a back vowel correspond to PAE labialized **k^w*, **g^w*, **k^w* rather than to plain velars. There is no Yeniseian evidence of a distinction between rounded and unrounded uvulars, and I suspect that the roundedness in Athabaskan-Eyak derives from vowel quality in the original syllable nucleus. Finally, it is important to note that Leer (p.c.) observes that the velar/uvular place-of-articulation contrast across the various branches of Na-Dene has remained extremely stable. The vowel-conditioned mergers of uvulars and velars that occurred in Yeniseian therefore represent a radical departure from the stability of this contrast in Athabaskan, Eyak, and Tlingit.

³³ Krauss (p.c.) regards the Eyak word as most likely a diffusion from Tlingit rather than a true cognate.

3.1.4. A note on possible anlaut/auslaut assimilation and dissimilation

The anlaut *s-* reconstructed by S.Starostin in PY **ses* 'small river' no doubt reflects the situation in Proto-Yeniseian, as it is well justified by the sound correspondences in the free-standing noun 'river' across all of the attested daughter languages; however, evidence from compound river names, however, suggests the earlier onset could have been **ʒ* (the regular PY correlate to Na-Dene **d*). Such a sound could have assimilated to /*s*/ through long distance assimilation before the sibilant auslaut. An earlier Yeniseian form with an initial voiced affricate **ʒ* would explain Yugh hydronyms in affricate -*čes*, Arin hydronyms in voiced -*zes* ~ -*zas*, voiced Pumpokol hydronyms in -*det* ~ -*dat*, as well as western Siberian hydronyms in -*tes*, -*tiš* from an otherwise undocumented Yeniseian language or group of languages. These may include the name of the famous Irtysh River, if hydronyms in -*tes*, -*tiš* were indeed left by an extinct Yeniseian dialect and not derived from Uralic or another source. If one accepts that PY **sē*'s originated from earlier **ʒē*'s through long-distance assimilation, there is a strong likelihood it is cognate with PPA **de*'š, Eyak *deh*ž 'sandbar' (Krauss 2005:84), a morpheme that means 'river' in a number of Athabaskan language and which in its possessed form -*de*'že' appears as the final component of river names across a broad area of north central Canada. See Kari (1996:260) for a superb discussion of these and other Northern Athabaskan hydronyms.

The onset correspondence in river-name formants Ket -*ses* and Yugh -*čes* (and the possibly Yeniseian -*tes*) is attested by only this single item, and the question remains whether long-distance consonant harmony can be supported for Pre-Proto-Yeniseian on the basis of additional evidence. One instance of coda-to-onset dissimilation identified by S.Starostin (1995) is the case of Ket *dīt*, Yugh *dīt* 'spruce grouse', where the expected Yugh form should be **d'it'* to match Kott *č* in *fenčera* 'female spruce grouse' (PY **žida*). A type of long-distance dissimilation identified by S.Starostin (1982:155) is the change of coda /*s*/ to /*t*/ in Kott or Arin words with anlaut /*s*/: Kott *še:t* 'river', Arin *sat* 'river', *čit* 'larch tree' (cf. Ket *sē*'s 'river', *se*'s 'larch tree'). This rule must have arisen after the breakup of Common Yeniseian, since it is limited to the Kott-Assan branch. The possibility that Proto-Yeniseian inherited the results of additional processes of assimilation or dissimilation between anlaut and auslaut consonants, such as the one suggested above in the words for 'river', is a topic deserving further research.

3.2. Yeniseian tonogenesis in light of Na-Dene comparisons

Ket and Yugh stand out among North Asian languages in having phonological-word based distinctions in prosody that are generally referred to as 'tones' (Werner 1997c, Vajda 2004, Georg 2007), following Heinrich Werner's seminal discovery and description of these phonemic distinctions in the 1970s. Yugh and the three Ket dialects (Southern, Central, and Northern) contain five prosodically contrasting types of monosyllabic or sesquisyllabic phonological words. The term *sesquisyllabic* refers here to a disyllable ending in a vowel or sonorant, but not an obstruent coda. It is crucial to note that Yeniseian tone involves other features besides contrastive pitch, so that calling this typologically unusual system *tone* must be accompanied by an important caveat. For brevity's sake, the five prosodic types in Ket and Yugh will be referred to here as tones rather than using a more accurate description such as "prosodic types of monosyllabic or sesquisyllabic phonological words distinguished partly by pitch". Each Yeniseian tone is an amalgam of at least two of the following four features: (1) melodic pitch, (2) vowel length, (3) laryngealization or pharyngealization, (4) the presence or absence of a second syllable. The origin of three of the five modern tonal types involves reduction of sound segments still present in other Yeniseian languages. Some Southern Ket rising-falling tone monosyllables occur in free variation with a sesquisyllable containing an intervocalic guttural (*kāwun* ~ *kaən* 'fox'), while other sesquisyllables occur in free variation with high-tone monosyllables (*kāwūn* ~ *kā'n* 'foxes'); note that the accent mark in Ket disyllables ending in a vowel or sonorant generally correlates with higher pitch on the given syllable (cf. Vajda 2004, 2008). Such free variation further distinguishes Ket from syllabic-tone languages such as Mandarin Chinese, where the tones do not alternate synchronically with non-tonal segments. Finally, it should be pointed out that Ket/Yugh phonological words consisting of three or more syllables, as well as disyllables ending in an obstruent, have simple non-melodic word stress, usually on their first syllable.

The origin of Ket and Yugh tone is sometimes apparent from cognates across the various daughter languages. Ket or Yugh rising-falling tone monosyllables normally have cognate Kott disyllables with an intervening guttural: cf. Kott *pagan* 'mittens' vs. Ket *boxon* ~ *boon* 'mittens'. Visible segment loss is also involved in some instances of falling tone, as can be seen by comparing Kott *šagal* and Yugh *sà:r* (note that [h] in Yugh examples transcribes pharyngealization in the second phase of the vowel). Yugh monosyllables with high tone and half-long vowels (*sē*'l 'bad') correlate regularly with Central or Northern Ket high-tone, half-length vowel words containing second vowel (*sē*'li 'bad'). The Southern Ket dialect has everywhere lost the second vowel (*sē*'l 'bad'), making them identical to the Yugh forms.

The remaining two Ket and Yugh tones, which occur exclusively in monosyllabic phonological words, do not correlate with non-tonal features present elsewhere in Yeniseian. One is an abrupt tone on a short vowel with laryngeal stricture in its second phase (optionally including full glottal closure). This tone is identical in Yugh and all three Ket dialects: Ket/Yugh *se*'s 'larch tree', Ket *ta'q*, Yugh *ta'χ* 'finger'. The other is high tone, just like that described above. However, this high tone occurs on a short rather than half-long Yugh vowel: *sēs* 'river', *dīk* 'conifer resin', while all three Ket dialects have half-length but no second vowel: *sēs*' 'river', *dīk*' 'conifer resin'. The two types of high tone are thus phonologically differentiated in Yugh by short vs. half-long vowel length and in Central and Northern Ket by the presence vs. absence of a second vowel. In Southern Ket they have basically fallen together, with both types of high tone containing a half-long vowel and no second syllable.³⁴

Table 24 summarizes the five prosodic types of monosyllables or sesquisyllables in Ket and Yugh. The two primary tones are generally not derivable from elements attested elsewhere in Yeniseian,³⁵ while the three secondary tones alternate with non-reduced structures either in the same language or in cognate words from another language. Because high tone represents two distinct entities, the term 'simple high tone' or 'high tone' will refer to cases where Yugh has a short vowel and all three Ket dialects have a half-long root vowel but no second vowel. The term 'extended high tone' refers to cases where the vowel is half-long in both Yugh and Ket, and the Central and Northern Ket dialects have a second, open syllable. Kott cognates are added where useful to illustrate the presumed origins of tonal features in Ket and Yugh.

TABLE 24. Primary and secondary tonogenesis in Yeniseian

Primary tones (origin cannot be determined from internal Yeniseian comparison)

simple high tone (half-long vowel in Ket but not in Yugh)

Yugh:	<i>sēs</i> 'river'	<i>sēŋ</i> 'liver'	<i>dīk</i> 'conifer resin'	<i>tīk</i> 'snow'
Ket (all dialects):	<i>sēs</i> ' 'river'	<i>sē'ŋ</i> 'liver'	<i>dīk</i> ' 'conifer resin'	<i>tīk</i> ' 'snow'

abrupt tone (with laryngeal second phase of vowel and optional glottal ['] closure)

Yugh:	<i>se</i> 's 'larch'	<i>se'n</i> 'reindeer (pl.)'	<i>χo'n</i> 'conifer branch'	<i>ta'χ</i> 'finger'
Ket (all dialects):	<i>se</i> 's 'larch'	<i>se'n</i> 'reindeer (pl.)'	<i>qo'n</i> 'conifer branch'	<i>ta'q</i> 'finger'

Secondary tones (origin involves non-tonal elements present elsewhere in Yeniseian)

extended high tone (with half-long vowel in both Ket and Yugh, second vowel in CK)

Yugh:	<i>χā</i> 't 'fur'	<i>χū</i> 'n 'to flow'	<i>dī</i> 'f 'I eat'	<i>čī</i> 'k 'swan'
Southern Ket:	<i>qā</i> 'r 'fur'	<i>qu</i> 'n 'to flow'	<i>dī</i> 'p 'I eat'	<i>tī</i> 'y 'swan'
Central Ket:	<i>qā</i> 'dā 'fur'	<i>qu</i> 'ne 'to flow'	<i>dī</i> 'ba 'I eat'	<i>tī</i> 'ya 'swan'

³⁴ Southern Ket words with extended high tone do undergo intervocalic lenition, suggesting the second vowel is present at a deeper level even though it drops in the surface phonology. Therefore, extended high tone and simple high tone are still distinguishable even in Southern Ket, as can be seen by comparing SK simple high tone *tī*'k 'snow' with extended high tone *tī*'y 'swan', the latter showing fricativization of final /*k*/ suggestive of intervocalic position. Also, Southern Ket has high-tone sesquisyllables where the original first syllable contained a geminate vowel, and the second syllable is a grammatical suffix, e.g. *ā*'niŋ 'to play' (cf. Yugh *afiniŋ* 'to play'), *sō*'laŋ 'snowslede' (< *suul* 'snowslede' + plural suffix -*aŋ*).

³⁵ Exceptions include some irregular plural forms with tonal ablaut, such as *sē*'l 'reindeer' (pl. *se'n*), *ē*'j 'pine tree' (pl. *e'n*), where the glottal stop seems to have resulted from consonant segment reduction.

rising-falling tone (on geminate vowel created by loss of intervocalic consonant)Ket: *qəəl* 'bile' vs. disyllables in Yugh *χəχul* and Kott *agar* 'bile'Ket: *boxon* ~ *boon* 'mittens' vs. disyllables in Yugh *boxon* and Kott *pagan* 'mittens'**falling tone** (from reduction involving a voiceless continuant, which leaves pharyngealization in Yugh)Yugh: *sà:^hr* vs. Kott *šagal* 'to spend the night' vs. Ket rising-falling tone cognate *saal*

Primary tone minimal pairs such as Ket/Yugh *se*'s 'larch tree' vs. Yugh *sēs*, Ket *sēs*'s 'river' presumably reflect a distinction already operating phonemically in Common Yeniseian. The remaining three types, labeled as secondary tones, must have arisen after the breakup of Yeniseian, since some of the tonogenetic features associated with them etymologically are still evident elsewhere in Yeniseian. Also, note that secondary tonogenesis occasionally yielded different outcomes in Ket and Yugh, as shown in the examples under rising-falling and falling tone. Primary tones normally match perfectly in Ket and Yugh. Finally, even though tone was not documented as such in the Yeniseian languages that became extinct before the 20th century, certain peculiarities in their transcription strongly suggest the presence of similar tones there as well (cf. Werner 1990b).

Comparisons with Na-Dene cognates demonstrate that the simple high tone (henceforward referred to as 'high tone') originated either: (1) as compensation for the loss of an original glottalized coda obstruent, or (2) on the basis of an earlier full vowel or diphthong. Abrupt tone originated as the default, with the optional glottal stricture present only when the syllable in question is pronounced in isolation and under pragmatic focus. In other words, the default abrupt tone appeared in cases where the original syllable contained neither a full vowel nucleus nor a glottalized obstruent coda. Abrupt tone still operates as the default for Ket monosyllabic words, with Russian loans usually receiving it: e.g., *ho'p* 'priest' (< Russian *pop* 'priest'), *lo'p* 'bedbug' (< Russian *klop* 'bedbug'). Also, the laryngeal feature associated with abrupt tone monosyllables disappears whenever these syllables form complex morphological structures, with no evidence from either Yeniseian phonology or morphology to indicate that it derived from any earlier segment that might have left a trace elsewhere in the morphophonology. The tonogenetic features associated with high tone, on the other hand, do show various traces in the phonology and morphology. These traces include vowel ablaut in syllables containing original full vowels (or diphthongs) as well as the lack of labialization in the vowel /a/ when adjacent to glottalized uvulars (as examined above in section 2.2.2).

It is worth pointing out at the outset that the primary tonal opposition in Yeniseian must have arisen after the split from Na-Dene. The non-tonal features that gave rise to the Yeniseian tones—vowel length and coda glottalization—clearly existed as such in Proto-Na-Dene. The subsequent rise of tonal contrasts in certain Na-Dene daughter languages represents parallel processes of tonogenesis, even in cases where they involve some of the same features that generated tone in Ket. In other words, tonogenesis in Yeniseian and Na-Dene arose separately, even where triggered by identical phonological features and yielding partly coincidental results.

3.2.1. Yeniseian primary tonogenesis in closed syllables with short vowels

The original opposition of tone inherited into Common Yeniseian involved a contrast between high tone on a half-long vowel vs. abrupt tone on a short vowel with laryngealization in its second phase. High tone syllables are transcribed here as /ː/ in the Ket examples and /ˑ/ in their shortened Yugh cognates. Abrupt tone is transcribed using the apostrophe /' / to mark the optional glottal stricture. The half-length in Yugh presumably shortened before the rise of the extended type of high-tone. Short vowel syllables closed by a stable consonant (i.e., a consonant lacking any irregular morphological changes and which can be taken as original) regularly developed high-even tone when originally followed by a glottalized coda obstruent. Coda glottalization, which is clearly attested in Proto-Na-Dene, apparently disappeared by the time of Common Yeniseian, leaving behind compensatory high tone and half-length in the preceding vowel nucleus. Table 25 provides a few examples.

TABLE 25. Correlation of Yeniseian high tone with Na-Dene coda glottalization

Yeniseian	Na-Dene
Ket <i>sē'ŋ</i> 'liver'	PAE * <i>-sənt</i> 'liver'
Ket <i>tī'k</i> 'snow lying on the ground'	PND ~* <i>t'i(k)</i> 'frozen snow and ice'
Ket <i>dī'l</i> 'willow'	PA * <i>tš'āt</i> 'plant, shrub'
Ket <i>lī'q</i> 'squirrel pelt'	PPA * <i>dā-tək-i</i> 'squirrel' (alongside PA * <i>təq'</i>)

Short-vowels followed by an original non-glottalized obstruent or by a stable sonorant seem to have developed abrupt tone by default to contrast better with high-tone syllables. This tone is still visible in monosyllables where no subsequent morphological processes triggered secondary tonogenetic developments. In such words, which can be called 'primary monosyllables', the distribution of high vs. abrupt tone corresponds systematically to the type of coda reconstructable from the Na-Dene cognates. Table 26 provides examples.

TABLE 26. Correlation of Yeniseian abrupt tone with Na-Dene non-glottal codas

Yeniseian	Na-Dene
Ket <i>qo'n</i> 'conifer tree, branches'	PAE * <i>gand</i> 'spruce or pine needles'
Ket <i>ta'q</i> 'finger', 'toe' (< 'digit')	PAE * <i>yə-ta-ts'ing</i> 'finger' (with * <i>yə-ta-</i> 'hand')
Ket <i>ko'd</i> 'rump'	Eyak * <i>-g'ada-</i> 'rump', PA * <i>-dž'ade</i> 'lower leg'

Note that morphological developments on the Na-Dene side may have resulted in a lengthened vowel in some Athabaskan cognates to Yeniseian abrupt tone words (cf. PA **dž'ade* 'lower leg'), obscuring the original regularity of this correlation. I suspect this might be true in the case of PAE **g'e'n* 'daylight' (> PA **dž'e'n* 'daylight'), where the corresponding partial cognate in Ket is the adjective *ka'n* 'light, bright' suggesting an older adjective form **g'an* (?) no longer attested in Na-Dene. Tonal mismatch in such partial cognates seems to involve secondary word formation processes. The same is probably true in the case of the PAE verb root **g'e'd* 'poke O' when compared to the Central Ket short-vowel noun *qu*' 'poker, ray, spit for roasting meat', probably from earlier **qu'd*, 'poker', given the Central Ket plural form *qudeŋ* and the tendency of original coda *d* (where derived from PY **ž* and ultimately cognate with PND **d*) to be unstable in Yeniseian (see 3.5). In the semantically related Ket infinitive, the infinitive suffix produced falling tone: Southern Ket *qu̇r*, Central Ket *qu̇:da* 'poke, scratch, dig' (cf. section 2.3). In true cognates, Na-Dene monosyllables with an original full vowel, such as PAE **g'e'd* 'poke O', should correspond to Ket high-tone syllables with half-length, regardless of whether or not the original coda was glottalized (see 3.2.2 below).

In short-vowel closed syllables that underwent neither secondary tonogenetic processes in Yeniseian nor vowel lengthening in connection with secondary word building in Na-Dene, distribution of the two Yeniseian primary tones corresponds systematically to the coda type reconstructable for the Proto-Athabaskan-Eyak cognates. Yeniseian words that are fully cognate to Na-Dene words with original full vowels normally have high-even tone regardless of the coda type.

One final point to note is that Yeniseian shows no sign of ever having contained glottalized nasal codas. In all cognates to Na-Dene words with a glottalized coda *n'* or *ŋ'*, Yeniseian shows velar nasal *ŋ*. Crucially, the preceding vowel has abrupt tone rather than the high tone that would have developed if the coda had originally been glottalized. Cf. Ket *ba'ŋ* 'land, earth' vs. PA **n̄ān* 'land, earth' (plausibly cognate if from earlier **m-yān*).³⁶ The Ket/Yugh velar nasal *ŋ* is only found in coda position and appears to be a Yeniseian innovation developing from /n/ due to absorption of a following glottal stricture or guttural consonant. This must have occurred prior to the development of high tone from glottalized codas (cf. 3.4 for more on nasal correspondences.) Ket words with high tone before coda *ŋ* have Na-Dene cognates with complex codas ending in a glottalized obstruent, as exemplified by Ket *sē'ŋ* 'liver' and PAE **-sənt* 'liver'.

³⁶ I thank Jeff Leer (p.c.) for suggesting this, as well as for noting possible Sino-Tibetan cognates for 'earth' that begin with the sequence **ml-*.

3.2.2. Yeniseian tonogenesis in primary monosyllables with original full vowels

Ket-Yugh monosyllables whose Na-Dene cognates contained a full (i.e., half-long or long) vowel nucleus regularly show high tone, regardless of whether the coda was glottalized or not. These syllables, which I will call 'primary long monosyllables', often have a different vowel quality in Yeniseian than in Na-Dene. Generally, Yeniseian has /i/ or /u/ while Na-Dene has /a/ or /e/, suggesting earlier diphthongs, a different portion of which seems to have been preserved in each family (Table 27):

TABLE 27. Yeniseian and Na-Dene cognates with primary full vowels

Yeniseian	Na-Dene
Ket <i>sīn</i> , Yugh <i>sīn</i> 'old'	PA * <i>xān</i> 'old age, Tling. <i>šān</i> 'old person' (Leer 2008b:5)
Ket <i>dīn</i> 'emit light'	PPA * <i>-deñ</i> 'emit light'
Ket <i>dīk</i> , Yugh <i>dīk</i> 'pitch, resin'	PPA * <i>džeq</i> 'resin'

Yeniseian high-tone nouns often show unusual vowel ablaut in the plural, also suggesting an original diphthong: cf. Ket *tēd*, 'husband' *tat-n* 'husbands', Ket *sēs*, 'river' *sās* 'rivers' (where the falling tone developed through absorption of the plural ending *-ŋ*). Where such words have plausible Na-Dene cognates, these anomalies might help reconstruct the origin of full vowels in Proto-Na-Dene from earlier diphthongs.

3.2.3. Proto-Yeniseian open monosyllables

The origin of tone in Yeniseian monosyllables ending in a vowel or an unstable continuant remains unclear. It is likely that the glottal stricture or half-length in some Modern Ket open syllables derives from an elided coda continuant of some kind rather than from the processes described above. A good example is Ket *sī* 'night', reconstructed for Proto-Yeniseian by S.Starostin (1995:274) as **si* on the basis of Kott *šig* ~ *šix* 'night'. In cases where such words appear to have Na-Dene cognates, often only the onsets clearly match: Ket *ta*'s 'stone' vs. PAE **tse*' 'stone' < PND ~**kʷay*; Ket *tu*' 'head' vs. PAE **-tsi*' 'head'; Ket *ki*'s 'foot' vs. PAE **-qe*' 'foot'; Ket *quj*' 'birchbark' vs. PA **qʷəx* ~ **qʷix*' 'birch' (Leer, p.c., corrected from PA **qʷəy* ~ **qʷi* given in Krauss and Leer 1981:196); also Ket *taya* vs. PA **ts'u*' 'breast' and Ket *hūj*' 'belly' vs. PA **-wāt*' 'belly'. Vowels in these type of words as in primary long syllables, often show irregular morphophonemic alternations, as can be seen in Ket *ki*'s 'foot' vs. Ket *kasn* 'feet' and *kassat* 'sole of the foot'. Studying phonological alternations in open syllables might reveal the original rhyme in both Proto-Na-Dene and Proto-Yeniseian. In some cases, the irregular Ket plural suggests coda simplification, as in Ket *du*' 'hat' which is possibly cognate with PA **tšʷaxd* 'hat'; cf. Ket plural *dūn-ŋ* 'hats', where the excrescent half-length and extra nasal segment /n/ suggest an original coda cluster. Another possible cognate pair is Ket *di*' 'eagle' (plural *dīyin*), alongside *dax* 'giant eagle (in Ket mythology)'. Possible Na-Dene cognates are Tlingit *č'á'k*' 'bald eagle' (Naish and Story 1996:27) and Ahtna Athabaskan *hwts'ek*' and Upper Tanana *tθ'ik* or *tθ'ak* 'osprey' (Jim Kari, p.c.).

3.2.4. Typology of Athabaskan high/low tones and Yeniseian primary tones

Krauss (2005) demonstrated that Athabaskan high/low tone contrasts derive from an earlier contrast between the presence vs. absence of coda glottalization, with the original glottalized codas still present in the cognate Eyak and Tlingit words. Typologically, Athabaskan tonogenesis is extremely interesting because coda glottalization produced mirror opposite results in different tonal Athabaskan languages. In some languages an original glottal coda yielded high tone, with the remaining syllables developing low tone by contrast. Languages with this type of tonogenesis, such as Dëne-Sūtine (Chipewyan), are called 'high-marked languages'. In other tonal Athabaskan languages, however, coda glottalization yielded low tone in the preceding syllable, with high tone developing by contrast in the other syllables. Such languages, of which Navajo and Apache are notable examples, are called 'low-marked languages'. In the remaining languages, notably Ahtna, Dena'ina, most of Koyukon, and the Athabaskan languages of California, glottalized obstruent codas simply lost their glottal pronunciation without triggering any compensatory tonal contrast at all.

Table 28 provides examples of words from the two phylogenetically opposite types of Athabaskan tone languages alongside their Ket and Yugh cognates. Cognates deriving from proto-forms with original coda

glottalization are juxtaposed with those deriving from originally non-glottalized codas. The first two cognate sets have secondary vowel length in Proto-Athabaskan-Eyak, while the second pair provides an example of short vowels before an original cluster. In both types of syllables, the tonal outcome depends only on the presence vs. absence of glottalization in the plosive consonant at the end of the syllable.

TABLE 28. Correspondence between Yeniseian and Athabaskan tones that developed on the basis of an earlier contrast in coda glottalization

Yeniseian		Modern Athabaskan		Pre-Proto-Athabaskan	
high-marked		high-marked	low-marked	non-tonal, with coda glottalization contrast	
Ket	Yugh	Dëne-Sutiné	Navajo	*proto-form	original meaning
<i>dīk</i>	<i>dīk</i>	<i>dzé</i>	<i>džèh</i>	* <i>džeq</i>	'pitch/conifer resin'
<i>tīŋ</i>	<i>tīŋ</i>	<i>tàn</i>	<i>tín</i>	* <i>tən</i>	'ice' ('hoarfrost' in Yen.)
<i>sēŋ</i>	<i>sēŋ</i>	<i>đór</i>	<i>zid</i>	* <i>sənt</i>	'liver'
<i>qo'n</i>	<i>xo'n</i>	<i>gār</i>	<i>(gād)</i>	* <i>gand</i>	'needle/spruce branches'

High tone in Ket and Yugh regularly correlates with high tone in an Athabaskan high-marked language like Dëne-Sūtine but with low tone in a low-marked language like Navajo. This pattern exists because all of these respective tonal signatures derive from earlier coda glottalization. Note, however, that in Modern Navajo there are no phonetically high-tone short-vowel closed syllables. Thus, Navajo *gād* 'juniper' has low tone instead of the high tone found in other syllables with originally non-glottalized codas.

With regard to tonogenesis in primary monosyllables, Yeniseian is a 'high-marked language', to borrow Athabaskanist terminology. However, the unmarked, non-high-tone syllables in Ket and Yugh display an additional trait, not found in any Athabaskan high-tone language. When pronounced in isolation, Yeniseian non-high-tone syllables have secondary laryngealization. The glottal stricture, which is optional and tends to be produced only in a syllable pronounced with pragmatic focus, presumably arose to accentuate the contrast with high-tone monosyllables; it has nothing to do with original coda glottalization, judging from the available Proto-Athabaskan-Eyak cognates. If this analysis is valid, then Yeniseian is typologically noteworthy for developing this type of optional laryngealization 'out of nothing', simply to further emphasize an existing prosodic contrast, rather than through reduction of a specific segment as is normally the case with the origin of glottal features.

3.3. Secondary tonogenesis through reductions involving disyllables

In some branches of Yeniseian, certain disyllables reduced to create new prosodic phonological word types. These processes have done much to obscure the neat tonal correspondences presented in Table 28. Most of the original disyllables in question probably contained more than one morpheme, though their etymologies often remain at least partly opaque. The reductions, which are rather complex, yielded more simple high-tone words, as well as three new prosodic types that probably did not exist in Common Yeniseian: extended high-tone words, rising/falling-tone words, and falling-tone words. The different tonal outcomes hinged on three factors: (1) whether the second syllable was closed or open, (2) the phonetic nature of the segment or segments undergoing reduction, and (3) the location of the primary word stress (i.e., did the word's semantic head occupy the first or second syllable). Falling tone is etymologically the most complex and will be discussed last.

Secondary tonogenesis from a root-first disyllable with an open second syllable created the prosodic type introduced above as 'extended high tone'. Unlike the original simple high tone, it shows half-length in Yugh as well as Ket, and also a second syllable vowel in Central and Northern Ket. One example is CK *kīne*, SK *kīn*, Yugh *kīn* 'dawn', etymologically a compound of PY **gə'n* 'light' + **xi'c* 'day' (cf. Kott *kinig* 'dawn'), where the second syllable had already lost its original coda in Proto-Ket-Yugh (cf. Modern Ket/Yugh *i* 'day'). Another example is the infinitive 'to flow': CK *qu'ne*, NK *qu'ni*, SK *qu'n*, Yugh *xū'n*, where the lack of

final vowel in the corresponding finite verb base *-qun*, suggests the presence of an infinitive suffix which was partly absorbed by the original monosyllable, causing a change in tone.

Root-initial disyllables with a closed second syllable generally yielded rising/falling tone through loss of an intervocalic guttural. This process occurred regularly in Ket with velars and uvulars (though sometimes there is free variation between disyllables and geminate-vowel monosyllables); in Yugh it occurred due to the elision of velars and uvulars except *χ*: cf. Ket *qəəl* but Yugh *χəχul* 'bile'. The velars and uvulars that elided in Ket or Yugh can often be found in the Kott cognates, e.g., Ket *taal*, Kott *t^hegar* 'otter'.³⁷ Another example is Ket *saal* 'to spend the night', derived from PY **sig* 'night' plus another morpheme, possibly the instrumental suffix **-t*, with the original syllable coda remaining in the Kott cognate *šigal* 'to spend the night'. A further tonogenetic process occurred in the Yugh cognate to yield pharyngealized falling tone: *sà:^hr* 'to spend the night', suggesting that intervocalic velars were inherited intact into Proto-Ket-Yugh, later yielding falling tone in Yugh but leaving long vowel monosyllables in Ket. Late secondary tonogenetic developments such as this have resulted in tonal mismatch between Ket and Yugh.

Proto-Ket-Yugh root-initial disyllables that lost intervocalic /j/ generally became simple high tone: Ket *kīn*, Yugh *kīn* 'maggots', where Kott *hoi* 'worm', supports the etymology **koj* 'worm' + plural suffix *-in* for the Ket and Yugh words.³⁸ Yugh *f* (from PY **p*) remained intervocalically, but Ket *h* (also from **p*) elided. This yielded high tone in cases where the root originally contained a short vowel (cf. Ket *āniŋ* vs. Yugh *afiniŋ* 'to play'), and rising/falling tone where the root syllable contained length (cf. Ket *aaŋ* vs. Yugh *afinŋ* 'hot' < PKY **āp* 'heat' + **əŋ* 'adjective suffix').

In cases where the second syllable contained the primary root (and presumably the word stress as well), intervocalic consonant reduction created simple high tone monosyllables. Note that this process is recent and confined to Ket, as can be seen from the Yugh and Kott cognates. Compare Ket *ṽn* 'to boil' with Yugh *α-χan*, Kott *au-gan* 'to boil', also Kott *č-au-gan* 'to burn', a disyllable originally derived from a thematic prefix plus a verb root cognate with the root in PA **dā-q'a'n* 'burn, ignite'. Another is Ket *īn* 'standing (said of a single animate)' vs. Yugh *-fiun* 'standing', another thematic prefix plus verb root combination; cf. PA **-he'n* 'stand (said of a single animate)'. The following instance of Southern Ket free variation nicely illustrates the stress-related origin of rising-falling tone (*kəkuun* ~ *kəən* 'fox') and the secondary genesis of simple high tone (*kəkuin* ~ *kə'n* 'foxes'); compare the Yugh cognates *kəχun* 'fox' and *kəχuniŋ* 'foxes', where the intervocalic uvular remained and no secondary tonal developments took place.

The last tone to be discussed, falling tone, is phonetically the most variable across Yugh and the three Ket dialects. In addition to its characteristic melody, this prosodic type involves a geminate vowel with pharyngealized second phase in Yugh, a non-pharyngealized geminate vowel in Central and Northern Ket with a second vowel following the root syllable, and a simple short non-pharyngealized vowel in Southern Ket: cf. Yugh *lù:^hd*, CK *lù:da*, SK *lur* 'vee (waterfowl formation)'. Falling tone is also the most complicated etymologically. In many such words, the origin of pharyngealization and falling tone is unclear. Instances where a Kott intervocalic guttural corresponds to falling tone in Yugh seem to be secondary developments confined to Yugh, since the Ket cognates to such words have rising-falling tone on a geminate vowel, as seen in Kott *šagal*, Yugh *sà:^hr*, and Ket *saal* 'spend the night'. Yeniseian internal evidence, where available, together with Na-Dene comparanda where available, suggests that the falling tone developed on the basis of the loss of a fricative element in the second part of an originally disyllabic word. The tonogenetic element in question sometimes originally preceded the coda consonant and sometimes followed it. In the words for 'vee' just presented, the second syllable probably comes from the Proto-Ket-Yugh distributive suffix **-dā* attached to a root conveying animals moving in a row. This root presumably ended in a consonant that fricativized to yield falling tone. The actual consonant element involved in the creation of falling tone is generally not visible in any available Yeniseian cognate, though sometimes it can be inferred from

³⁷ Some Kott forms show reductions similar to Ket, cf. *tūr* 'otter', a Kott form recorded in the 18th century, presumably from a different dialect from that recorded by Castrén (1958). What is important for the present discussion about tonogenesis is whether at least some form of Yeniseian preserves the unreduced form of the words in question.

³⁸ I thank George Starostin for suggesting this etymology.

internal reconstruction. An example of a long pharyngealized falling tone word is the Yugh noun *sù:^ht*, derived by adding the instrumental suffix *-t* to the root syllable *suy* ~ *sū* meaning 'back, return'. The falling tone in Southern Ket *in*, Central Ket *i:ni*, Yugh *i:^hn* 'fingernail, claw' could conceivably have derived from a nominalizing suffix added to a root cognate to PA **ye'n* 'sharp' (note that the palatal glide does not appear word initially in native Ket words except as an optional phonetic onset before /i/ or /e/ in the pronunciation of some Southern Ket speakers). Other instances of falling tone correlate with disyllables in Na-Dene that end in final fricatives, as can be seen by comparing SK *kùn*, CK *kù:ne*, Yugh *kù:^hn* 'wolverine' and Eyak *kəna*'s 'wolverine' (Krauss 1970:759) and PA **-tš'ŋ's* (Krauss and Leer 1981:194), where the retroflex onset **tš* derives by regular rule from PAE **k'*. Other examples include Ket *tix*, Yugh *čl:^hk* 'snake' vs. PA **t^həyāš* 'eel'; and SK *qòn*, CK *qò:nə*, Yugh *χò:^hn* 'cartilage, gristle' vs. PA **-g'əndž* 'cartilage, gristle'. Note that in the latter example, voiced velar anlaut *g* became a uvular before a back vowel, labializing the vowel (similar to voiced uvular *g*), while coda **dž* corresponding to falling tone in Yeniseian.

To summarize, patterns of Yeniseian tonogenesis offer a variety of evidence supporting a genetic link between Yeniseian and Na-Dene.

3.4. The proto-sonorants in onset and coda positions

Na-Dene sonorants were fundamentally described by Krauss and Leer (1981), who showed that Proto-Athabaskan-Eyak had the following six sonorants: **w*, **y*, **n*, **ñ* (or **ŋ' ~ y*), and **m ~ w̃*, with the variants *ỹ* and **w̃* representing non-occlusive allophones of **ñ* (**ŋ'*) and **m*, respectively; there was also **ŋ'*, with allophones **m* and *w̃*. Finally, some syllables seemed to have a zero onset, probably realized phonetically as [h], [w], or [y] depending upon the quality of the following vowel. All nasal phonemes had glottalized counterparts (e.g., **n'*, **ñ'*). The lateral fricatives /t/ and /l/ are obstruents in Na-Dene rather than sonorants.

Modern Yeniseian has few sonorant-initial words. Exceptions include interjections such as Ket *ma* 'take it' (conceivably a loan of Russian *na* 'take it') or complex forms where initial *m*, *n*, or *ŋ* (the latter in Kott and Assan only) represents a pronominal proclitic or verb prefix. Word-initial [j] is confined to loans or occurs in Southern Ket facultatively before /i/ or /e/, as in *eel* ~ *jeel* 'berries' and *in* ~ *jin* 'needle'. The lateral *t*, which is realized phonetically by native speakers as [tʃ] word initially and as [t] in auslaut, is an obstruent and will be dealt with in section 3.5, although in Southern Ket it allophonically is realized as liquid [l] intervocalically and at the end of high-tone and rising-falling tone monosyllables (see Vajda 2008).

As a rule, sonorants remain distinct from obstruents in the morphophonology of both families, with the exception of the bilabial approximant **w*, which yielded secondary obstruent **b* in Athabaskan as well as in Yeniseian, remaining *w* in Eyak and apparently becoming *h* in Tlingit. The full range of Yeniseian correspondences to PAE **w* requires additional explanation, however. Evidence suggests that the original distribution of Pre-Proto-Yeniseian **w* was broader than for PY **w*, a relatively unusual phoneme, and that PPY **w* yielded three distinct outcomes in anlaut, only one of which was PY **w*. S.Starostin (1982, 1995) demonstrated that **w* yields Ket/Yugh *b* and Kott *p* in the anlaut of a number of words. Instances of Ket/Yugh *b* deriving from PY **w*, however, never occur before a high vowel, with the exception of pronominal elements such as **win* 'self', **wi* 'interrogative formant', later Ket/Yugh *bu* 'he, she' < **wV* (S.Starostin 1995:294). Seeming exceptions, such as Kott *-buj* 'pull' or *-buk* 'find' probably represented phonetic [baj], [bak] as in the Modern Ket cognate *-bak* 'pull'; G.Starostin (1995:174), in fact, reconstructs PY **wək* 'find'. At the same time, the phoneme reconstructed as **x* is found in anlaut only before high vowels, where it yields Arin *k-* or *x-* and Pumpokol *h*, but elides leaving a zero anlaut in Ket-Yugh, and Kott-Assan (S.Starostin 1995:296–299). Examples include Ket/Yugh *us* 'warm, hot, thaw' vs. Arin *kus* 'warm', Ket/Yugh *-us* 'sleep' vs. Arin *kus* 'sleep', and Ket *ūn*, Yugh *ūn* 'two' vs. Arin *kin* 'two' and Pumpokol *hin-eaŋ* 'two'. Ket-internal evidence suggests that PY **x*, correlating with Arin *k-* rather than *x-*, represents a sound that split off from PY **w* in the anlaut of content roots before a high vowel. For example, alongside Ket *ūn* 'two', there is also the Modern Ket combining form *ben-* found in a variety of words meaning 'apart', 'double', and the like: *bene* 'apart', 'in two', *bensal do'ŋ* 'double-edged knife'. There is also the verb incorporate *un-* 'in two', e.g., *untet*

'to split in two', *unavok* 'it splits open'. A similar morpheme family is *bel-* 'separate', 'free', 'loose' vs. the incorporate *ul-* in verbs meaning 'release', 'free', 'let go' (*ultij* 'to set free'). Forms of the adjective *hana* 'small' in compounds such as *bən-čol* 'small sled' (< *suul* 'sled') and *un-tip* 'puppy' (< *tīp* 'dog') suggest that Pre-Proto-Yeniseian *w became *p in the anlauts of certain syllables. Cognate pairs with initial *p in Yeniseian but Na-Dene *w include Ket *hā-l* 'be bent over' - PPA **wa'tt* 'hang suspended' and Ket *hā-s* 'shaman's tamborine, disc (of full moon)' - PPA **wa'tts* 'round shape'. Auslaut-to-anlaut devoicing assimilation of PPY *w might explain this correlation. Modern Ket sequences where anlaut *h* remains before a high-vowel /i, u, u/ presumably involve *h* from original PPY *p rather than from earlier *w. Finally, as Kott cognates demonstrate, Modern Ket anlaut *b* before a high vowel occurs in a few pronominal elements, where it originated from PY *w or in roots deriving from PY *b, e.g. PY **bul* 'leg' > Ket *bū-l*, Kott *pul*. The vowel alternation between *hūj* 'belly' and *hāj* 'bellies' does not involve loss of the anlaut since the singular form is actually pronounced [h**v̄*ç] and the vowel was presumably [ə] in Proto-Yeniseian as well (**pāj* 'belly'); cf. PA **-wāt* 'belly'.

Na-Dene roots that Athabaskanists reconstruct with a zero- or *h-* onset correlate with Ket *h* and Yugh *f*. Once example is PA **he-n* 'stand (said of single animate subject)', a plausible cognate with Yugh *-fun* 'to stand (said of people or animals, not trees or objects)' and Ket *īn* (< *-hūn*) both containing the root syllable **-pūn*. This suggests that the epenthetic anlaut in this syllable also fell together with PY *p.

Table 29 illustrates the distinctive sonorant reflexes in onset vs. coda position due to the universal denasalization that occurred in Yeniseian root onsets, with anlaut /n/ preserved only in affixes or clitics. There are so far not convincing cognates representing the unusual coda sound *w, while onset /j/ seems to have disappeared everywhere by Proto-Yeniseian times.

TABLE 29. Dene-Yeniseian sonorant correspondences

Na-Dene	Yeniseian
*w	*w, *x (later Ket Ø before /u/), h (< PY *p < PPY *w)
onset	PAE * <i>w-</i> '3p pronominal prefix' PAE * <i>wV-</i> '3p pronoun' PAE * <i>-wagw</i> 'stretch, spread out' PA * <i>-wāt</i> 'belly'
	PY * <i>w-</i> '3p inanimate-class prefix' PY * <i>wV</i> '3p pronoun' PY * <i>-wək</i> 'pull' Ket <i>hūj</i> 'belly'
*y (= j)	Ø, j (= palatal approximant)
onset	PAE * <i>ye-n</i> 'sharp'
coda	PND ~ * <i>k'ay</i> 'stone'
	? (j)in 'claw', 'fingernail' <i>tu's</i> 'stone', <i>tu'ŋ</i> 'stones' (unstable /s/)
*n	d (root anlaut), n (clitic) n (coda)
onset	PA * <i>nīg</i> 'move hand' (KL 1981:199) PA * <i>-nāq</i> 'swallow' (KL 1981:198)
clitic	PA * <i>nə-</i> 'round shape prefix'
coda	PA * <i>də-q'an</i> 'burn, ignite'
	<i>dāj</i> ~ <i>nāj</i> 'touch, disturb by moving' ³⁹ <i>-doq</i> 'eat' (animate object) <i>n-</i> 'round shape prefix' Ket <i>-qan</i> 'boil', Kott <i>č-au-gan</i> 'burn'
PA * <i>ñ</i>	(ŋ ^y)
clitic	PAE * <i>-ñi</i> 'perfective suffix'
coda	PAE * <i>-de-ñ</i> 'emit light'
	Ket, Yugh, Kott <i>n-</i> 'perfective prefix' Ket <i>dīn</i> 'emit light' PA * <i>-la-ñ</i> 'be many' (<i>l</i> is fused classifier) Ket <i>o'n</i> ~ <i>o'n</i> 'many'

³⁹ The alternate stem form here probably derives from the fact that the given verb is often used with a thematic prefix *n-* (possibly a shape prefix meaning 'around'), and does not represent alternate denasalization of a root anlaut. Shapes prefixes with the form *n-*, being proclitics by origin, never denasalize. In fact, they regularly cause long distance progressive nasalization of the inanimate prefix *b-*, as in the form *namadij* 'it is shaking' < *n-* around + *a-* tense + *m-* (< *b*) inanimate prefix + *Λ-* perfective/stative prefix + *daj* 'shake'. The perfective past-tense marker /n/ also causes this: *imnuqo* 'it died' < *i* 'peg prefix' + *m* (< *b*) inanimate prefix + *u-* epenthetic vowel + *qo* 'die'; cf. the present tense of the same verb: *ibuqo* (or *ibuqo*) 'it dies', where *b* appears rather than nasalized *m*.

No strong possibilities of Yeniseian cognates to PA **ñ* (< PAE **ŋ^y*) have yet come to light, except for the perfective stative suffix discussed in section 2.2.1 and possibly the infinitive suffix discussed in section 2.2.5. Three potential Yeniseian cognates to Proto-Athabaskan roots reconstructed as having coda **ŋ^w* are somewhat speculative. The first is Ket *dīn-t* ~ *dən-da* 'dragonfly', where the velarized quality of the original nasal might be preserved in the back vowel articulation; cf. PA **daŋ^w* 'fly' (Krauss 2005:129). The vowels /Λ/ and /u/ normally occur after /d/, /t/ only in cases where these consonants represent original affricates or palatals, in which case Ket /d/ normally corresponds to Yugh /d̄/, which is not the case here (cf. Yugh *dān-abej* 'dragonfly'). Another example where the vowel quality preceding the coda again might suggest a labialized nasal coda is Ket *-dun* 'shout', PAE *-daŋ^w* 'boom, explode' (Krauss and Leer 1981:190).

The Yeniseian coda /m/ does not occur in any words with an obvious Na-Dene cognate. In some cases, final /m/ may have derived from assimilation of *ŋ* after original *w. Ket *tūm* 'black', possibly derived from PY **tuw* 'clay', 'earth' + **bes* 'like' + **aŋ* 'adjective suffix' cf. the Yugh cognate *tumbes* 'black'. In most cases, however, /m/ appears as a root auslaut that cannot clearly be derived morphophonemically from other sounds in Yeniseian: Ket *tēm* 'goose', Yugh *čēm* 'goose', *īm* 'pine nuts', *qām* 'arrow', *dūm* 'bird'. The preceding high tone might offer some clue to the ultimate origin of coda /m/, since the primary high tone in these Yeniseian words could have developed from an earlier diphthong.

Finally, in all cases where Na-Dene cognates to Yeniseian words contain a glottalized nasal coda (except for *ŋ^w* / *ŋ^w* in the speculative comparisons made above), this segment appears in Ket as velar /ŋ/. Also, in primary short syllables, the vowel shows the reflex of having been followed by an originally non-glottalized coda (Table 30).

TABLE 30. Possible Yeniseian cognates to Na-Dene words with glottalized nasals

Na-Dene	Yeniseian
PA * <i>qōn</i> 'fire'	Ket <i>qōŋ</i> 'daytime'
PAE * <i>-sənt</i> 'liver'	Ket <i>sēŋ</i> 'liver'

It is likely that Pre-Proto-Yeniseian codas consisting of a nasal followed by a glottal stop or guttural fricative such as *χ* or *x* yielded a simple velar nasal in Proto-Yeniseian. This may account for the velar nasal in Yeniseian words for 'people': Ket *de'ŋ*, Yugh *d'e'ŋ*, Kott *čeaŋ* (tone or glottal stricture was not transcribed as such in Kott, though idiosyncrasies in the vowel transcription suggest it was present). Recall Trombetti's (1923) identification of these words as cognate to Athabaskan 'person', 'people' (cf. Leer 2000:292: PA **dane* 'person, Athabaskan man'). This comparison looks increasingly plausible, despite questions about the internal structure of the Athabaskan word.⁴⁰ The Modern Yeniseian word for 'people'—Ket *de'ŋ*, Yugh *d'e'ŋ*, Kott *čeaŋ*—may have originally been singular. Evidence for this comes from the Ket singular noun *dangols* 'male ancestor image', from *de'ŋ* + *hōl* 'image' + *si* 'nominalizing suffix', as well as records of the use of the vocative form *deŋo* as a singular form of address to any close affinal relative (Alekseenko 1967:159).

To summarize this section, the Yeniseian correspondences to Na-Dene nasals at present contain significant gaps.⁴¹ In anlaut, at least, this may be due to the relative paucity of the sounds in question, particularly the labialized nasals **m* and **ŋ^w*. In general, neither Yeniseian nor Na-Dene would make an ideal typological candidate for linguists interested in sonorants.

⁴⁰ PA **dane* 'person' seems to behave phonologically as a combination of a prefix *də-* with a stem *ne-*, though it is unclear what either element would mean separately.

⁴¹ S.Starostin's (2007) cognate sets linking Yeniseian with Sino-Tibetan and other languages in his "Sino-Caucasian" family show stronger nasal correspondences. This fact, coupled with parallels in the pronoun system and the sheer number of putative cognates in this database (over 400 linking Yeniseian to Sino-Tibetan, for example), has led me to conclude that Sergei Starostin's original (1982) Sino-Caucasian proposal, which has been subsequently worked on by his son George Starostin and others, warrants new attention. Before this is done, it is premature to conclude that Yeniseian is more closely related to Na-Dene. The present article's conclusion is simply that Yeniseian appears to be related to Na-Dene (Athabaskan-Eyak-Tlingit).

3.5. Dene-Yeniseian obstruent onset correspondences

Cognates in basic vocabulary are sufficient to support many correspondences between Na-Dene and Yeniseian obstruents, at least in onset position. As within Na-Dene itself, onsets are more straightforward than codas, since additional phonological processes operated to erode word-final consonants. The Proto-Yeniseian sound inventory was first reconstructed by Sergei Starostin (1982, 1995, 2005; cf. also G. Starostin 1995) based on consonant correspondences from Ket, Yugh, Kott, Assan, Arin, and Pumpokol.⁴²

Modern Ket, with only 12 consonant phonemes—the sonorants *n, ɲ, m, j*, and obstruents *b, t, d, s, t̪, k, q, h* (Vajda 2004)—shows evidence of a significant conflation of consonant articulations when compared to the extinct Yeniseian languages. For example, the Kott and Yugh correspondences to both Ket /d/ and /t/ reveal what must have been several distinct phonemes in Proto-Yeniseian. Another trace of the conflation of alveolar and post-alveolar affricates with apical *d* and *t* involves patterns in vowel quality. Modern Ket has seven vowel phonemes—*i, e, a, ʌ, o, u*—each found with four different monosyllabic tones. The vowel /u/ is invariably high back unrounded, while /ʌ/ is realized phonetically as mid-high back unrounded [ɤ] under high tone and mid-low back unrounded [ʌ] elsewhere. There are no diphthongs. Pre-Proto-Yeniseian may have originally contained diphthongs that developed into half-long vowels with high tone. The original vowel quality in full vowel syllables remains unclear. In short vowel nuclei, there were apparently only five vowel phonemes: *i, a, ʌ, o, u*. The unrounded mid-vowel phoneme was realized in Common Yeniseian as front [e] after original alveolars (**t, *d, *s, *t̪*) or voiced palatals **j, *ʒ* (< **g* or **gʷ*): Ket *dek-ŋ* ‘spruce grouses’ vs. PA **dax* ‘spruce hen’; and Ket *sē-ŋ* ‘liver’ vs. PAE **-sənt* ‘liver’. The same phoneme was realized as [ʌ] after **ts, *č* (< **k* or **kʷ*), plain and labialized velars.

The alternation between modern Ket /e/ and /ʌ/ after /s/ helps determine whether this sound derives from original **s* or **x* (palatal or front-velar fricative) on the one hand, or from **š* or **xʷ*, on the other. Front vowel /e/ appears in Ket cognates to Na-Dene words originally containing apical fricative onset **s*: Modern Ket *sē-ŋ* ‘liver’ (PA **-zât*, Eyak *-sahd* ‘liver’); also Ket *sen-ij* ‘shaman’ (PA **-D-yən*, ‘sing shamanistically’, ‘be a shaman’, Eyak *xi-l* ‘shaman’). Ket /s/ corresponding to PA **š* is instead followed by /ʌ/ in Modern Ket: *sən-ij* ‘dark blue or green’, where *-ij* is an adjective suffix (PA **šwəñ*, ‘black’, PA **t-D-žwəñ*, ‘be black’). Back /ʌ/ likewise occurs in Modern Ket after an original plain velar fricative **x* or after Ket *h* (< PY **p*) that correlates with PA **w* (presumably from PPY **w*). All of these Na-Dene back fricative elements correspond to Ket *h* and Yugh *f*, presumably by Common Yeniseian times having fallen together with PY **p*. Compare Ket *hə-ŋ* ‘throw net’, Yugh *fə-ŋ* ‘throw net’ with PA **wən-t̪* ‘large game snare’, where the instrumental suffix *-t̪* could have caused long-distance devoicing of original Yeniseian anlaut **w*.

Vowel raising processes continue the same pattern. The mid vowel raises to [i] under high tone before an original palatal consonant. Compare PA **dax* ‘spruce grouse’ and Ket *dī-t* ‘spruce grouse’, with the Ket plural *dekŋ* ‘spruce grouses’ showing the original vowel height with the expected front mid-vowel quality [e] after the dental anlaut. After labialized consonants, the mid-vowel raises to [u] rather than [i]. Compare Ket *hū-j* ‘belly’ and *hāj* ‘bellies’, with PAE **-wāt* ‘belly’. When apicals and post-alveolar affricates fell together in Old Ket, the difference between [e], [ʌ], [i], [u] became phonemic. Vacillations such as Modern Ket *tujij* ~ *tijij* ‘growing’ suggest /u/ may have changed to /i/ sporadically before palatal /j/; the same process may account for Ket *dī* ‘eagle’, which should be **du* if derived from an original **č* onset, though the vowel may have originally been /a/: cf. Ket *dāq* ‘eagle’ (as a mythological bird in folkloric texts). Modern Ket also shows vacillation between /e/ and /a/ (presumably < **ʌ*) before /t/ derived from **ts* or **ts̪*, as in Ket *-ted, -tey, -tat* ‘hit endwise with a long object’; cf. PA **tsəy* ‘poke, act endwise with a rigid stick-like object’ (Young and Morgan 1992:604). Such unstable vowels seems to correlate with original /ʌ/.

To summarize, Yeniseian-internal evidence from consonant contrasts in the various daughter languages, as well as the distribution of /e/ vs. /ʌ/ and /i/ vs. /u/ can be combined with evidence from Na-Dene

comparanda to show how Yeniseian obstruent onsets correspond with the more complicated obstruent systems of Na-Dene.

3.5.1. A palatal consonant series in Dene-Yeniseian

An important breakthrough made by Jeff Leer in his work on establishing regular sound correspondences between Tlingit and Athabaskan-Eyak was the discovery of a new series of consonants in Proto-Na-Dene, which he called the ‘palatal series’ (cf. Leer, this volume for the most complete presentation). Phonetically, these consonants may have been articulated as genuine palatal obstruents [**j, *c, *c, *ç*] or as front velars [**gʷ, *kʷ, *kʷ, *xʷ*]. Leer’s discovery led to a parallel breakthrough in my efforts to show regular correspondences between Yeniseian and Na-Dene. Among other things, the existence of this series explains why the Athabaskan-Eyak TS-series sometimes correlates with Tlingit /ts/, and sometimes with Tlingit /š/ or /k/. This previously unexplained correlation can be seen in Na-Dene words for ‘head’ and ‘rock’, among others: PA **-tsi* ‘head’ and Eyak *-tsiⁿ* ‘neck’ (found verb-internally in sequences such as *-tsiⁿ-dā-le* ‘say’), but Tlingit *-šá* ‘head’, *šan-tu* ‘inside the head’. Note the parallelism with PA **tse* ‘stone’ and Eyak *tse* ‘stone’ but Tlingit *ša* ‘mountain’. Leer (this volume) reconstructs the Proto-Na-Dene forms of both words with a palatal onset (IPA symbol /c/, Leer’s practical orthography symbol ‘ky’). The original TS-affricate correspondence across Na-Dene can be seen in words for ‘finger’, ‘breast/teat’, ‘hit’ endwise and many others, though the Tlingit reflexes of PND **ts* show occasional unexplained variation between *t̪* and *t̪ʰ*, as in PAE **-tsing*, Tlingit *-t̪ʰiç* ‘finger’ and PAE **tsu*, Tlingit *t̪ʰa* ‘teat’.

As it turns out, the Yeniseian cognates to these two groups of Na-Dene words display a strikingly parallel dichotomy. Though all the words in Modern Ket have onset /t/, when cognate forms are added from the extinct Yeniseian languages (where available), it becomes obvious we are dealing with two different proto-sounds. Yeniseian words that correspond to Na-Dene words with the original TS-affricate series onsets have one set of reflexes, while cognates to Na-Dene words with onsets deriving from proto-palatals show a different set (Table 31).

TABLE 31. Reflexes of palatals vs. apical affricates in Yeniseian and Na-Dene

a. DY series (the original *TS series)							
	Ket	Yugh	Kott	Arin	Pumpokol	PA	Tlingit
‘finger’	tʰq	tʰχ	tʰok	to	tok	*-tsʰəç	-t̪ʰiç
‘breast’	tʰya	tʰga	tʰa	te	tike	*tsʰu	t̪ʰa
‘poke’	ted ~ tey	ted̪ ~ teg	ti ~ te	—	—	*tsəy	—
b. DY (later merged with *TS series in PAE but not in Tlingit)							
	Ket	Yugh	Kott	Arin	Pumpokol	PA	Tlingit
‘head’	tuʷ	čuuʷ	—	ke	—	*-tsiʷ	-šá
‘stone’	tuʷs	čuuʷs	šiš	kes	kit	*tseʷ	ša (mountain)

The back vowels /ʌ/ (< **ə*) and /u/ in Yeniseian words with reflexes from original palatals (Ket *tuʷ* ‘head’ and *tuʷs* ‘stone’) further suggest that the proto-palatal stops must have been affricates in Proto-Ket-Yugh in order to have produced mid-vowel /ʌ/ instead of /e/.

3.5.2. Dene-Yeniseian obstruent correspondences

The next several subsections demonstrate the obstruent correspondences, insofar as they have been worked out. The lateral onsets **t̪* and **t̪ʰ* will be dealt with last. Note that I do not posit any CH-series. I will suggest that the sounds reconstructed for Proto-Athabaskan-Eyak as representing the post-alveolar affricates **dž, *t̪š, *t̪ʰš* do not constitute a separate series in Dene-Yeniseian. Rather, I will argue that these sounds, inherited into Proto-Athabaskan-Eyak, derive from an earlier palatalization of the labialized velar series before original front vowels. Later, a second phase of palatalization occurred in early Athabaskan to turn the remaining labialized velars into a new retroflex series. Yeniseian comparative evidence suggests the postalveolar and labialized velar series in Na-Dene languages both originated from a single series.

⁴² Heinrich Werner and I are preparing a comprehensive “Etymological dictionary of the Yeniseian languages,” which will summarize all that is known about Yeniseian linguistic history based on family internal comparative evidence. This research is supported by the Linguistics Department of the Max Planck Institute for Evolutionary Anthropology, Leipzig and will help bring the Yeniseian data to the attention of a broader audience.

The tables in each section below give the correspondences for each sound, accompanied by a few sample cognate sets. The tables are followed by commentary that sometimes includes additional cognates supporting these correspondences. Following Athabaskanist tradition, the Na-Dene transcription uses voiced obstruent symbols for voiceless unaspirated sounds, while the corresponding voiceless symbols transcribe voiceless aspirated sounds (also see Appendix A). The use of symbols *d*, *t*, etc., in transcribing modern Yeniseian, however, signifies a distinction between voiced vs. voiceless. The actual forms that exist (or were documented as existing) in the Yeniseian daughter languages are supplemented by S.Starostin's (1982, 1995, 2005) or G.Starostin's (1995) Proto-Yeniseian reconstructions, where these are available. The symbols for proto-sounds on the Na-Dene sides of these charts basically reflect the well-understood Proto-Athabaskan-Eyak, except in the case of the palatal series, where they represent Leer's recent discoveries in Proto-Na-Dene and can be found described in more detail in Leer (this volume).

3.5.2.1. T-series obstruent stops: *d, *t', *t

The Yeniseian reflexes of Dene-Yeniseian alveolar (or dental) stops show different effects depending upon the coda (Table 32). Voiced (or unaspirated plain) *d palatalized in Pre-Proto-Yeniseian, yielding PY *č. This did not occur, however, in syllables with an auslaut dental, where *d remained.

TABLE 32. Dene-Yeniseian T-series correspondences

Na-Dene = Yeniseian

*d (in syllable without auslaut dental in Yeniseian) = PY *č > d (Ket), d' (Yugh), č (Kott) with original /e/ and /i/ remaining rather than becoming /ʌ/ and /u/ in Ket/Yugh (except where a labialized coda affected vowel quality, as in 'fly')
PA *dā-ne 'person, man', (see discussion of singular and plural forms in Leer 2005:292-294) vs. Ket <i>d'e'ŋ</i> , Yugh <i>d'e'ŋ</i> , Kott <i>če'ŋ</i> 'people' < PY *č'e'ŋ 'people' (S.Starostin 1995:309); this set contains the earliest proposed Dene-Yeniseian cognate, published by Trombetti in 1923, who cited the Ket, Kott, and Tlingit forms, as well as forms from individual Athabaskan languages such as Navajo <i>diné</i> 'people'; for evidence that the Yeniseian word was originally a singular noun, see the discussion in section 3.4 above
PAE *dā-qualifier, Ket <i>d-</i> , Yugh <i>d'-</i> , Kott <i>č-</i> 'thematic prefix connected with the notion of long shape', also found in verbs denoting sound or fire
PAE *dā- 'reflexive, benefactive' (verb prefix in qualifier zone); <i>dā-</i> 'one's own' (pronoun); Ket <i>d-</i> , Yugh <i>d'-</i> , Kott <i>č-</i> 'verb root anlaut in verbs expressing action done by the subject's own body'
PA *dā= 'distributive plural proclitic', Ket <i>-da</i> , Yugh <i>-d'a</i> 'collective suffix' (possibly cognate)
(in syllables with Yeniseian auslaut dental, which suppressed secondary lenition) = PY <i>d > d</i> (Ket, Yugh, Pumpokol), <i>t</i> (Kott, Arin)
PA *dax 'spruce grouse', Ket <i>dīt</i> , Yugh <i>dī'</i> 'spruce grouse', plural forms Ket <i>dekŋ</i> , Yugh <i>dekŋ</i> ; but cf. Kott <i>fen-čera</i> 'spruce hen' (< <i>fen</i> 'female'), where the assimilation did not take place; S.Starostin (1995:310) reconstructs PY *čida 'spruce grouse', which may include some sort of suffix, since the coda correspondences and high tone do not regularly match the non-glottalized monosyllable in PA *dax
PAE *de-ñ 'emit light'; Ket <i>dī'n</i> 'blink, emit light'
PA *daŋw 'fly'; Ket <i>dī'n-dā</i> and Yugh <i>dān-abej</i> 'dragonfly' < PY *dān 'dragonfly' (S.Starostin 1995:220)
PAE *dā' 'blood'; Ket <i>del</i> 'blood' (only in <i>del-es</i> 'blood-sky', the taboo designation for the malevolent God of the West in Ket mythology)
(in auslaut the reflexion of PND *d generally correlates with PY *č, but is sporadically unstable often dropping in absolute final position, appearing again in its regular anlaut reflexes of Ket <i>d</i> , Yugh <i>d'-</i> or as <i>t</i> , as in the Yugh plural form <i>d'atn</i> ; after anlaut <i>k</i> from PY *g (= PND *g'), however, PND *d yields PY *d (Ket/Yugh <i>d</i> , Kott <i>r</i> , as in the last example)
PPA *c'e'd 'poke O'; Ket <i>-qud</i> 'dig', Yugh <i>-χud'</i> 'dig', also Ket <i>qu</i> ' (plural <i>qaden</i>) 'poker, ray, spit for roasting meat'; cf. PY *qič 'dig' (S.Starostin 1995:260)
PA *-dž'α'de' 'lower leg, shin', Eyak *-g'α'dā- 'rump'; Ket <i>dī</i> 'thigh, base of tree' (plural <i>dā'n</i>), Yugh <i>dī</i> 'thigh, base of tree' (plural <i>d'atn</i> ~ <i>dā'n</i>), Kott <i>či</i> 'base of tree' < PY *č'i 'base of tree' (S.Starostin

1995:310); Ket *ko'd*, Yugh *ko'd* 'rump', 'butt' < PY *ko'd ~ go'd 'rump' (S.Starostin 1995:226); Kott *kar* 'vagina' may also be cognate here, since Kott /a/ correlates with Ket/Yugh /o/ after an onset correlating with PND *gw or *g, which would validate initial PY anlaut *g

Na-Dene = Yeniseian

*t' = PY *d > d (Ket, Yugh, Pumpokol), t (Kott/Arin)
PA *nā-t'ac 'fly' (probably from PPA *nā-D-'ac 'fly'), Eyak <i>-taq</i> '(flea) jumps'; Ket <i>-doq</i> , Yugh <i>-doχ</i> 'fly'; cf. PY *dōq- 'fly, jump' (S.Starostin 1995:223), though Kott <i>fataga i:naŋ</i> 'I fly', and Pumpokol <i>dago uta</i> 'bat' (literally, 'flying mouse'), suggest original vowel /a/
PA *-t'āq' ~ -t'ac 'propel (long object), shoot (arrow)', the PAE forms possibly showing confusion with PA 'fly'; Ket <i>-daq</i> , Yugh <i>-dāχ</i> , Kott <i>-tek</i> 'throw, shoot O' < PY *dāq 'shoot' (S.Starostin 1995:219)
*t = PY *t > t before a voiceless fricative auslaut in Ket, Yugh, Pumpokol; Kott/Arin t'; the same process affects anlaut correspondences to PND *ts' and *k'
PAE *t'e-g 'raw' (Krauss 2005:128), where -g is the privative suffix (meaning 'not', 'lacking'); Ket <i>tū</i> ~ <i>tuy</i> 'raw' (as in <i>tuy-am</i> 'it is raw'), Kott <i>t'u</i> 'raw' < PY *tu- 'raw, unripe' (S.Starostin 1995:288)
PND ~*t'i(ŋ)k' 'ice, frozen snow' > t'χ 'snow'; Ket <i>tī'k</i> , Yugh <i>tīk</i> , Kott <i>t'i:k</i> , Arin <i>tē</i> ~ <i>t'ē</i> , Pumpokol <i>tig</i> 'snow lying on the ground' (from an originally palatal coda, which presumably yielded a voiceless fricative in PY, thus explaining anlaut t rather than d; cf. S.Starostin 1995:285 PY *tiχ 'snow'); cognacy between the Tlingit and Yeniseian forms was first proposed in Ruhlen 1998

Na-Dene = Yeniseian

*t = PY *t > t (Ket, Yugh, Pumpokol), t' (Kott/Arin), with following /e/ and /i/ rather than /ʌ/ and /u/ in Ket/Yugh
PA *tu 'water, liquid' (Krauss 2005:82), Ket <i>tu</i> ~ <i>to</i> in compounds, where it designates 'water, moisture': Ket <i>to-qoj</i> 'dry up' (<i>qoj</i> = dry): <i>tu-t-a-b-qoj</i> 'it dries up' (< water-thematic.consonant-present.tense-inanimate-dry), possibly also Ket <i>tō'ji</i> 'stream' < PY *toj- 'stream', (S.Starostin 1995:28); cf. also PY *tu 'bay', 'channel', (S.Starostin 1995:288), reconstructed on the basis of Ket <i>ej-tu</i> 'channel', Kott <i>hau-tu</i> , where the first element is etymologized as 'island'
Eyak <i>dā-tuχ</i> 'to spit', Ahtna <i>-tuh</i> , Tlingit <i>χ'e-D-tuχ</i> 'to spit'; Kott <i>tuk</i> 'saliva'
PA *tāñe 'trail, path' (Leer 2005:294); Ket <i>-tā'n</i> 'path, direction' (used as a postposition), Ket <i>tanno</i> 'to take aim in hunting' < <i>tan</i> 'path' + <i>qo</i> 'kill'
PA *tān 'ice', Ket/Yugh <i>tī'ŋ</i> 'hoarfrost', Kott <i>t'eāŋ</i> 'hoarfrost' < PY *t[i]ŋ- 'hoarfrost' (S.Starostin 1995:286)
PAE *-te- 'lie', PA *sā-te-ñ (with perfective suffix) 'single animate S lies down', Ket <i>-ta</i> , Yugh <i>-te</i> 'generic base in verbs of stationary position'; Ket <i>-tn</i> , Kott <i>-te:n</i> 'animate S lies down'; also Ket <i>ten</i> in <i>tengisqut</i> 'it lies fallen'
PAE *te' 'mat' > PA *tē'č, Eyak <i>te'č</i> 'mat', Ket <i>atč</i> , Yugh <i>ater</i> 'bedding' < <i>at</i> 'placed downward' + *tāl 'mat'; also Ket <i>qatč</i> , Yugh <i>χatar</i> 'mat' < *χad or *χaj 'fur' + *tel 'mat', Eyak <i>te'č</i> 'mat' and Ket/Yugh *tel 'mat'
PA *-tāñ 'handle' (noun), Eyak <i>(-dā-t)te</i> 'handle (of hammer, etc.)'; Ket/Yugh <i>tu'n</i> 'kettle', Pumpokol <i>a-tin</i> 'kettle' (a prefixed form that might mean 'something with a handle' or 'his handle', 'his kettle') < PY *ti'n- 'kettle' (S.Starostin 1995:285); also perhaps the element <i>-tn</i> in words denoting tools with a handle, such as <i>habatn</i> 'flat-tipped spoon for kneading dough'
PA *tax' 'hill'; Ket <i>tū</i> : 'cliff', 'concave edge of a riverbank'

3.5.2.2. TS-series: the non-lateral dental affricates and fricatives *ts', *ts, *s

Leer (2008b) argued that the affricate *dz* in Na-Dene arose secondarily through cluster resolution when *d* (or *dā*) combined with a following consonant. Thus there are only three proto-segments in this series (if *s is also included), rather than four. Discounting instances where PAE *ts' and *ts derive from original palatal stops, the two apico-dental (or apico-alveolar) affricates *ts', *ts show the following correspondences with Yeniseian (Table 33). The glottalized and aspirated occlusives in this series fell together in onset before a fricative auslaut in Early Yeniseian, just as in the T-series examined above. Recall that in coda position the original distinction between glottal and non-glottal obstruent is also distinguishable in Yeniseian by the tonal contrast it generated on a preceding short vowel.

TABLE 33. Dene-Yeniseian TS-series correspondences

Na-Dene = Yeniseian

***ts'** = PY ***t** > t (Ket/Yugh), t^h (Kott); possibly, following the pattern described above for ***t'**, the voiceless anlaut in the first two examples below is due to suppression of voicing before what was in PY a voiceless auslaut, with PND ***ts'** elsewhere = PY **d** > d in Ket/Yugh, though cognates confirming this are lacking so far

PAE ***-ts'ing** 'finger', Tlingit **-t^hi'g** 'finger', Ket **ta'q**, Yugh **ta'χ** 'finger, toe' < PY ***tə'q** 'finger, toe' (S.Starostin 1995:283)

PAE ***ts'u** 'teat, milk' is possibly cognate with Ket **ta^hya** 'chest, breast' < PY ***taga** 'breast' (S.Starostin 1995:284), if the Yeniseian form contains a suffix of some sort

Na-Dene = Yeniseian

***ts** = PY ***t** > t (Ket/Yugh), t^h (Kott), with following /ʌ/ and /u/ rather than /e/ and /i/ attested in Ket/Yugh

PA ***tsay** 'poke, hit using the end of an object', Ket **ted** ~ **tey**; Yugh **ted^h** ~ **tet^h** ~ **teg** 'poke, hit using the end of an object', Kott **t^hi** ~ **ti** ~ **te** 'hit, beat'; probably < PY ***taç** with dental auslaut in Ket and Yugh root monosyllable due to progressive assimilation; cf. PY ***te[ç]** 'beat' (G.Starostin 1995:173)

Na-Dene = Yeniseian

***s** = PY ***s** > s (Ket, Yugh, Arin), š (Kott), t (Pumpokol)

PAE ***-sant** 'liver' (PA ***-zât**, Eyak **-sahd** 'liver'); Ket **sēŋ**, Yugh **sēŋ** 'liver' < PY ***seŋ** 'liver' (S.Starostin 1995:272)

PA ***zəl**, 'hot'; Ket **sil-** in **silgit** 'molten fat' (< **sil** + **ku't** 'fat') and **sīl** ~ **si-li** 'summer' (< **sil** 'hot' + **i** 'day'); S.Starostin 1995:275 reconstructs PY ***sir-** 'summer'

PA ***sax**, 'crumbled fragment' (Young and Morgan 1992:739; Krauss 2005:84); Ket/Yugh **si-** 'small fragment' in Ket **siis**, Yugh **sifās** 'pile of small fragments', where the original second syllable **-fās** appears cognate with PA ***xats** 'hill' (Young and Morgan 1992:467);⁴³ cf. also PY ***sipes** 'small pile' (S.Starostin 1995:275)

PND ***si(ː)g'** 'belt' > PA ***sās**, 'belt, sash' (Young and Morgan 1992:467), Tlingit **sí'g** 'belt' may be connected with Yeniseian words for rawhide: Ket **sās** 'soft leather from reindeer legs', **siit** 'rawhide strap'; cf. PY ***sās** 'suede', ***si'id** ~ ***si'iz** 'rawhide strap' (S.Starostin 1995:270, 274)

Tlingit **šū'χ'** 'robin', PAE ***šū'q'** 'robin' > PA ***šū'χ**, Eyak ***šū'q'** 'robin'; also PA ***či'x'** 'ochre' (Krauss 2005:84); Ket **sū'k** 'paint, color' < PY ***suK** S.Starostin 1995:277; probably originally meaning 'red ochre'; the original uvular coda, lost in coda position before high vowel /u/, reappears in **suxaq** 'rust' (< ***sū'q** 'ochre' + **aq** 'rot'), also Ket **sujij** 'alder', Arin **šujgen** 'alder' (probably containing ***ken** 'tree', though cf. S.Starostin 1995:277 PY ***sujVŋ** 'alder'). Na-Dene words for 'robin', 'ochre', 'alder tree' could have a deep etymological connection with one another and with Yeniseian words for 'ochre, paint', 'alder' due to the shared distinctive rust brown color; cf. also Tlingit **še'χ'** 'red alder', **ka-še'χ'** 'dye, color', though these etyma are not regarded as etymologically related to words for 'robin' (Jeff Leer, p.c.)

There is one systematic exception to this correspondence set in Yeniseian. Apparently, the Pre-Proto-Yeniseian sequence ***tsu** (from either plain or glottalized onset) deaffricated to **su** rather than **tu**. Na-Dene cognates that would support this include Ket **-suk** 'shove', Eyak **tsu'x** 'thrust, shove'; also Ket/Yugh **sukŋ**, Kott **šukŋ** 'thick in circumference' (said of trees) (< PY ***suk** + adj. suffix ***-ŋ**), Pumpokol **suk-du** 'he is fat' and PND ***tsa'x'** 'thick in circumference', 'heavy'. Evidence for this Yeniseian-internal change also comes from an interesting parallel in words meaning 'mosquito, midge'. Eyak has **ts'iyux** 'mosquito' (Krauss 1970:717), while Proto-Athabaskan 'mosquito' shows a vacillation between ***ts'u'y(a)** and ***ts'i'y(a)** (Krauss 2005:83). Proto-Yeniseian has ***suj** 'mosquito' (S.Starostin 1995:277), based on Ket **sū'j**, Yugh **sūj**, Kott **šuj** (presumably reflecting earlier ***tsū'j**) and Modern Ket **tū'd** 'midge' (possibly reflecting earlier ***tsī'y**, with the same change

⁴³ Jim Kari (p.c.) has suggested that Dena'ina **-zex** 'crumbs, small particles' represents evidence that Proto-Athabaskan had separate words for 'sand' as opposed to 'crumbs, small particles'.

of the final palatal to **-d** in Ket as observed in words meaning 'hit endwise with a long object'). This suggests the alternate roots reconstructed for Proto-Athabaskan may represent two different, but related words for biting or swarming insects.

3.5.2.3. *K^y-series: the palatal (or front-velar) obstruents *g^y, *k^y, *k^ʷ, *x^y*

The Proto-Na-Dene palatal series is transcribed throughout this article using the palatalized velar symbols ***g^y**, ***k^y**, ***k^ʷ**, ***x^y**, following Leer's (this volume) practical orthographic convention ***gy**, ***ky**, ***ky**, ***xy**. Not only are Leer's symbols more transparent than the canonical IPA palatal obstruent symbols ***j**, ***c**, ***ç**, ***ç**, they also convey the possibility that the original sounds could have been palatalized (or front) velars rather than true palatals. For simplicity's sake, the series itself is referred to here as the 'palatal series', again following Leer. Note that this series should not be confused with the front velars that developed in Early Athabaskan through fronting of original plain velars.

In Proto-Yeniseian, these sounds appear to have fronted to ***d^j** (< ***dž**), ***č**, and ***s** only before a front vowel; after a back vowel or in coda position they became uvulars. I will argue that a similar conditioning may have affected their reflexes in other Dene-Yeniseian languages as well, since the distribution of front vs. back reflexes of these sounds seems to differ both across the Yeniseian daughter languages as well as within Na-Dene. For example, Tlingit, like Arin and Pumpokol in Yeniseian, sometimes shows velar reflexes of this series even after front vowels. This apparent tendency of the palatal series to yield differing reflexes based on front vs. back vowel articulation could explain the appearance of **k** rather than expected **š** in some Tlingit cognates, if chronologies of vowel changes are considered. This would follow too from Leer's (this volume) observation that instances of Tlingit **š** from the proto-palatal ***k^ʷ** often correlate with a following front vowel. The appearance of uvular reflexes of these sounds in Ket/Yugh when not in an environment before a front vowel suggests a link with the place of articulation of the following vowel (Table 34).

TABLE 34. Dene-Yeniseian *K^y-series* (palatal-series) correspondences

Na-Dene = Yeniseian

***g^y** = PY ***ž** > d (Ket), **d^j** (Yugh), **č** (Kott dialects), t (Pumpokol)

PND ***g^yux** 'poke, stab O' > Eyak **-dzux**, Tlingit **-gu~**; Ket **-do-**, Yugh **-d^hou**, Kott **-čou** 'poke, stab O' (basic root in numerous verbs denoting stabbing or slashing); cf. PY ***ž[e]χV** 'shave' (S.Starostin 1995:310)

PND ***-(s-D-)g^yind** 'one animate S falls, undergoes an experience' > Tlingit **O-s-D-gi'd** 'animate being falls', PA ***zad** 'one animate being falls' > 'animate undergoes experience'; Ket **-den**, Yugh **-den** 'animate subject undergoes experience' (basic root used in numerous change-of-state verbs); note that Yugh **d^j** or Kott **č** in syllables with a dental anlaut derive from an original palatal or labiovelar (or retroflex), whereas original ***d** anlauts did not yield affricates before a dental auslaut

Na-Dene = Yeniseian

***k^y** and ***k^ʷ** before original front vowel = PY ***č** > t (Ket), **č** (Yugh), **š** (Kott), **k** (Arin and Pumpokol; possibly uvular **q**)

PND ***k^ya(ː)y** > PA ***tse** 'stone', Eyak **tsa'**, Tlingit **ša'** 'mountain'; Ket **tə's**, Yugh **čə's**, Kott **šiš**, Arin dialects **kes** ~ **qes**, Pumpokol **kit** 'stone' < PY ***čis** 'stone' (S.Starostin 1995:217); cognate status first proposed in Ruhlen 1998

PND ***-k^ye/i(ː)ŋ** > PA ***-tsi** 'head', Tlingit **-šá** 'head'; Ket **tuu'**, Yugh **čuu'** 'head'; cognate status first proposed in Ruhlen 1998; cf. PY ***c[i]g** 'head' (S.Starostin 1995:214), where the reconstructed auslaut /c/ differs from /č/ in 'stone' only because the reconstruction incorporates Kott **tagai** 'head', a word more likely cognate not with Ket **tuu'**, Yugh **čuu'** 'head' but with Ket **dayaj** 'head with bushy hair'; the form for 'head' recorded in 1736 for Arin, **kedake**, could conceivably represent two synonyms spoken in succession during elicitation, with Arin **ke** 'head' cognate Ket **tuu'**, Yugh **čuu'** and Arin **dake** 'head' cognate with Ket **dayaj** 'head with tousled hair' and Kott **tagai** 'head', though one would expect the voiceless anlaut form **take** in Arin; if this is correct, then Arin **ke**, Ket **tuu'**, Yugh **čuu'** would support PY ***čuu'** 'head'; see also section 3.1.1 above for a discussion of the possibly shared Dene-Yeniseian compound meaning 'hair of the head'

Na-Dene = Yeniseian

*k' and *k' elsewhere = PY *k > q (Ket), χ (Yugh) in environments where velars, both original and from palatals, became uvulars before back vowels; Kott h, Arin k

PND ~*k'o 'undergo pangs (of pain, starvation, death)' > PA *tsa 'root in verbs of dying'; Ket -qo-, Yugh -χou, Kott -hau 'die' < PY *qo- 'die' (S.Starostin 1995:264)

PND ~*k'o'n 'hem, hanging end of garment' > PA *tsa'n 'breechcloth', Tlingit kú'n 'hem (of coat or shirt)'; Ket verb base -qan in verb 'S sews O on' (e.g., *datayisqan* 'she will sew them on')

PND ~*k'o(x) 'become dry' > PA *tsá'y 'be dry', Tlingit ku'x' 'go dry'; Ket -qoj 'become dry', Yugh -χoj 'become dry', Arin koj 'dry' < PY *qV[ç]i- 'dry' (adj.) (S.Starostin 1995:265)

PND ~*k'i(t)' 'ashes' > PA *tsi't' 'hot coals, embers', Eyak tsi'tl'-g 'ashes', Tlingit ket'-t 'ashes', Ket *qolan* 'ashes', Yugh *χolan* 'ashes'; the back vowel in Yeniseian may be the original articulation, with Tlingit /e/ fronting later, but leaving the earlier velar reflex from palatal *k'. There is also Ket *kul-* 'hot embers', used as an incorporated in the verb *kul-*to 'bury O, originally meaning 'bury O in hot ash as a means of cooking'; the onset would be expected to be /q/, however, and not /k/.

(in coda) PND ~*t'i(k)' 'ice' > Eyak t'its' 'ice', Tlingit t'ix' 'ice' (also used as a stem in verbs meaning 'freeze solid', 'freeze together'; Ket tī'k, Yugh tik 'snow frozen on the ground' < PY *tix' 'snow lying on the ground' (S.Starostin 1995:287); note that the uvular became a velar before a high vowel, as is regular for Ket and Yugh

Na-Dene = Yeniseian

*x' = PY *s > s (Ket, Yugh), š (Kott), t (Pumpokol), with following /e/ and /i/ rather than /ʌ/ and /u/ in Ket/Yugh

PND *x'i- 'perfective prefix' > PA *sə-, Eyak s- ~ sə-, Tlingit jü-; Yeniseian s-, i-, a- 'conjugation prefix'; see extended discussion in section 2.2.1 above

PND *x'e(-)t- 'evening' (with instrumental suffix -t); Tlingit xi(t) = 'dusk', clitic in verbs meaning 'darkness falls, it becomes dusk' (Leer 2008b:9); Ket sī-, Kott šī:g, Arin saj 'night' < PY *sic 'night' (S.Starostin 1995:274); it is possible that Ket *saal* 'spend the night' is built with instrumental suffix -t

PND ~*sxa'n 'old age, person; old' > PA *x'a'n 'old age', Tlingit ša'n 'old age', Ket sī'n, Yugh sin 'old, decrepit' < PY *sin' 'old, decrepit' (S.Starostin 1995:275); cognate status first proposed in Ruhlen 1998

PND ~*sxin in words meaning 'shaman, medicine song', 'cure by singing' > PA *x'an 'medicine song', PA *D-yən 'sing a medicine song, be a shaman', PA *də-yən-ən 'shaman' (with human nominalizer suffix -ən), Eyak xi'l 'shaman', Tlingit -sa'n 'cure O through singing' (the unusual anlaut correspondence between Tlingit and PAE could conceivably be due to absorption of a consonant prefix in Tlingit); Ket/Yugh *sen-ij* 'shaman', Kott *šen-aj hit* 'shaman'; the Kott form means 'shamanizing man' (< *hit* 'man'), which suggests that the element -ij/-aj is an infinitive or adjectival suffix on what was originally a modifying word; cf. these Ket forms where the suffix is absent: *sen-am* 'female shaman' (< *qī'm* 'woman'), *sen-da duu* 'shaman's cap' (with possessive clitic -da); PY *senVŋ 'shaman' (S.Starostin 1995:271)

Yeniseian comparanda might help sort out some of the idiosyncrasies in Tlingit vs. AE proto-palatal correspondences by suggesting how front vs. back vowel articulation affected the evolution of the original palatal series in Tlingit. The broader picture likely involved different chronologies of palatalization. An apt typological parallel might be the sequential stages of velar palatalization in Slavic (cf. Schenker 1993:69, 73-74).

3.5.2.4. *K^w-series: the rounded velars (or retroflex) *g^w, *k^w, *k^w, *x^w*

Krauss (1964) demonstrated that this series retained velar articulation in Tlingit and Eyak, but became retroflex in much of Athabaskan. When Yeniseian comparanda are considered, it turns out that the rounded velar series has exactly the same reflexes as the CH-series reconstructed as containing postalveolar *dž, *č', *č, *š) in Proto-Athabaskan-Eyak. There is some evidence that the latter series in Na-Dene most likely

represents an earlier palatalization of the same *K^w* series inherited from Proto-Na-Dene before front vowels, though this hypothesis must be taken as preliminary. Compare PPA *dže'q' 'pitch' with Eyak *-gəxts' 'be sticky', Eyak *gahc* 'pitch' and the possibly sound-symbolic Tlingit form *k'u'χ* 'pitch, gum' (Leer 1996:88), which is not a regular cognate to the Athabaskan and Eyak forms since it contains glottalized consonants.⁴⁴ The Athabaskan and Eyak forms, at least, suggest the original onset in all these words was *k^w, which originally palatalized before front vowels but not before back. In later Proto-Athabaskan (but not in Eyak and Tlingit) all of the remaining (i.e., still unpalatalized) rounded velars palatalized to yield retroflex sounds (as shown in Krauss 1964 and elsewhere). Taking this approach to the origin of post-alveolar affricates in early Na-Dene might lead to the discovery of more Tlingit/AE cognates. It also removes the need to distinguish between a rounded velar series and a post-alveolar series, if both sets of sounds came from the same series in Proto-Na-Dene.

Additional evidence for this proposal comes from Yeniseian. Note the interesting doublets in Yeniseian where /k/ precedes a back vowel but /d ~ d̥ ~ č/ precedes a front vowel in what appear to be the same root etymologically. One example is Ket/Yugh *ka'n*, Kott *kan* 'light' (adjective) vs. Ket *dī'n*, Yugh *dīn*, Kott *čīn* 'daylight, light of day' (noun). Note that Ket *d*, Yugh *d̥*, Kott *č* before a dental auslaut cannot be due to original *d, which remained dental in such syllables. In the noun, some sort of derivational process seems to have yielded high-tone full vowel /i/, which in turn triggered palatalization of the onset. The same pattern is observable in Yeniseian words for 'rump' vs. 'thigh, base of tree', which reveal identical variation between *k*-sounds + back vowel and *d*-sounds + front vowel occurs: Ket/Yugh *ko'd* 'rump' vs. Ket *dī*' and Yugh *dīi*' 'thigh, base of tree', and Kott *čī* 'base of tree'.

While these patterns might seem to be simply Yeniseian-internal developments, both pairs in question, including perhaps the very derivational processes that link them, have exact parallels in Na-Dene, with the onsets remaining velars before a back vowel (until early Athabaskan, where all of the onsets in question palatalized). The Yugh irregular plural *dāt'n* 'thighs' suggests it is cognate to PPA *-g^wa'de' 'lower leg, shin', while the Eyak -g^wada-, 'rump' appears cognate with the original Ket noun *ko'd* 'buttocks'. Only later did PPA *g^we'n 'light of day', Eyak *gah* 'day' and PPA *-g^wa'de' 'lower leg, shin' undergo a new palatalization that turned all of the remaining labialized velars into retroflex (or post-alveolar) consonants: PA *dž'e'n 'day' and PA *-dž'a'de' 'lower leg, shin'. In Tlingit, like Eyak, the original velar also remained before a back vowel; cf. Tlingit -gan 'burn, shine', ga'n 'outdoors' (Leer 1993:38). Words like Eyak *ge-* (in a construction meaning 'noon') and PA *g^we'n 'light of day' presumably acquired their front-vowel articulation and vowel length only after the first Na-Dene palatalization rule had stopped applying.

Therefore, despite the differing onsets in PPA *dže'q' 'pitch' (an inheritance of the original palatalization before front vowels in early Na-Dene) and PA *dž'e'n 'day' (the result of a new palatalization occurring only in early Athabaskan but which applied everywhere, or nearly so), these sounds ultimately derive from the same series. This would explain why reflexes of this series in Yeniseian are uniform: Ket *dī'k*, Yugh *dīk* and Kott *čik* 'pitch' (PPA *dže'q' 'pitch', corresponding to CH-series), as well as Ket *dī*', Yugh *dīi*', and Kott *čī* 'base of tree' (PPA *-g^wa'de' 'lower leg, shin' and Eyak -g^wada- 'rump', corresponding to KW-series). The Yeniseian reflexes in all such cases are uniformly split according to the place of articulation of the following vowel, with *d*-sounds before unrounded vowels and *k*-sounds elsewhere, regardless of whether the cognate in question corresponds to the Athabaskan postalveolar series or to the Athabaskan rounded velar series. As in the case of the palatal series, shifts in place of articulation by the Na-Dene labialized velar series find a typological parallel with the sequential velar palatalizations of Early Slavic (cf. Schenker 1993:69, 73-74).

Table 35 illustrates how Na-Dene internal differences between *g^w and *dž are irrelevant to the Yeniseian correspondence. Note that while the picture with *g^w and *dž is clear, the varied Yeniseian correspondence to PA *k^w / *č' and *k^w / *tš'* suggest that additional possible splits may have occurred in Yeniseian (such as a change to /d/ before unrounded vowels but to /k/ before rounded). At present I cannot be sure, but the split does not seem to correlate with the difference between palato-alveolar and retroflex in Proto-Athabaskan.

⁴⁴ I am grateful to Jeff Leer for allowing me to photocopy and use his unpublished typewritten manuscript *AET Comparative Lexical Database*, dated Aug. 30, 1993.

Finally, lacking an Athabaskan cognate, I am not sure where to place the onset correspondence between Ket/Yugh *tū-t* 'navel' vs. Eyak *džit* 'navel' and Tlingit *ku-l* 'navel' (Leer 1996:82), a set of possibly cognate words where the sound correspondences have been muddled by secondary palatalizations (in Eyak) as well as by anlaut/auslaut assimilatory processes (in Ket), and coda simplification (in Tlingit).

TABLE 35. Dene-Yeniseian K^w-series correspondences

Na-Dene = Yeniseian

**g^w* > PA **dž* (and possibly earlier to PAE **dž* before front vowels) and **k^w* > **tš* (and possible earlier to PAE **tš* before front vowels)

= PY **ž* before front vowel in early Yeniseian > *d* (Ket), *d'* (Yugh), *č* (Kott)

PPA **dže-q* 'pitch', Eyak *gahc* 'pitch'; Ket *dī-k*, Yugh *dīk*, Kott *čik* 'pitch' < PY **žik* ~ **žig* ~ **žix* 'pitch' (S.Starostin 1995:310-11)

Eyak *-g^wada-* 'rump', PPA **-g^wa:de'* 'lower leg, shin' > PA **-dž'a:de'* 'lower leg, shin'; Ket *dī* 'base of tree' (plural *da'n*), Yugh *dī* 'rump (of person), base of tree' (plural *d/atn* ~ *da'n*), Kott *či* 'base of tree' < PY **žī* 'base of tree' (S.Starostin 1995:310)

PPA **g^we'n* 'day' > PA **dž'e'n* 'day' (also cf. Tlingit *gah* 'day', Eyak *gah* ~ *ge-la* 'day'); Ket *dī'n*, Yugh *dīn*, Kott *čin* 'daylight, light of day'

PPA **k^wəχ* > PA **tšəχ*, Eyak *kī'χ* 'cry'; Ket *-den*, Yugh *-den* ~ *d'e* (the latter variant recorded in Castrén 1858), Kott *-čen*, Arin *-šen*, Pumpokol *-čiin* 'cry' < PY **ž'e-n* 'cry' (S.Starostin 1995:310); the coda nasal in Yeniseian probably derives from the perfective/stative suffix

= PY **g* elsewhere > *k* (Ket, Yugh, Kott). Note that this correspondence yields the only instance where Kott /k/ corresponds to Ket/Yugh /k/; in other cases, Ket and Yugh /k/ corresponds to Kott /h/

Eyak *-g^wada*, 'rump'; Ket *ko'd* 'rump', Yugh *ko'd* ~ *go'd* 'rump, butt' < PY **ko'd* ~ **go'd* 'butt' (S.Starostin 1995:310); anlaut *g* in the Yugh forms, though unique to this word, suggests that the Yeniseian correlate of PND **g^w* before a back vowel may have originally been voiced **g*; unfortunately, no Kott cognate of the form **ko'd* exists to confirm this; the stable final *d*, however, is problematic, also Yugh *d'* would be the expected reflex of Na-Dene **d*

PPA **g^we'n* 'day' (noun), is also partly cognate to the Ket/Yugh *ka'n* 'light' (adjective) < PY **gə'n* 'light' (adj., noun) based on anlaut *k* in Kott *kinix* ~ *knix* 'dawn' (S.Starostin 1995:226)

Eyak *kana's* 'wolverine' (Krauss 1970:759) and PA **-tš'ī'n*s in word for 'wolverine' (Krauss and Leer 1981:94); Ket *kūn*, Yugh *kū.ā'n* 'wolverine'

Na-Dene = Yeniseian

**k^w* > PA **tš'* (and possibly earlier to PAE **tš'* before front vowels) = PY **d* / *t* > *d* (Ket/Yugh/Pumpokol, except before a voiceless fricative coda, where it yielded PY **t*), *t* (Kott), *t*, *t'* (Arin); becomes *t* everywhere before original voiceless fricative auslaut

PA **tš'*- 'indefinite prefix', Eyak *k'u-* 'indefinite prefix'; Ket, Yugh, Pumpokol *d-* 'generic 3p animate prefix'

PA **tš'axd* 'hat', Eyak *tš'iyahd*; Ket *du'*, Yugh *du'*, Kott *ti*, Arin *t'ej* 'cap', *t'ugn* 'caps', with coda /d/ expected to be unstable in Yeniseian < PY **dī* 'hat' (S.Starostin 1995:221)

PA **tš'āt'* 'shrub, plant', Tlingit **tš'á-t'* 'willow'; Ket *dš-l* 'willow'; Yugh *dš-l* 'willow'; Arin *talset* 'willow', Kott *ti:li* ~ *ti:le* 'willow' < PY **dāl'i* 'willow'; S.Starostin (1995:221) suggests a Turkic source for this word; if not borrowed, the excrescent vowel in Kott could have arisen as a means of coda cluster resolution prior to the elision of /t/)

PA **tš'ī-χ* 'birchbark canoe'; Ket/Yugh *tii* 'canoe' (devoicing before fricative auslaut), Pumpokol *tīg*, Arin *taj* 'boat, vessel', Arin *kul-tej* 'birchbark or hide container' < PY **tix* 'boat, vessel' (S.Starostin 1982:168)

PA **tš'əχəs* 'merganser (*Mergus merganser*, a species of diving duck)'; Ket *təχ*, Central Ket *tə:χə*, Yugh *tə:χ* 'common goldeneye' (*Bucephala clangula*, a similar species of diving duck) < PY *təq* 'species of duck'; the initial element *al* in Kott *alt'ax* 'common goldeneye' is unexplained (see table 42 for the claim that Kott anlaut *alt-*, *ilt-* correlated with an original lateral affricate onset)

Na-Dene = Yeniseian

**x^w* > **š'* also *š* = PY **x* > *s* (Ket/Yugh), *š* (Kott), *x* (Arin/Pumpokol); note that **xi* in Ket/Yugh became /i/; with following /ʌ/ rather than /e/ in Ket/Yugh

PPA **x^wa* > PA **ša* 'sun'; Ket/Yugh *ī* 'sun'; Ket/Yugh *īryan* 'sunlight'; Kott *e-ga* 'sunlight'; Arin *xa-gali* 'sunlight'; Pumpokol *hi-χem* 'sunray' (*χem* = arrow', cognate to Ket *qā'm* 'arrow'); cf. PY **xiga* 'sun' (S.Starostin 1995:296)

PA **š^wāñ*, 'black', PA **-D-ž^wāñ*, 'be black'; Ket/Yugh *sən-ij* 'dark blue or green', Kott *suenga* 'blue, gray', *sə'n qəj* 'brown bear' (all possibly ultimately deriving from an ancient generic term for dark color); S.Starostin (1995:276) reconstructs PY **son-* 'blue, green' on the basis of Ket, Yugh, Kott words for 'blue', 'green'

PPA **x^wəq* ~ **šəq* ~ **š'əq* 'hook-shaped'; Ket *sū-* (only in complex words) 'back', 'return' < PY **su-* 'half', **suga* 'back, return' (S.Starostin 1995:276)

PPA **x^wəq* ~ **šəq* ~ **š'əq* 'hook-shaped' + *†* 'instrumental suffix' > PA **šəχt* 'hook'; Ket *sūt*, Yugh *sū.ā* Kott *suli* 'holding hook' < PY **sūli* 'cradle hook' (S.Starostin 1995:279); again the second vowel in Kott seems to correlate with an original coda cluster (see 'willow' above)

PA **šīš* 'inconnu, sheefish' could be cognate with Ket *su'l*, a word usually translated into English as 'Siberian white salmon' but actually representing the same species (*Stenodus leucichytus*), if the coda in Athabaskan changed through assimilation or if the coda in Yeniseian dissimilated; unfortunately there are no corroborating additional examples.

3.5.2.5. K-series: the unrounded velars *g, *k', *k, *x

The regular velars (unrounded non-glottalized) also assimilated to an adjacent front vowel in Yeniseian, remaining unchanged elsewhere (except where coda reduction rules applied). Also, everywhere except in Arin, original *x* dropped before any high vowel. This accounts for Yeniseian-internal correspondences such as Ket/Yugh *ū-s* 'thaw', but Arin *kus* 'thaw' (cf. Dëne-Sųłiné *-whus* 'heat water from snow' < PA **-yus* or *-yusš*). Additionally, in Ket/Yugh but not Kott or Arin, aspirated *k* must have spirantized and then disappeared, yielding correspondences such as Ket *λn* ~ *λ'n* 'pole, stick' but Arin *-gen* 'tree, pole' (cognate with PA **kən* 'pole, stick, tree'): Ket *sujij* 'alder', Arin *šujgen* 'alder' and *ittigen* ~ *istigen* 'spruce tree' (< *itti* ~ *isti* ? + *gen* 'tree'). Another example is Ket *uñ* ~ *u'n* 'base, sled-runner', a morpheme that also appears in the postposition 'under, beneath' as Ket *-uñ-d* and Kott *-han*, the latter providing another example of the retention of the anlaut from **k* in Kott but not in Ket/Yugh. This word is clearly cognate with PA **k'a'n* 'belly, base, sled-runner', with the raised vowel in Ket expected in cognates with an Athabaskan original full vowel.

Table 36 shows the velar correspondences insofar as they have been worked out so far.

TABLE 36. The Dene-Yeniseian K-series correspondences

Na-Dene = Yeniseian

**g* (fronting to *g'* in PPA) before front vowels in Early Yeniseian = ?possibly \emptyset (Ket/Yugh), *h* (Kott)

**g* in other cases = *q* (Ket), *χ* (Yugh), *h* (Kott)

PA **-g^wəndž-e* 'gristle, cartilage'; Ket *qəñ*, Yugh *χə.ā'n* 'gristle, cartilage' < PY **qəñi* 'cartilage' (S.Starostin 1995:264)

Na-Dene = Yeniseian

**k* and **k'* (front to *k'* and *k'* in PPA) = PY **x* > \emptyset anlaut in Ket/Yugh, with falling tone that sometimes alternates with abrupt tone, *h* in Kott where not voiced to *g*, with following /ʌ/ and /u/ in Ket/Yugh

PA **də-k'ən* 'stick, pole, tree', Eyak *də-kinh* 'stick'; Ket *ən* 'stick, branch', Ket *dən* 'tree bark', Arin *-gen* 'tree' in *šujgen* 'alder', *ittigen* 'fir'

PA **k'a'n* 'base, belly, sled-runner'; Ket/Yugh *uñ* ~ *u'n* 'base, sled-runner', Kott *-han*, Ket *-uñ* 'under' (postposition) < PY **i'n* 'sled-runner' (S.Starostin 1995:196)

(coda) PPA **D-łəq* 'S laughs'; Ket *-dax*, Yugh *-dax*, Kott *-čak* 'S laughs' < PY **žəq* 'laugh' (S.Starostin 1995:309); note again the correlation of unrounded Ket/Yugh /a/ before Na-Dene glottalized guttural coda

Na-Dene = Yeniseian

**x* or **š* (fronting to **x'* in PPA) = PY **x* > \emptyset anlaut (Ket/Yugh, Kott/Assan), probably *x* in Pumpokol, Arin (see

discussion of 1sg pronoun prefix in section 2.2.2)

PND $\sim^*w\text{-}sx\text{e}()$ (w) or $\sim^*u\text{-}sx\text{e}()$ (w) 'name' > PA $\sim^*u\text{-}\dot{z}e$ 'name' (Young and Morgan 1992:772), Eyak $w\dot{s}eh$ 'name'; Ket, Yugh \bar{i} 'name'

PPA $\sim^*t\text{-}D\text{-}\dot{z}e'g$ 'hunt' (Young and Morgan 1992:769); Ket/Yugh $-ej \sim e\gamma$ 'kill'; note that this verb base in Ket acts morphologically as if it begins in a consonant, since the imperative prefix d - does not appear: Ket $an\acute{e}j$ 'Kill him!'

*x (fronting to \sim^*x' in PPA) = PY *j in coda (probably from original fricative rather than glide) > j (Modern Yeniseian)

PA $\sim^*y\dot{i}k\text{'-}y\dot{i}t\dot{s}'$ 'breath, breathe' (Krauss and Leer 1981:195); PAE $\sim^*y\dot{i}n\dot{g}e?$ 'shadow, shade', $x\dot{a}x$ 'safety, health, life'; Ket \bar{i} 'soul, vapor' (suggested by J.Kari)

PA $\sim^*t\dot{s}'i\text{'-}x'$ 'birchbark canoe'; Ket/Yugh tii 'canoe' (devoicing before fricative auslaut), Pumpokol tig , Arin taj 'boat, vessel', Arin $kul\text{-}tej$ 'birchbark or hide container' < PY $\sim^*ti\chi$ 'boat, vessel' (S.Starostin 1982:168)

cf. also words for 'birch' below

Note, however, that Na-Dene *x often correlates instead with PY *p, since bilabial stops became velars or uvulars in Pre-Proto-Na-Dene (see section 3.5.2.7 below).

3.5.2.6. Q-series: the unrounded uvulars *g, *q', *q, *x

The unrounded uvulars (non-glottalized as well as glottalized) also assimilated to a following front vowel in Yeniseian, replacing their uvular quality with a velar articulation (Table 37). They remained uvulars before back vowels. It should be noted that Modern Ket /q/ is realized in onset position as [q̣]. Whenever I spoke Ket with native speakers during fieldwork, any pronunciation of [q] without a significant fricative release was routinely misunderstood as [k]. This suggests that the Modern Ket uvular stop, at least in some words, was originally a fricative in Proto-Ket-Yugh, as it remained everywhere in Modern Yugh.

TABLE 37. Dene-Yeniseian Q-series correspondences

Na-Dene = Yeniseian

*g, *q', and *q before front vowels in early Yeniseian = PY *k > k (Ket/Yugh), h (Kott, except where voiced to g intervocally)

PA \sim^*qe 'foot', PA \sim^*qe 'footwear', Eyak $qi\text{-}d\dot{a}$ 'anatomical prefix'; Ket/Yugh $ki's$ 'leg and foot together', 'foot' < PY $\sim^*ki's \sim \sim^*gi's$ 'foot' (S.Starostin 1995:238); while the cognate status of Tlingit $q'os$ 'foot, leg' and Eyak $k'ah\dot{s}$ 'foot, lower leg, paw' in the cognate set 'foot' proposed by Ruhlen (1998:13,995) is ruled out on phonological grounds, as Tlingit uvulars never correspond to Eyak velars; it is still possible these words have an etymological relationship to the Yeniseian terms

PA $\sim^*g\dot{a}ne$ 'arm', Eyak $\sim^*g\dot{a}la$ 'arm'; Ket/Yugh $kentibul$ 'shoulder joint', 'top of arm', Arin $qin\dot{a}j$ 'shoulder, arm', Kott $h\acute{e}nar$ 'shoulder' < PY \sim^*ken 'shoulder joint' (S.Starostin 1995:236); cognate status first proposed in Ruhlen 1998

PA $\sim^*ge's$ 'king salmon'; Ket $k\acute{e}s$ 'burbot' (fish)

Na-Dene = Yeniseian

*g in other cases = PY *q > q Ket, Yugh χ , Kott h, with labialization of adjacent vowel in Ket/Yugh but not in Kott
PND $\sim^*g\dot{a}$ - conjugation marker; Ket (q)0-, Yugh (χ)0-, Kott (h)0- conjugation marker; see extensive discussion in section 2.2.1

PAE $\sim^*g\dot{a}nd$ 'spruce or pine needles'; Ket $qo'n$, Yugh $\chi o'n$ 'conifer branches' < PY $\sim^*qon \sim \sim^*q\dot{a}n \sim \sim^*\chi on$ 'fir branches' (S.Starostin 1995:262)

PAE \sim^*gunt 'knee' > Eyak $\sim^*guh\dot{d} \sim \sim^*cunhd$, PPA \sim^*gut 'knee'; Ket $qonun \sim qonn$ 'waist seam of a dress'; Ket $\sim^*q\dot{o}n$ postposition meaning 'up to the edge'; note also Ket $k\dot{o}n$ 'joint of the middle finger', though this word cannot be cognate unless the velar originated secondarily from $\sim^*s\dot{u}$ 'middle' + $\sim^*q\dot{o}n$ 'joint' > $\sim^*s\dot{u}k\dot{o}n > k\dot{o}n$ (as uvulars normally become velars after high vowels)

Tlingit $g\dot{u}d\dot{z}$ 'wolf' (Naish and Story 1996:26), Eyak $g\dot{u}d\dot{z}ih$ 'wolf' (Leer 1996:136); Southern Ket $q\dot{u}t$, Northern Ket $q\dot{u}ti$, Yugh $\chi\dot{u}t \sim \chi\dot{u}t$ 'wolf' < PY $\sim^*qite \sim \sim^*\chi ite$ 'wolf' (S.Starostin 1995:260)

(coda) PAE $\sim^*n\dot{a}t'ag$ 'fly', Eyak $\sim^*t\dot{a}q$ '(flea) jumps'; Ket \sim^*doq , Yugh $\sim^*do\chi$ 'fly', Kott tox 'jump' (noun), $\sim^*t'ak$ 'jump' (verb), combined as PY $\sim^*d\dot{o}q$ 'fly, jump' (S.Starostin 1995:223); also Pumpokol $dago\text{ }uta$ 'bat' (literally, 'flying mouse'), Kott $tagala$ 'bat' (probably literally 'flying squirrel'; cf. Ket $\bar{l}\dot{a}x$ 'squirrel pelt'); cf. PY $\sim^*dagV \sim \sim^*d\dot{a}gV$ 'bat' (S.Starostin 1995:219)

Na-Dene = Yeniseian

*q' and *q in other cases = PY *χ > q (Ket), χ (Yugh), q' ~ k (Arin dialects), Kott: h, where not voiced to g, with no with labialization of the adjacent vowel in Ket/Yugh

PA $\sim^*q'\dot{a}x'$ ~ $\sim^*q'i\text{'-}x'$ 'birch'; Ket quj , Yugh $\chi u'j$ 'birch bark', Kott $h\acute{i}pal$; the latter word may contain a cognate to Ket \sim^*hul , Yugh \sim^*ful 'accumulation', which would still support S.Starostin's PY reconstruction of $\sim^*\chi i'w$ 'birch'; S.Starostin and others have also noted that similar sounding words for 'birch', 'birch bark' occur in other Siberian languages, suggesting the alternate possibility that this is a loanword into Yeniseian; cognacy first proposed in Ruhlen 1998

PA $\sim^*d\dot{a}q'a'n$ 'burn, ignite', Eyak $\dot{d}\dot{a}q'a$ 'burn'; Ket \sim^*qan , Yugh $\sim^*\chi an$ 'boil', Kott $au\text{-}gan$ 'boil', $\dot{c}\text{-}au\text{-}gan$ 'burn O'; cognacy of the verb roots proposed by Ruhlen (1998)

PPA \sim^*qun 'fire', Eyak $qu' \sim qu'(n)$ 'fire'; Southern Ket $q\dot{o}j$, Central Ket $q\dot{o}:j\dot{a}$ 'daytime' (with falling tone likely deriving from original second morpheme, possibly $\sim^*qoj + \sim^*xig$ 'day'); cf. PY $\sim^*\chi\dot{o}j$ 'day' (S.Starostin 1995:303)

PA $\sim^*q'a$ 'edge'; Eyak $\sim^*q'a$ 'edge'; Tlingit $\sim^*\chi e$ 'outer part of mouth', 'opening' (Leer 1996:43 identifies 'outer edge' as the original meaning); Ket $q\dot{a}t$ 'edge, fringe' (if final $-t$ is a suffix)

(coda = PY *q, but with no labialization of the preceding vowel in Kott)

PA $\sim^*t'eq' \sim \sim^*t'aaq'$ 'propel (long object), shoot (arrow)'; Ket \sim^*daq , Yugh \sim^*dax , Kott \sim^*tek 'throw, shoot O' < PY $\sim^*d\dot{a}q$ 'shoot' (S.Starostin 1995:219)

*χ = PY *χ > q (Ket), χ (Yugh), q' ~ k (Arin dialects), Kott: h, where not voiced to g, with no with labialization of adjacent vowel in Ket/Yugh

PND $\sim^*\chi a(w)$ 'hair, fur'; Central Ket $q\dot{a}de$, Yugh $\chi\dot{a}t$ 'fur' (possibly with collective suffix $\sim^*d\dot{a}$); also Kott hei , Arin qaj 'fur coat' and Ket $qa't$, Yugh $\chi\dot{a}t$ 'outer clothing' < PY $\sim^*\chi\dot{a}z$ 'outer clothing' (S.Starostin 1995:300)

3.5.2.7. The Na-Dene rounded uvular stops *g', *q', *q

Na-Dene rounded uvulars presumably developed from an adjacent rounded back vowel. Consequently they have the same correspondences with Yeniseian as unrounded uvulars, except for the fact that they correspond to Yeniseian uvular articulations even after a front vowel, as in the first example in Table 39, since the vowel in question was presumably a back rounded vowel originally.

TABLE 38. Yeniseian plain uvular correspondences to Na-Dene rounded uvulars

Na-Dene = Yeniseian

*g', *q' = PY *χ > q (Ket), χ (Yugh), in Kott: h, where not voiced to g

PPA $\sim^*g'\dot{e}d$ 'poke O'; Ket \sim^*qud 'poke, scratch O', Central Ket qu' (plural $q\dot{a}dej$) 'poker, ray, spit for roasting meat'; cf. PY $\sim^*q\dot{i}z$ 'dig' (S.Starostin 1995:260)

PAE $\sim^*q'\dot{a}ns$ > PA $\sim^*q'\dot{a}s$ 'cloud', Eyak $q'\dot{a}hs$ 'cloud'; cognate with root in various words meaning 'dark' in the sense of 'obscured from view', e.g., Ket $qon\text{-}ij$ 'darkness' (< 'dark' + i' 'day'); Yugh $\chi on\text{-}sij$ 'darkness' (< 'dark' + $s\acute{i}$ 'night'), Kott $h\acute{o}n$, $h\acute{o}n\dot{s}u$ 'dark', Pumpokol $kon\dot{c}idin$ 'dark' (literally, 'it gets dark', where \dot{c} is probably a conjugation marker), Arin $bonosot\text{-}xom\dot{s}üma$ 'dark'; cf. PY $\sim^*\chi on\text{'-} \sim \sim^*\chi on\text{'-}$ 'dark' (S.Starostin 1995:302); cf. also Ket $qon\text{'-} \sim qones\text{'-}$ variable incorporate in verb 'S gets lost', where the form with \sim^*s may be the original root coda; cf. PY $\sim^*qon\text{'-} \sim \sim^*\chi on\text{'-}$ 'lose' (S.Starostin 1995:263)

3.5.2.8. Na-Dene correspondences to Yeniseian bilabial plosives *b, *p

As is known, Na-Dene languages lack bilabial plosives, except where secondarily developed from original *w. Krauss (1964) pointed out that this typological anomaly requires some explanation. Comparison with

Yeniseian strongly suggests that *b and *p merged with labialized velars and uvulars in Pre-Proto-Na-Dene. The loss of original bilabial plosives in Na-Dene could have occurred under areal influence from other northwestern North American languages. Yeniseian, like other North Asian languages, continues to have bilabial plosives (Table 39).

TABLE 39. Na-Dene velar/uvular correspondences to Yeniseian bilabial plosives

Na-Dene = Yeniseian

*k ^w (adjacent an original front vowel) = PY *b > b (Ket/Yugh, Pumpokol), p (Kott, Assan, Arin)
PAE *-k ^w ək ^w e- 'kidney' > PA *tš'ətš'e- 'kidney', Tlingit -k'ax' 'fish kidney' (secondary loss of labialization is typical of gutturals in Tlingit, though the correspondence of Tlingit uvular χ to AE velar series is irregular); Ket/Yugh <i>bajb-ul</i> 'kidney', Kott <i>koip-ala</i> 'kidney', with the second element representing a suffix used to derive paired body parts: Arin <i>šiš-ali</i> 'lung', <i>kanč-al</i> 'testicle' (cf. also the Ket noun <i>alla</i> ~ <i>dalla</i> 'half'); k- in Kott <i>koipala</i> results from secondary dissimilation before /p/, supporting the reconstruction PY *b[a]jbVl 'kidney' (S.Starostin 1982:171, 1995:206)
PPA *k ^w əy > PPA *tš'əy 'wind blows', Eyak <i>k'u:y</i> ; Ket <i>bēj</i> , Yugh <i>běj</i> , Kott <i>pe:i</i> , Assan <i>bej</i> ~ <i>pej</i> , Arin <i>paj</i> , Pumpokol <i>baj</i> < PY *bej 'wind' (S.Starostin 1982:146); the Ket and Yugh root is also used in verbs meaning 'wind blows', as well as in <i>ulvej</i> 'soul', 'life force'
*g or χ ^w (elsewhere) = PY *b > b (Ket/Yugh, Pumpokol), p (Kott, Assan, Arin)
PA *gax, Eyak *gax, Tlingit <i>gax</i> 'rabbit'; Ket/Yugh <i>be's</i> , Kott <i>peš</i> 'rabbit'
PA *χos ^w , Eyak *χu(n)š 'thorn' (if derived by long-distance assimilation from earlier *c ^w ax ^w , given that χ ^w is rare in PAE); Ket/Yugh <i>bu's</i> 'penis', also found in words having to do with insect stings: <i>bust</i> ~ <i>bustin</i> 'wasp', <i>bustet</i> 'to sting'

Na-Dene = Yeniseian

*x (fronted in PA to *x ^w) could correspond to PY *p > Ket <i>h</i> , Yugh <i>f</i> , Kott <i>f</i> if derived from earlier *x ^w before a front vowel
PA *x ^w ats 'ridge', also Eyak <i>gə-tə-xi'ts-t</i> 'hill'; Yugh <i>si-fəs</i> 'pile of small fragments' < PY *sipes 'small pile' (S.Starostin 1995:275)
PA *x ^w ēn'ts 'wart' (Krauss 2005:101); Ket <i>huū'n</i> 'wart', <i>huutn-əŋ</i> 'warts' Yugh <i>fiūn</i> 'wart', presumably from a PY form something like *puū'n or *puū'nt 'wart', though cognates from the southern Yeniseian languages are lacking; the irregular plural suggests an earlier coda cluster; conversely, it is conceivable this form is a loan from Selkup <i>pen</i> ~ <i>pini</i> 'wart', though the opposite direction of borrowing is equally plausible
*q or χ (elsewhere, probably from earlier *q ^w) = PY *p > Ket <i>h</i> , Yugh <i>f</i> , Kott <i>f</i>
PPA *qo- 'area prefix', Eyak <i>qu</i> 'future prefix'; PY *p (G.Starostin 1995:178) > Ket <i>h</i> , Yugh <i>f</i> , Kott <i>f</i> 'flat surface, area' (qualifier / thematic prefix in verb forms)
PPA *χəz 'turn on an axis' (if from earlier *q ^w əz, with spirantization and loss of labialization secondary due to the auslaut); Ket <i>huūs</i> , Yugh <i>fū:ʰs</i> 'twisted, spiral' (falling tone probably developed from absorption of an adjective suffix)

3.5.2.9. Yeniseian correspondences to the Na-Dene laterals *l, tʃ, *tʃ'

S.Starostin (1982, 1995) reconstructs five liquid phonemes for Proto-Yeniseian to reconcile the complex web of anlaut and auslaut correspondences. Vajda and Werner (in preparation) explain some of them as arising from morphophonemic processes and provisionally treat Proto-Yeniseian as having only two liquid phonemes, pronounced in auslaut as *l (probably [ʃ]) and *r (probably sonorant [r], less likely sonorant [l]). This interpretation reconciles the complicated Yugh liquid auslaut correspondence with southern Yeniseian by identifying secondary processes such as the change of Proto-Ket-Yugh auslaut *r to ʃ through absorption of a suffix. This explains cases where Modern Yugh /ʃ/ corresponds to /r/ in southern Yeniseian, an example of which is found in the adjective meaning 'wet, damp': Yugh *ū·ʃ*, Kott *u:ra*, Assan *ura*, Arin *kur*, Pumpokol *urga* 'rainy'; the Kott/Assan and Pumpokol forms suggest the original morpheme structure of this word was PY *xur 'water' plus an adjective suffix of some sort. Conversely, original auslaut *l became /r/ in

Proto-Ket-Yugh before other suffixes, e.g., Yugh *bir-ej* 'how' (< *bil-kej*, cf. Kott *bil-aŋ* 'which', Kott *bil-i* 'where'). When secondary morphophonemic developments are accounted for, Proto-Yeniseian can be reconstructed with two lateral phonemes in auslaut. Na-Dene comparanda show that these proto-sounds pair up between the two families in the following way in auslaut: PY *ʃ = PND affricate *tʃ (or *tʃ') and PY *r = PND fricative *ʃ. A typical example of this auslaut correspondence can be found in the shared instrumental suffix - PY *r (or voiced *l) = PND *ʃ. This cognate suffix appears as Ket *qatʃ*, Yugh *χatar* 'mat' (< *χad or *χaj 'fur' + *tel 'mat'; cf. Eyak *te'ʃ* 'mat', PA *tē'ʃ 'mat'), but as Ket *sùl*, Yugh *sù:ħʃ* 'holding hook', with lateral articulation also in Yugh due to the absorption of the guttural element (cf. PA *šəχ-ʃ 'hook'). Note that all auslaut liquids have fallen together everywhere in Modern Ket as lateral l (usually voiced between vowels and pronounced as voiceless fricative ʃ in coda position), while Yugh retains the phonemic distinction.

The situation with word-initial laterals presents a more complicated picture. Yeniseian-internal correspondences reveal processes of elision or epenthesis previously not described in connection with the development of liquids in Yeniseian. The onset fricative phoneme *ʃ seems to have disappeared before a front vowel in Ket and Yugh. The following doublets exist in Southern Ket that demonstrate retention of l before a back vowel but its elision before a front vowel: *lam-* 'flat' (also found in words for 'board', 'door', 'side')⁴⁵ vs. *ēm*, 'flat, even'; *lam-* 'small' (in *lamtol* 'bug', *lamt* 'small piece') vs. *īm* 'small'; *lòr* 'cow parsnip' (plant with large hollow stems), *lordan* 'bulrush' (literally, 'hollow-stem grass') vs. *èr* 'chimney tube'. Because of this rule, Modern Ket anlaut l appears only before back vowels unless another l is found in the same word: Ket *lèl* 'lymph', Northern Ket *libla* 'shaggy plover (bird)'. In southern Yeniseian, the reflexes of original *ʃ generally appear in anlaut without an epenthetic vowel only in syllables containing another dental consonant:⁴⁶ cf. Ket *lòs* 'vagina' vs. Pumpokol *lat* 'vagina'; before a dental auslaut the lateral fricative yields dʃ or j in Kott and Assan, as can be seen by comparing Ket *lò'n* 'lips' vs. Kott *dʃan* 'lips'. Note that S.Starostin (1982, 1995:267–268) posits the palatalized rhotic phoneme *r̄ for most instances where Ket/Yugh anlaut l corresponds to l or dʃ in southern Yeniseian: e.g., PY *fòs 'vagina', PY *fòn 'lip'. However, anlaut liquids in Common Yeniseian were most likely pronounced as laterals since no daughter language shows rhotic [r] in anlaut, despite the fact that in auslaut position one of the liquid phonemes was almost certainly pronounced as rhotic [r] (i.e., the one that correlates with PND *ʃ; see above). As earlier mentioned, Modern Ket anlaut l is actually pronounced with a brief plosive onset [ʃ]. Yugh retains a phonemic distinction in anlaut between two liquid phonemes in anlaut: l (corresponding to Na-Dene *ʃ) and the uncommon anlaut ʃ (< S.Starostin's PY *ʃ'), which seems to correlate with PND *tʃ', though the Na-Dene glottalized lateral affricate more often correlates with the syllable tʃVl in Yeniseian (see Table 42).

Table 40 provides comparisons with Na-Dene to support the anlaut correspondence PND *ʃ = PY *l, the evidence for which is fairly strong before back vowels. The one case where Athabaskan shows an anlaut liquid that presumably disappeared in Yeniseian ('son-in-law') is much weaker, with the evidence for loss of Yeniseian anlaut ʃ before front vowels coming almost exclusively from internal reconstruction.

⁴⁵ Northern Ket pronunciation of *la'm* 'board', 'wooden door' (as opposed to 'tent flap') as *lēm* probably represents a recent innovation.

⁴⁶ An exception would be Arin *laj* 'swamp', if this word is indeed cognate to Yugh *laχ* 'dirt', also Arin *lam* 'roof' (probably cognate with Ket/Yugh *la'm* 'door', 'board'). Note that several Arin and Pumpokol words with anlaut l have nothing to do with PY liquids but rather pair up with Ket and Kott words beginning in k (< PY *g): cf. Arin *lot*, Pumpokol *lete* 'winter' vs. Ket *kə't*, Kott *ke:ti* 'winter'; also Ket *ka'n* 'light, bright', *kū'n* 'dawn', Kott *kinix*, *kin-ig*, *knix* 'dawn' vs. Arin *ulum-alači* 'bright', 'dawn' (literally, 'it-has-become-bright day'), where initial /u/ is probably epenthetic; and Pumpokol *lut* 'rope' vs. Ket *ku't* 'belt', Kott *ku:ra* 'rope'. The analysis presented earlier, that PY *g correlates with Athabaskan retroflex *dʒ < labiovelar *k^w might help explain the correlation of these particular Ket/Kott velars with Arin and Pumpokol /l/, if the original sound in PPY was something like *d'.

TABLE 40. Dene-Yeniseian correspondences to the simple lateral fricative

Na-Dene = Yeniseian

- *ʃ in anlaut before a back vowel = PY *ʃ (probably pronounced as a lateral since no Yeniseian language records anlaut [r]) > Ket, Yugh *l* (actually pronounced with a brief plosive onset [ʃ])
- PA *-la 'point, end', Navajo -láád 'tip, end, extreme' (< PA *-layad); Ket *lā* 'barb on the end of a fishing hook'; note that while this morpheme in Athabaskan is also used to form words meaning 'hand', the Ket words *ta'ŋ* 'hand', *taŋat* 'wrist' (< *a'd* 'bone', a suffix used to derive body-part nouns) could conceivably represent a different morpheme
- Eyak -lax, Navajo -lááh 'beyond, more than, greater, surpassing' (postposition); Ket -la 'augmentative or comparative adjective suffix: *sī'n* 'old'—*sinla* 'rather old, older'; this morpheme may be linked to words meaning 'extremity' in the set above
- PA *dā-lāk-i ~ dā-lag-i 'squirrel'; Ket *tāq*, Yugh *tāx* 'squirrel pelt' < PY *fāq 'pelt (used as trade item)' (S.Starostin 1995:267); note that PA *tsalax 'ground squirrel', a compound made from *tse* 'rock' + *tāg* 'squirrel', superficially resembles Ket *sa'q*, Yugh *sa'x*, Arin *sava*, Kott *šaga* 'squirrel' < PY *sa'qa 'squirrel' (S.Starostin 1995:268); however, the anlauts in the Yeniseian daughter languages differ from those in the case of PY *či's 'stone', showing that these words are not cognate
- PA *tē-dž 'soil' > Nav. *teezh* 'dirt' (Young and Morgan 1992:393) could be cognate with Yugh *tax* 'dirt' if PA auslaut *dž derived from earlier PAE *gʷ; in Yeniseian an original labiovelar coda could have become uvular after non-front vowel *a*; including possible cognacy with Arin *laj* 'swamp' S.Starostin (1995:267) reconstructs PY *fā'q 'dirt'
- PA *tu 'chunk of ice, glacier' (Krauss and Leer 1981:193), Eyak *ta* 'glacier'; Ket *tāa* 'heavy frost' (2nd vowel length probably derives from original second morpheme); Ket *tāqtoq* 'ski with no felt padding on the bottom, used in late winter on ice-encrusted snow' (< *tāq* 'ice' + *toq* 'step'; Ket *lutet* 'large block of ice on the riverbank in spring' (-*tet* 'break'), the latter word deriving from H.Werner's unpublished field notes
- *ʃ in anlaut before front vowel in Yeniseian disappears
- PA *-tān 'brother-in-law', -*len* 'be a son-in-law'; Southern Ket *ən*, Northern Ket *ə:ne* 'husband of daughter or younger sister', Yugh *ə'n* 'son-in-law', Kott *ani* ~ *ane* 'son-in-law' < PY *tān'i 'son-in-law' (S.Starostin 1982:190); the Yeniseian words suggest a suffix of some sort (possibly cognate to Na-Dene kin noun suffix -e); cf. Leer 2005: 306–309

Examples of the lateral affricate onsets *dl or *tʃ do not match up between the various branches of Na-Dene, leading Leer to suggest that these sounds, like *dz, are innovated composites of two segments rather than phonemes inherited from Proto-Na-Dene (Leer, 2008b). However, there are sporadic indications that the aspirated affricate *tʃ may have occurred more widely in anlaut, later reducing to ʃ (see the cognate sets for 'fish' and 'dog' in Table 41). Yeniseian cognates involving Na-Dene lateral affricates *tʃ as well as *tʃ are interesting because they sometimes show these segments separated by a vowel. The fate of original anlaut lateral fricatives in the Yeniseian daughter languages is quite varied, with these sounds sometimes falling together with PY *č, sometimes taking an epenthetic anlaut vowel, and sometimes losing their plosive onset, leaving only the lateral fricative portion.

TABLE 41. Yeniseian correspondences Na-Dene lateral affricates tʃ, tʃ'

Na-Dene = Yeniseian

- *tʃ (sometimes partly reduced to ʃ) or *tʃ' = PY syllable tʃl or simple anlaut *č ~ *tʃ > Ket *t* ~ *l*, Yugh *č* ~ *ʃ*, with the laterals appearing before /u/ or /u:/; southern Yeniseian cognates, where available, show either tʃl or word-initial *t* ~ *ilt* ~ *alt* ~ *alč* ~ *als*
- PPA *tʃe'q' 'classificatory stem for mushy substances'; the anlaut tʃ might be cognate with the Yeniseian root tʃl meaning 'mushy', as in Ket *tul-aq* 'dry-rotted wood', Yugh *tul-aq* id. Kott *tʃal-ak* ~ *tal-ax* 'id' (also Kott *tʃal-ag-a* 'is is rotten') < *tul* 'mushy' + *aq* rot'; note also *tul* 'mushy' in Ket *tulbay ūl* 'muddy water' (< *tul* 'mushy' + *ba'ŋ* 'earth' + *ūl* 'water') and *tultan* 'wet/mixed clay' (though *tan* is not etymologizable)
- PA *tān ~ *ti-n-k'e 'dog', plural *ti-nqe-(yu) (Leer 2005:299), with unaccounted for affricate anlauts

in several languages: Slave, Southern Tutchone and Sekani *tʃi* 'dog', Northern Tutchone *tʃij* 'dog', Tsuut'ina *tʃi* 'dog'; Ket *tīp*, Yugh *čip*, Kott *ilšip*, *alšip*, *alčip* id., Assan *alšip*, *alčip*, Arin *ilčap*, *ilčep* 'dog' (cognate status of this set hinges on the possibility that final PY *b is homologous with the unstable guttural in Athabaskan)

- PA *tuq'e 'fish (generic)', 'salmon' (Leer 2005:299), with unaccounted for affricate in Tsuut'ina *tʃuk'a* 'salmon'; cf. also PA *tūx 'whitefish' and Interior Tlingit *tūx*, 'whitefish' (Leer 2005:300–301), which Leer (p.c.) regards as a different root than the words for 'salmon'; Ket -*tuy* 'fish' (in *boytuy* 'herring', literally 'corpse fish' < *bō'ŋ* 'corpse', due to its short life out of water; also *tūy* 'tugun', a species of fish; Arin dialects *ilta* ~ *ilti* 'fish', Kott *te:g* 'fish', Assan *tig* 'fish'; S.Starostin reconstructs PY *c[i]k 'fish' on the basis of Kott *te:g* 'fish', Assan *tig* 'fish' as well as Ket *tix*, Yugh *či:k* 'snake' (see below for a different analysis of words for 'snake'); note that in the interpretation presented here, the final uvular in Na-Dene would be expected to correlate with a velar after a high vowel in Ket and Yugh
- PA *tʃaxaš 'eel', Tlingit *tʃik'x* 'worm' (Leer 1996:137); Ket *tix*, Yugh *či:k* 'snake', Ket *utix* 'earthworm' (< *ul* + *tix*, where /l/ elided before the original affricate); Ket *atix* 'freshwater lamprey'; other Ket words denoting worms or other crawling creatures contain the syllable tʃl, e.g. Northern Ket *kīn tuln* 'earthworm', Ket *toln* 'earthworm', Central Ket *tul'd* 'worm', Ket *tuln* 'lizard'; on the contrary, S.Starostin (1995:214) connects Ket/Yugh 'snake' with southern Yeniseian words for 'fish' (see above); note that the alternate interpretation presented here does not preclude both Yeniseian and Na-Dene words for 'snake' and 'fish' to be ultimately related to a root *tʃl referring generically to animals that crawl, slither, or move from side to side rather than directly forward, in which case the apparent shared morpheme for 'left' might conceivably be connected (though this is conjecture); cf. also Ket *lamtol* 'beetle', if *lam* = 'small')
- PA *tʃaxaš ~ *tʃaxax 'left side' (cf. Krauss 2005:129), Eyak *tʃihx* 'left (side)'; Ket *tūl* 'left, left side', *tulga* 'left, left side', Ket *tulga ke't*, *tulejdo ke't* 'left-handed person', Yugh *sullgei* 'on the left' (with unexplained /s/ instead of /t/), Kott *tʃul* 'left'
- Eyak *tʃ'a* ~ *tʃ'ah* 'rear, back end' (Krauss 1970:97), PA *-tʃ'a 'rear end, rump, buttocks' > Navajo -*tʃ'ááh* 'bottom, underside, underneath', -*tʃ'ááh* 'on the underside (postposition)', -*tʃ'aa* 'rump, arse, buttocks' (Young and Morgan 1992:576); Kott *ital* 'under', 18th century Ket *doló* 'under' (Adelung; cf. Werner 2005), Ket *ax-tul* 'wooded ravine' (*a'q* 'trees'), Ket *ken-tul* 'base (in Western thinking, the top) of arm', Ket *tol-git* 'low price, cheap' (*ki't* 'price'), 19th century Ket (Castrén 1858) *tol* 'shallow', low'
- Eyak *tʃ'i* 'bind', PA *tʃ'u 'tie, weave, make a snare', Navajo *tʃ'óót* 'cord, rope, string', with instrumental suffix -*ʃ* (Young and Morgan 1992:589); the anlaut could be cognate with Yeniseian *tʃl in words meaning woven item: Arin *tʃulap* ~ *ʃulap* 'rope' (the latter form probably with auslaut to anlaut assimilation); Ket *tō'l*, *toltr* 'wattle fish trap'; the second syllables *ap* and -*tr* are not etymologizable, however; Ket *lā'ŋ* 'string' might also be connected here
- PA *dā-tʃox ~ *dā-tʃet 'jump' > Koyukon *tʃuh* ~ *tʃet* 'jump', also 'fire ignites, burns, blazes' (Jetté and Jones 2000:587), *tʃaah* 'shine' (Jetté and Jones 2000:589); Central Ket *lijtepej* 'flare up (said of light)', Ket *qib-lan* ~ *qib-la*: 'by moonlight', Yugh *xe'fu-lun si* 'moonlit night'; only the element *ʃi* ~ *ʃu* ~ *ʃa* is comparable to the Athabaskan, with Yeniseian -*ŋ* probably a suffix of some kind
- PA *tʃ'a'y 'go in a herd' (Young and Morgan 1992:573); Southern Ket *lūr*, Central Ket *lū:da* 'vee (of birds)' (probably with collective suffix -*da*), Ket *tulensa* 'in a row'; also Yugh *ʃutn* 'small fish'; this and the last correspondence would suggest that tʃ', as in the case of ts', reduced to its fricative rather than plosive component after high-vowel /u/

It is not clear whether Yeniseian tʃl reflects the original situation, with Na-Dene tʃ' resulting from syllable collapse, or whether the vowel in Yeniseian tʃl is secondary. It is possible that many if not most anlaut lateral affricates in Na-Dene derived from innovations in Pre-Proto-Na-Dene or one of its daughter branches.⁴⁷ Excrescent anlaut /a/ or /i/ in southern Yeniseian words correlating with Na-Dene anlaut *tʃ ~ *ʃ such as Kott *ilšip* 'dog' or Arin *ilta* 'fish' conceivably arose to avoid word-initial laterals, an areal phenomenon in Inner Asia typical also of Turkic and Mongol phonology, with epenthesis failing to apply

⁴⁷ The Dene-Yeniseian evidence on lateral affricates presented here should be compared with S.Starostin's (1989) seminal overview of lateral phonemes in Eurasian language families, since it seems to confirm that Proto-Yeniseian did inherit lateral affricates, bringing it closer to other putative Dene-Caucasian languages.

only where the syllable contained a dental auslaut. The same rule of epenthesis also seems to have operated before original simple *l, as in Kott *alup*, Assan *alūp*, Arin *alap ~elep* 'tongue', where the initial /a ~ e/ appears to be epenthetic (cf. Ket *lap-taq* 'bite').

Finally, it might be mentioned that Proto-Athabaskan had a number of zero-onset and glottal-onset roots (Krauss and Leer 1981:201). Yeniseian has numerous vowel-initial words, a few of which may be cognate to Athabaskan zero or glottal onset words. One of these is the PA root **he'n* 'single animate stands', with (h) representing the probable realization of the onset slot rather than a consonantal segment of the root. This item may be cognate with the root in the synonymous Yeniseian infinitive represented by Ket *ī'n*, Yugh *ifan* 'single animate stands', which likely has a thematic prefix in Yeniseian. Possible glottal onset cognates include PA *'e'n* 'see, glimpse' and the Ket/Yugh base *-oŋ* in verbs of seeing (see Table 20) and also possible PA *'a:x'* 'snowshoe' and Ket *asl*, Yugh *asil* 'ski', with *-l* possibly the instrumental suffix (suggested by Kari, p.c.).

4.0. CONCLUSION

The evidence amassed so far in support of Dene-Yeniseian can be summarized as follows. The expression of tense/mood/aspect fundamentally involves the interaction between two cognate pairs of morphemes. The first are the tense-mood prefixes **x'i-* and **ga-*, which probably derive from auxiliary verbs. The second are the *ṭ*-progressive and *ñi-*perfective/stative aspect suffixes. In verbs denoting a state resulting from a prior action, the perfective/stative suffix appears together with a morphologically identical prefix, forming a sort of circumfix around the verb root. Other core prefixal classes likewise show homologies extending beyond structural congruence. There are cognates in verb-internal pronominal elements, with an interesting parallel in their positioning. The 3rd person agreement or animacy markers are prefixed before the tense/mood marker, while the 1st and 2nd person agreement markers appear after the tense/mood marker and closer to the verb root. Comparison of the 1st and 2nd person morpheme shapes remains a key problem, as does the search for Yeniseian cognates to the two series components (*s-* and *ṭ-*) of the Na-Dene classifier. Outside the finite verb, the intricate and seemingly parallel morphological pattern used to build action nominals (infinitives, gerunds) is quite striking.

The basic vocabulary contains a modest number of cognate compounds and derived words displaying structural and semantic parallels unlikely to have arisen through chance. Putative cognates include morphologically complex forms such as a cognate meaning 'holding hook' derived from the root 'back' or 'hook-shaped' followed by the instrumental suffix *-ṭ*. Overall, the cognates proposed are conservative in the degree of semantic latitude they display, yet appear sufficient in number to posit at least a preliminary system of sound correspondences involving consonants, vowels, and prosodic features. The most significant gaps in the correspondences are in the area of nasal and velar sounds. It is possible that future research will eliminate some proposed Yeniseian cognates through their identification as ancient loans from other North Asian languages. It is also likely that the system of sound correspondences will uncover cognates showing greater semantic distance than those so far proposed. But at this stage of comparison, when key areas of the sound correspondences remain unclear or rest on scant evidence, I would prefer to err on the side of caution and limit potential cognates to close semantic matches. In general, more cognates must be sought to test the sound correspondence system laid out here. So far, only several hundred items of basic vocabulary have been systematically compared, yielding about 100 cognates.

Only items of core vocabulary such as body parts, natural phenomena, and basic actions appear cognate. Notably, these include words for biota, natural history, and skill sets that specifically reflect hunter/gatherer life in the northern subarctic taiga forests of both Asia and North America. These items are for the most part also congruent with subsistence in Arctic environments. Such lexical parallels are exactly what one should expect to find between two language groups related over a time depth of many thousands of years, during which time ancestral speakers passed through the circumpolar zone to attain their respective homelands straddling two continents.

The forms of many of the most convincing cognates would not appear related without explication of

the layers of sound rules connecting them, a fact that should lend credence to the system proposed here. Other Ket and Athabaskan words or morphemes that closely resemble one another are merely coincidental look-alikes of the kind shared by any two languages. The comparisons presented above nevertheless offer a theoretical system for testing new potential cognates, which should obey all of the rules of onset, vowel, tone, and coda correspondence, in addition to appearing plausible on morphological and semantic grounds in light of the emerging view of Dene-Yeniseian. This exceeds a list of look-alike words that can be added to or subtracted from based on nothing beyond individual partial resemblance, with no hypothesis of sound correspondence to control whether newly considered resemblances conform to a genuine pattern. The system of sound correspondences proposed here, despite its significant gaps and many thin spots, suffices to support the cognacy of words that at first glance appear formally unrelated, as well as to disprove cognacy in the case of others that are quite similar phonetically.

Obviously, much more needs to be done to scrutinize and expand the hypothesis of genetic relatedness offered here. In some cases, a word known to me from the extensive descriptions of Navajo (Young and Morgan 1987, 1992; or Young 2000) or from Ahtna (Kari 1990) or Dena'ina (Kari 2007), or Koyukon (Jetté and Jones 2000) might seem a promising candidate as a cognate for some Ket term in basic vocabulary; however, my rudimentary knowledge of Na-Dene historical linguistics does not permit me to take the comparison further, without comparative data from Eyak or Tlingit. Also not dealt with are most of the Athabaskan qualifier prefixes, incorporated nouns and other stems (see FN 28) or verb-internal object markers. Nor have I yet subjected the system of demonstrative pronouns, locative postpositions or directional adverbs to systematic comparison.

It is possible that the lexical evidence for Dene-Yeniseian will increase considerably once the full corpus of Athabaskan, Eyak, and Tlingit vocabulary is considered. Another possibility is that some of the archaic verb morphology proposed for Dene-Yeniseian might also be discovered in Sino-Tibetan, if not in other Old World families. If so, then this evidence, coupled with the larger body of cognates already proposed between Yeniseian and other Old World languages might turn out to support Na-Dene and Yeniseian as branches of a broader family rather than as a family unto themselves. Even if one is inclined to accept Na-Dene and Yeniseian as genetically related, it is best to reserve judgment on the position of Yeniseian among the world's language families until more comparison has been made of the vocabulary and until a broader assessment of S.Starostin's (1982) Sino-Caucasian proposal is made in light of the full body of evidence accumulated so far (cf. especially S.Starostin 2007). At present, I would suggest referring to the proposal examined here as simply the "Dene-Yeniseian language link" or the "Dene-Yeniseian hypothesis", depending upon the reader's personal assessment of the evidence for language relatedness.

The morphological homologies, lexical cognates, and sound correspondences proposed between Na-Dene and Yeniseian are already extensive enough for data from each family to help elucidate the historical development of the other family. To stress it once more, this usefulness of the comparanda is what perhaps constitutes the best confirmation of a genetic linguistic link. Genuine language families offer infinitely more than a shared color on a map, a hyphenated family name, or a historiographic association with this or that discoverer. A genetic link provides an invaluable vantage point for discerning the concrete morphological and phonological changes that shaped each member language into what it is today. External comparative evidence is a treasure trove waiting to be used. As regards Dene-Yeniseian, the lid of that treasure chest has yet been raised only slightly.

Further work will require the continued cooperation of specialists in Athabaskan, Eyak, and Tlingit, as well as Yeniseian, including linguists working on Yeniseian within the framework of the Sino-Caucasian or Dene-Caucasian hypothesis. Given the extensive good will and invaluable assistance I have received from my American, Russian, and German colleagues before, during, and after the Dene-Yeniseic Symposium (Feb. 2008), I feel optimistic that this mutual work will proceed at an accelerated pace.

Though historical-comparative linguistics is often a story told about notable individual achievements, the days when anyone can singlehandedly "discover" or "prove" a language family are long gone, if they ever existed at all. My study of Yeniseian and Na-Dene is only one of many contributions in a long and

rich tradition of historical and descriptive work on some of the world's most intricate and fascinating languages. Comparative work is by definition a coming together of multiple minds with diverse knowledge and contrasting viewpoints. Typically left unacknowledged is the crucial task of recording the primary data. Completely unsung are the most important experts of all—the native speakers themselves. Perhaps the story of Dene-Yeniseian began in 1708 with Adriaan Reeland's deduction that Siberia's Ket hunters were cousins of the American Indian. Or when Thomas Jefferson identified the Asian origin of Native Americans. Or 1735, when Cossack adventurer Arzamas Loskutov chose to record the last precious Arin words from the last Arin speaker. Or when Russian peasants on the Yenisei began calling their enigmatic Ket neighbors Siberian Indians. However it began, the clearest lesson from comparing Yeniseian and Na-Dene is that effort spent documenting the world's disappearing languages can have vital impact on the future. Who would have imagined the ancient words Native American and Siberian boarding-school children were punished for speaking a few decades ago could wield a power vast enough to reunite entire continents?

To the nations who passed these languages down through time—the true founders of Dene-Yeniseian

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YENISEIAN, NA-DENE, AND HISTORICAL LINGUISTICS

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1.0. INTRODUCTION

The claim that Ket is related to North American languages is not new. A genetic link between Athabaskan-Tlingit and Yeniseian was proposed as early as 1923 by Italian linguist Alfredo Trombetti. The first suggestion that the Ket people and Native Americans share a special affinity dates back at least to 1708, when the Dutch Orientalist Adriaan Reeland¹ speculated they were related to American Indians (Vajda 2001c:15). Inquiry into a link between an Old World and a New World language family makes a long and interesting story. It involves the contrasting methodologies linguists have applied to these languages and illustrates what challenges lie ahead for future attempts to demonstrate hypotheses of language relatedness.

2.0. IMPLICATIONS FOR THE PEOPLING OF THE NEW WORLD

Before turning to linguistics, I would like to assess my findings in light of what other disciplines have revealed about trans-Beringian prehistory.² My original draft (Vajda 2008) was posted on February 24, 2008, in advance of the Dene-Yeniseic Symposium³ held by the Alaska Native Language Center in Fairbanks on February 26–27, 2008, and continued at the 2008 Meeting of the Alaskan Anthropological Society on February 29, 2008. I have since changed the title to “A Siberian link with Na-Dene languages”. Although I regard it as overwhelmingly likely the Ket represent the last remnant of a formerly diverse mosaic of hunter-gatherer cultures and languages across North Asia—the rest of which, outside the North Pacific Rim, were replaced by reindeer breeders during the past two millennia—I would not want to preempt possible answers to questions of migration, homeland, and time depth involving the ancestral speakers of Dene-Yeniseian. These questions cannot be answered with linguistic data alone, if they can be answered at all.

The Dene-Yeniseian language link could offer insights into the peopling of the New World and also into how fast languages change over time. During the symposium’s final day, Don Dumond (University of Oregon) pointed out that the arrival from North Asia by the ancestral Na-Dene likely occurred before 10,000 to 12,000 years ago. Archaeological research has so far yielded no evidence for a population influx from

North Asia into Alaska in the millennia between the final breaching of the Bering land bridge at the end of the Pleistocene at least 10,000 years ago and the crossing of Bering Strait by the ancestral Eskimo-Aleut about 4500 years BP (cf. also Ben Potter’s contribution to the present volume). The intricate lexical and grammatical homologies I have shown between Na-Dene and Yeniseian, however, would seem to suggest a separation younger than 10,000 years, given what is currently known about rates of language change over time. At present, no compelling reason exists to assume languages changed more slowly in prehistory than in the recent past, though I will return to this possibility below.

The February 2008 symposium featured no presentations on Beringian genetics research. However, it is clear that a close Dene-Yeniseian language connection does not parallel what population geneticists have so far discovered about the peopling of the New World (Schurr 2004). Research on human DNA of North Asian and New World populations by Rubicz et al. (2002), yielded no evidence that Yeniseian and Na-Dene speakers (including the Haida) share a specially close genetic affinity when compared to other peoples of their respective regions. One might expect a Dene-Yeniseian language link to be paralleled by evidence from population genetics, but so far such evidence is lacking (see Scott and O’Rourke, this volume). There is likewise no evidence that the Ket or Athabaskans adopted their present languages from outsiders, a shift that would explain the seeming incongruity between language and genes. In fact, both language groups could be characterized as unusually conservative, with clearly identifiable loanwords forming an inconsequential percent of the vocabulary. Linguistic conservatism is well attested for Athabaskan groups (Kari, this volume), and the same has also been argued for Ket (Vajda 2009).

Another possible explanation for the apparent closeness of the linguistic link between Yeniseian and Athabaskan-Eyak-Tlingit appears to stand at odds with established evidence from population genetics. It is possible that some modern Siberians represent a back migration out of Alaska during the Early Holocene, prior to the establishment of the Eskimo-Aleut on both sides of Bering Strait. Recently published evidence from population genetics indicates something like this indeed occurred (Tamm et al. 2007), though markers linking Yeniseian speakers specifically to the Na-Dene were not detected. A back migration of ancestral Yeniseian speakers into Siberia could, in theory, explain why the linguistic evidence for Dene-Yeniseian might appear younger than 10,000 years. Once again, however, what might seem plausible to linguists is incongruent with findings from other scientific fields. So far, no genetic markers have been found linking Yeniseian speakers specifically with speakers of modern Na-Dene languages. Perhaps the present study will spark new investigations by physical anthropologists of trans-Beringian population links.

Moving from physical to cultural anthropology, Yeniseian and Na-Dene communities share considerable affinity in economic lifeways, despite the relatively recent arrival of the Ket into their present sub-Arctic home. The traditional subsistence patterns of both the Ket and Athabaskans required snow sleds, canoes, footgear designed for traversing snowy terrain, and a variety of hunting, trapping, and fishing techniques. The Athabaskans subsisted for millennia as inland mobile hunters in sub-Arctic terrain, practicing seasonal fishing beside lakes and rivers as well (Ives 1990). By contrast, the Yeniseian peoples entered the taiga from a more southerly point of origin only during the past two millennia in response to pressure from pastoral groups (Vajda, in press 2). Judging from substrate river names, ancestral Yeniseian speakers moved northward from areas west of Lake Baikal and northeast of present-day Tuva, where their original economy appears to have been more fundamentally tied to riverine fishing than upland hunting. Toponymic and archeological evidence suggests the ancient Yeniseians occupied the margins of rivers and streams in more southerly areas of mixed forests, developing a sub-Arctic hunting economy only during the past two millennia. Yeniseian folklore portrays southern forests and mountains as the ancestral home (Aleksenko 1967). In seasonal rituals, encampments beside rivers and lakes take primacy, with inland hunting during colder months representing a departure into a less familiar and less hospitable world (Vajda, in press 1).

Physical evidence attesting to the primacy of ancient Yeniseians as fishers comes from a recent DNA analysis of remains from two Kitoi Culture cemeteries. These sites are probably associated with fishing encampments on the Angara, the major southeastern tributary of the Yenisei (Mooder et al. 2006). Burials there dating between 8000 and 7000 BP reveal a strong genetic affinity with modern populations of Ket and

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¹ Alternatively spelled ‘Adriaan Reeland’, ‘Adriaen Reelant’, ‘Hadrianus Relandus’, etc. See Wikipedia article ‘Adriaan Reeland’ (http://en.wikipedia.org/wiki/Adriaan_Reeland).

² I am indebted to Ben Potter (archaeologist, University of Alaska, Fairbanks) and to other conference participants, as well as to Victor Golla (Athabaskan linguist, Humboldt State University, Arcata, CA) for their insights into how to begin assessing the real-world implications of this language link.

³ The February 2008 meetings were called the “Dene-Yeniseic Symposium” following my occasional use (cf. Vajda 2007) of “Yeniseic” in place of the more traditional “Yeniseian”. With some discussion, the editors and contributors to the present volume have decided to return to “Yeniseian” out of respect for the scholars who originally introduced “Yeniseian” into the linguistics literature.

the Shor, a Turkic-speaking group with notable Yeniseian substrate influence in their language and culture (Vajda 2001c:xiii). These genetic markers are not shared in any appreciable quantity by other contemporary Siberians (or by Native Americans). This strongly suggests that at least some Yeniseian ancestors were primarily fishers as early as the Middle Holocene. To summarize, for both ancient Yeniseians and the Na-Dene, fishing and mobile upland hunting in established territories reflect a deeply rooted seasonal rhythm, though traditional Ket culture developed in a more temperate environment of mixed forest where subsistence through riverine fishing was culturally primary.

So far, the semantic fields specifically represented or seemingly absent among Dene-Yeniseian cognates are not inconsistent with the geographic, temporal and cultural picture emerging from these extra-linguistic studies. Cognate tree names are limited to species shared across Late Pleistocene North Asia and Interior Alaska. These include birch and willow, as well as words for conifer needles and resin. Conifers recolonized interior Alaska 6000 years ago (William Workman, p.c.), with black and white spruce the only widespread coniferous trees today. Cognates in the realm of material culture are also limited to items and practices present on both sides of Bering Strait already many thousands of years ago: snow-sled runner, canoe, holding hook, verb roots denoting specific types of striking motions ('hit endwise with a long object', 'slash') or object deformations ('bend into a hook shape', 'bend less than 180°', 'twist into a spiral'). Predictably, the cognates do not include words for technologies of Late Holocene acquisition, such as the bow and arrow, elaborate storage techniques, or the characteristic North American snowshoes. Perhaps the most fascinating cognate from a cultural angle is a root meaning 'shaman', 'cure by magic', or 'sing shamanically', which is represented in every branch of both language families, except for the sparsely documented Arin and Pumpokol on the Yeniseian side. While shamanism as a North Asian institution is thought to be a relatively late development, the tradition of healing through magical singing was likely inherited from Paleolithic times.

Finally, the pioneering global comparison of traditional myth motifs by Yuri Berezkin (this volume) does reveal a few tantalizing parallels between Yeniseian peoples and Native North America. These include the motif of twin brothers who travel to the sky and the origin of mosquitoes and other blood-sucking insects from the burnt ashes of a malevolent female monster's blood. But these parallels attest more to the distinctiveness of Ket folklore vis-à-vis other North Asian peoples than to any specific connection with the Na-Dene, since these motifs are distributed widely in North America. Specific parallels between the Ket and Athabaskans are few, but possibly include the Navajo motif of Big Fly and the Ket figure of Dragonfly (Kim, this volume); perhaps significant here is the fact that Ket/Yugh and Athabaskan words for 'fly' and 'dragonfly' appear partly cognate. Jim Kari (p.c.) notes the existence of extensive unpublished Tlingit and Athabaskan folklore, which could conceivably contain additional parallels to Yeniseian folklore. Even if more such parallels can be discovered, however, it remains unclear how they should be used to date human prehistory, as no one has yet devised a means of measuring the time depth of shared myth motifs across geographically disparate aboriginal populations.

It seems certain that the linguistic findings for Dene-Yeniseian will stimulate new avenues of inquiry in these fields that could bring this emerging picture into sharper relief. Linguistics can now provide a more convincing demonstration of a language link between an American Indian language and an Asian language than was generally assumed possible—the first such claim to garner the beginnings of what may become general acceptance by the linguistic community. My study thus promises an additional scientific vantage for considering trans-Beringian prehistory. Judging from the parallel findings of archeologists and paleo-ecologists, it is conceivable that Dene-Yeniseian could prove to be a language family older than 10,000 years.

If so, then the linguistic evidence from Dene-Yeniseian would suggest that the apparent incongruity between the Dene-Yeniseian linguistic facts and currently assumed dates for prehistoric trans-Bering migrations could be due to an overestimation of how quickly languages change on average over time. Unless hard evidence of migrations into Alaska from North Asia between 10,000 and 4500 BP can be found, my personal preference would be to entertain the ramifications of what an entry date for the Na-Dene prior to

10,000 BP might mean for historical linguistics. A combination of evidence from Dene-Yeniseian cognates and archaeological dates for tool assemblage shifts in Alaska may yield the first glimmering of suggestion that rates of language change among some aboriginal populations in the Early Holocene were slower on average than traditionally assumed based on observed rates of language change during the historic period. Perhaps the seemingly unusual linguistic conservatism of, say, Lithuanian, during the past two thousand years, rather than the faster change observed among Romance languages during the same period, better approximates the average rate of language change among northern hunter-gatherers in prehistory. If so, then widely accepted language families already held to be ancient, such as Uralic, Algonquian, and Uto-Aztecan, or even Na-Dene itself, may be older than previously assumed, perhaps dating to the first peopling of their respective areas in North Asia and the Americas.

All of this remains conjecture until we can develop tools for evaluating rates of language change that take into consideration the effects of radically different social and geographic contexts. Also, placing the oldest accepted language families farther back in time would further vex the most perplexing conundrum of all: how to reconcile the documented linguistic diversity of the Americas with a presumed first entry date younger than 15,000 years. A solution could conceivably be forthcoming from (1) solid evidence of a much earlier first entry date; (2) evidence of multiple entries in the Late Paleolithic by a linguistically already highly diverse population; (3) more compelling evidence for Greenberg's Amerind hypothesis; or (4) an alternate genetic classification of languages that reduces the 150 or so generally recognized first-level stocks in the Americas to a much smaller number. At present, none of these prospects appears forthcoming.

3.0. DENE-YENISEIAN AND HISTORICAL-COMPARATIVE LINGUISTICS

My work comparing Na-Dene and Yeniseian straddles two different positions in contemporary historical-comparative linguistics: one focused on reconstructing individual proto-languages, the other on providing hypotheses for classifying the world's several thousand languages into a genetic tree. The first, exemplified best in the writings of Lyle Campbell (cf. Campbell 1997), might be called the conservative or mainstream position in historical-comparative linguistics, with its focus on the quantity and quality of evidence needed to establish a language family. This tradition is cautious in accepting new proposals, with the perhaps unintended consequence of discouraging work on establishing new language links. Conservative historical linguists, and I would include myself firmly in this group in terms of the standards I attempt to meet, insist that validating a hypothesis of genetic relationship requires a system of homologies in grammatical morphology as well as a body of lexical cognates extensive enough to reveal systematic sound correspondences. The conservative position places key emphasis on the identification of sound correspondences extensive enough to permit at least rudimentary reconstruction of an ancestral proto-language. It is less concerned with the goal of proposing a global taxonomy of language relatedness, than with the goal of defining which among the world's languages can irrefutably be demonstrated to be related through descent from an ancestral proto-language and which cannot. More conservative assessments place the number of first-level language families well into the hundreds (Lyovin 1997) and express, at best, a determined agnosticism regarding the possibility of establishing more remote connections between these families.

The second tradition, exemplified perhaps most prominently in the work of Joseph Greenberg (cf. Ruhlen 1987), is primarily concerned with classifying the world's languages into the most plausible genetic groupings, given the data currently available. This tradition, an early expression of which appeared in the often uncited writings of Alfredo Trombetti (1923), examines all languages in an attempt to classify them using general taxonomic principles analogous to techniques geneticists use to classify relative closeness and distance among different human populations. Membership in the superfamilies so far proposed—which number no more than two dozen—is typically based on a few morphological or lexical commonalities, such as the striking *m/t* contrast in 1st and 2nd singular pronouns shared across much of Northern Eurasia and the American Arctic. In most cases, the similarities used as a basis for classification are found in only a subset of the languages grouped together. For example, only a minority of languages in Greenberg's Amerind

classification actually shows the famous *n/m* contrast in 1st and 2nd singular pronouns—a feature taken as diagnostic for the family as a whole; in such cases the remaining languages or language groups are linked transitively by other traits, each of which is likewise present in only a subset of the member branches.

As mentioned already, my interest in linking previously established language families places me in the category of linguistic taxonomist, though I insist on conservative standards of assessing potential evidence. In this sense, I see myself as beholden to each of these historical-linguistic positions. I also see the goal of producing a plausible overall hypothesis of genetic classification as partly distinct from the goal of verifying which languages can unambiguously be shown to have derived from a common proto-language. In other words, proposing a hypothesis of genetic classification is for me partly distinct from establishing a language family, though the latter entails the former. The chief disagreements in contemporary historical-comparative linguistics have originated, in my opinion, from a blurring of these two goals and the methods required for achieving them. This blurring perhaps has its origins from how Indo-European was established over 200 years ago.

Both long-rangers (linguists who propose deep genetic connections between the world's established families) and mainstream linguists trace the founding of historical-comparative linguistics to a single event: the discourse presented in 1786 by Sir William Jones to the Royal Asiatic Society which irrefutably demonstrated the existence of an Indo-European language family. Though European languages such as Greek and Latin had long been suspected of being related in some way, Jones introduced the notion that languages can be classified through descent from a common ancestor which itself no longer exists and that this inheritance is deducible from comparing words and grammatical elements still present in the descendent languages. The establishment of the language family as a classification principle based on historical divergence from a shared proto-language is unique to Sir William Jones, but his discovery of Indo-European eventually became a general model for proposing and demonstrating new language families. All of the various contemporary positions in historical-comparative linguistics would probably reference the discovery of Indo-European as a model for their own acceptance of language families. Long rangers emphasize that the founding of Indo-European stemmed from the moment Sir William Jones proposed the family and did not require vindication from the decades of subsequent comparisons and reconstructions to establish its validity. Traditional linguists point to the sheer quantity of evidence alluded to in Jones's original proposal, which included grammatical paradigms as well as lexical cognates. Although none of the sound correspondences evident in these resemblances were actually worked out until later, the evidence from Indo-European comparisons undertaken afterward easily lent itself to these investigations. Consequently, the more conservative tradition is apt to reject new proposals of genetic relationship unless they contain a reasonably analogous quantity and quality of evidence—comparanda obviously amenable to at least partial reconstruction of a proto-language through the presence of systematic sound correspondences. Long-range linguists, on the other hand, emphasize the goal of genetic classification itself and deemphasize the threshold of evidence needed to validate that the languages hypothesized as related do in fact unimpeachably reflect a shared proto-language. In other words, linguists from both traditions in one way or another base their acceptance of language families and their rejection of new claims of genetic relatedness on the same event: the "discovery" of Indo-European.

Disagreements about language classification could perhaps be mediated by reexamining what Sir William Jones actually accomplished in 1786. The founding of Indo-European was not a single event but three simultaneous events. As far as I know, no one has argued this before, because Sir William Jones accomplished all three at a single stroke. Yet each represents a distinct intellectual triumph. First, Jones made a claim of genetic relatedness entailing a new language classification. Second, he cited comparative data in support of his claim that genuinely reflected inheritance from a common ancestral tongue. Third, although his evidence predated modern conceptions of sound laws and linguistic reconstruction, the entire vocabularies and grammatical paradigms he alluded to obviously formed a *system* that ultimately lent itself to comparative analysis and reconstruction. This third part of his triumph—the founding of a language family and not simply making a proposal of language classification—went beyond a mere hypothesis of

genetic relatedness since it provided evidence sufficient to initiate an entire comparative linguistic tradition. The linguists who later began work on Indo-European reconstruction and sound laws already knew what to compare. Because one person accomplished all three tasks simultaneously—making the initial claim, citing the first genuine lexical and grammatical homologies, and amassing evidence sufficient to establish a productive linguistic tradition that eventually served further to validate the proposed claim—the question of who "discovered" or who "proved" Indo-European has rarely arisen.

The events leading to future acceptance of language families will almost certainly differ from this somewhat oversimplified account of the founding of Indo-European. One reason is that the concept of language family has now been established for centuries. Different standards, goals, and expectations have arisen with regard to claiming, demonstrating, and accepting language relatedness. As mentioned above, a few linguists have already classified the world's 6000 or so languages into a small number of superfamilies (cf. Ruhlen 1987). Others recognize several hundred unrelated families and have so far rejected most attempts to classify them into larger genetic units. Balthasar Bickel and Johanna Nichols currently place the number of first-level stocks at around 300 (Nichols, personal communication). Anyone working on establishing a language family today, unlike Sir William Jones, will find themselves grappling with the demands of two different and often antagonistic traditions, intellectually beholden to both yet perhaps regarded as belonging faithfully to neither. One tradition will have already classified the languages into some superfamily and may question why the issue of genetic relatedness is being resurrected at all; the other may regard the entire undertaking as patently impossible from the start.

The historiography of work on Dene-Yeniseian may prove informative for anyone wishing to tackle today's challenges and controversies in genetic linguistics. As mentioned above, the original claim that Yeniseian and Na-Dene represent a genetic unit was made by the Italian linguist Alfredo Trombetti in 1923. Yet Trombetti cited little or no valid evidence for this claim, as far as I can determine, except for the possibly cognate words for 'people' (Ket *de'ŋ*, Athabaskan *diné*). Valid Dene-Yeniseian cognates were proposed much later, by Merritt Ruhlen (1989a,b) and Moscow linguist Sergei Nikolayev (1991), both of whom were working in the context of comparing Yeniseian with Sino-Tibetan and Caucasian languages, but their actual validity became clear only after a system of sound correspondences and morphological patterns had been developed to test them. Up till now no one had amassed the quantity and quality of evidence for Dene-Yeniseian needed to initiate fruitful work on internal reconstruction and the establishment of a system of sound correspondences. This third task is what I attempt in the present volume.

If one accepts Na-Dene and Yeniseian as genetically related, then Trombetti's original linkage of Ket and Kott to Athabaskan and Tlingit (Eyak as a Na-Dene language was unrecognized at the time) represents the first correct claim of genetic relationship between an American Indian family and a family of the Old World, regardless of whether or not it cited valid evidence. Sir William Jones's claim in 1786 would have been no less correct without evidence, however, so if one accepts my arguments for Dene-Yeniseian, then, in a sense, my comparative work is simply validating, or vindicating, Alfredo Trombetti's much earlier claim, which was ignored at the time and generally long forgotten by linguistics.

The second accomplishment of Sir William Jones's famous discourse is the identification of genuine homologies inherited from a common proto-language. With respect to Na-Dene and Yeniseian, valid lexical cognates were identified in the late 1980s and some were published as early as 1991. In that year, Moscow linguist Sergei Nikolayev, working in the larger context of comparing both families to Caucasian languages (Nikolaev 1991) identified several valid cognates. Others appear in earlier unpublished manuscripts by Merritt Ruhlen (1989a, b). At the time of his discovery of Dene-Yeniseian cognates, Ruhlen was working with materials gathered by Moscow linguist Sergei Starostin, who had earlier proposed a genetic link between Yeniseian, Sino-Tibetan, and North Caucasian (cf. S. Starostin 1982, 1984). He noticed a number of lexical similarities between Starostin's Yeniseian reconstructions and Na-Dene vocabulary. During the following decade, Ruhlen and others following the same line of inquiry continued to make lexical comparisons. Blazhek and Bengtson (1994), combining data taken from Ruhlen (1989a,b) and Starostin (1982, 1984), published what my research would support as valid Dene-Yeniseian cognates for 'liver', 'navel', 'stomach', 'conifer resin',

'finger', a perfective verb affix, and possibly a few others among their broader Dene-Caucasian comparisons. The most striking proposed cognate, in my opinion, were Ruhlen's (1998) comparanda for 'birchbark', citing Modern Ket *quj* and Proto-Athabaskan **q'əj*.

The linguists who compared Yeniseian and Na-Dene in the broader context of Sino-Caucasian or Dene-Caucasian during the 1980s and 1990s should be credited, in my estimation, for identifying genuine cognates shared by Yeniseian and Athabaskan-Eyak-Tlingit. The system of sound correspondences I propose in my article confirms that Ruhlen (1998) presented at least eight valid cognates. These are his Yeniseian and Athabaskan, Eyak, or Tlingit comparanda meaning: head, stone, foot, breast, shoulder/arm, birch/birchbark, old, and burn/cook, and possibly a few others. Unless new evidence emerges from the published or unpublished writings of earlier linguists, it was possibly Trombetti, followed by Sergei Nikolaev, Merritt Ruhlen and other "long-range linguists" who discovered and published the first valid Dene-Yeniseian cognates. Although the cognates in their materials form only a small subset of the assembled comparanda, the publication of what can now be supported on the basis of systematic sound correspondences as valid cognates between an Old World and a New World language family represents a linguistic milestone.

Unlike Indo-European, however, neither the first claim of genetic relationship, nor the first publication of cognates established Dene-Yeniseian as an accepted language link. Most linguists coming to my conference presentations on Yeniseian during the years 2000–2002, remained skeptical that any connection between American Indian and Asian language families could ever be demonstrated, given the probable time depth involved.

The reason for this persistent skepticism is that there is no way to distinguish a correct deduction from a wrong guess in genetically classifying languages unless the evidence is systematic and substantial, though linguists differ on exactly what constitutes the threshold for confirmation. A list of lexical similarities can be compiled between any languages. If the languages in question are later shown convincingly to be genetically related, then such a list is likely to include some genuine cognates; if not, the status of all of the words remains impossible to verify with any confidence. If there were some way of being certain that pairs of words like Ket and Athabaskan 'people' or 'birchbark' were genuine cognates, then no one would have to do anything more to demonstrate the relationship. Unless the proposed similarities can be expanded into a discernable system in both vocabulary and grammar, however, they are not sufficient to remove reasonable doubt about the validity of the hypothesis. Even if one accepts a claim of genetic relationship based on such evidence, it is impossible even to start integrating it into the historical-comparative traditions of each member family without enormous additional work. Establishing a language family entails far more than making a correct deduction about genetic relationship.

In this sense, the evidence previously cited in support of a genetic link between Yeniseian and Na-Dene contrasts sharply with the scope of evidence for Indo-European available at the moment Sir William Jones's proposal was made, which ultimately lent itself to a host of valuable avenues of comparative work, including internal reconstruction and the determination of sound laws. The Dene-Yeniseian materials published prior to my study, as far as I can determine, contain fewer than a dozen genuine cognates, almost no valid grammatical homologies, and no correctly identified sound laws. I elaborate on a few of these points in my article, though the topic of assessing the full corpus of earlier proposed evidence for Dene-Yeniseian deserves a separate article in its own right. It is possible that further research will lend support to more of the earlier proposed cognates.

In other words, the third accomplishment by Sir William Jones at the announcement of his discovery—the removal of reasonable doubt about the claim of genetic relationship leading to the founding of a new historical-linguistic tradition—has hitherto been lacking in Dene-Yeniseian studies. I attempt with my contribution to the present volume to accomplish this final task. In cases such as Dene-Yeniseian, where one person makes the initial claim of relatedness and another amasses evidence sufficient to garner general acceptance of the family as established or proven, historical linguists may need to devise a new vocabulary for describing these events. Any simple statement that a single person discovered Dene-Yeniseian in the same way Sir William Jones established Indo-European must be qualified by all of the complexities I have

recounted above. Because Sir William Jones's initial claim of language relationship was so obviously self-validating, the founding of Indo-European can be described in a single sound bite. The founding of Dene-Yeniseian cannot. Future demonstrations of linguistic relatedness are likely to resemble the Dene-Yeniseian rather than the Indo-European historiography, since so many hypotheses about language relationships already exist.

Regardless of methodological considerations, I would argue that the contributions of Alfredo Trombetti and more recent long-range linguists bear historiographic significance. At the same time, the importance of gaining broader acceptance of a language family through the demonstration of systematic evidence should not be dismissed as the subjective whim of historical linguists. If Sir William Jones had made his claim without alluding to evidence capable of garnering broad acceptance, he would certainly have been no less correct. But he could never have impacted the course of linguistic science as he did, or generate the fruitful historical-comparative traditions that followed in the wake of his discovery, only one of which was language classification.

4.0. MY STUDY OF YENISEIAN AND NA-DENE

Taking Dene-Yeniseian to the point where it is possible to begin new avenues of collaborative historical-linguistic and interdisciplinary research involving Ket and Na-Dene languages has been a long journey. My own contribution is included here to round out the historiography of Dene-Yeniseian studies up to the present day.

My interest in Russia and its diverse native languages grew from the fact that my mother's native language was a dialect of Carpatho-Rusyn spoken in eastern Slovakia and northern Hungary that resembles Russian and was the first language I heard as a child. My interest in Native America also stems from my background, since family lore holds we have some Cherokee ancestry on my father's side. This led me to study such Native American languages as Cherokee and Navajo before becoming a professional linguist. Though trained as a Slavist in the 1980s, I eventually became more interested in the exotic and less studied languages of Eurasia, so that the fluent Russian I acquired as a student in Moscow and Leningrad became a research tool rather than my topic of scholarship. I first became aware of Ket in the early 1980s from reading Bernard Comrie's (1981) seminal English-language survey of the languages of the Soviet Union. The section on Ket in particular fascinated me. Whole horizons seemed to lie ahead, awaiting exploration. The system of tones and the bewildering strings of verb prefixes seemed utterly out of place in North Asia, making the language's isolate status all the more intriguing in a region otherwise occupied by suffixing, toneless families such as Uralic and Turkic.

I eventually made a detailed study of all three problems—the tones, the verb morphology, and the persistent enigma of genetic relations—first from a historiographic perspective, later to help solve each of them myself. My first attempts to learn Ket from grammars and articles authored by Soviet linguists convinced me that more work was needed to produce an observationally adequate description of the phonology and verb system. But the general inaccessibility of the published data and the geographic diaspora of the scholars studying the Ket people and language led me first to write a general history and bibliography of Yeniseian studies (Vajda 2001c). While researching this book I traveled to Tomsk, Siberia, in January 1998 at the invitation of Alexandra Kim, whose has contributed one of the articles in the present volume. There I became the first American linguist to work in the Siberian Languages Laboratory established at Tomsk State Teacher Training College by Andreas Dulson, founder of Yeniseian studies in Siberia and author of the first monograph-length grammar of Ket (Dul'zon 1968). In Bonn, at the apartment of Heinrich and Isolde Werner, I became the first English-speaking linguist to work with a native Ket speaker, Zoya Maksunova, who was also visiting the Werners at that time. The various trips I made in 1998 furnished a vast trove of research materials. Today I possess the most complete archive of published and unpublished Ket linguistic and ethnographic materials in the world.

During the next several years I published a small grammar of Ket (2004) as well as new analyses of the tones (Vajda 2003b) and verb morphology (Vajda 2003a). These studies would prove crucial to my work on

the question of whether Ket and its extinct Yeniseian relatives (Yugh, Kott, Arin, Assan, Pumpokol) are genetically related to other languages, the problem that fascinated me most. In the early 1990s, even before becoming aware of claims of genetic relationship by other scholars, I noticed how Ket verb prefixes bore an uncanny resemblance to those of Navajo, a language I had studied earlier. During the research for my first book (Vajda 2001c), I made a complete historiographic study of the many previous proposals linking Ket with such languages as Basque, Burushaski, Sino-Tibetan, Na-Dene, various Caucasian languages, Sumerian, and others. The link with Na-Dene continued to strike me as particularly promising. But researching this possibility myself required mastering all potentially relevant patterns in the Yeniseian tones and verb morphology. Without a deep knowledge of Modern Ket language structure, a principled comparison with the equally complex systems of Athabaskan, Eyak, and Tlingit appeared utterly beyond reach.

During this period I met Bernard Comrie and Johanna Nichols. Like me, they had first trained as Slavicists and later specialized in the non-Slavic languages of the Soviet Union. That these accomplished and world-renowned scholars would be interested in my fledgling work on Ket tones and verb morphology was very encouraging. Johanna Nichols attended my first talk on Modern Ket tones, given at the 1997 Non-Slavic Languages Conference held in Chicago (Vajda 1997). In fall 1998, Bernard Comrie invited me to Leipzig, where I gave the first invited talk at his newly established Linguistics Department of Max Planck Institute for Evolutionary Anthropology. During these years I met nearly every living scholar who had worked on Ket, including Sergei Starostin in Moscow, Natasha Grishina and Sergei Butorin in Novosibirsk, and Heinrich Werner and Stefan Georg in Bonn. Werner and I began a long collaboration that continues unabated to this day. We are currently in the process of writing a comprehensive etymological dictionary of Yeniseian (Vajda and Werner, in preparation), which we plan to dedicate to Sergei Starostin in recognition of his pioneering work on reconstructing Proto-Yeniseian.

In spring 1997 I invited Merritt Ruhlen (Palo Alto, CA) to present a talk at my university. I was impressed that Ruhlen was actively working on the problem of Yeniseian genetic linguistics, while no one else seemed to have given a second thought since Trombetti. Ruhlen's position that Yeniseian was related to Na-Dene as part of a larger Dene-Caucasian language family had already appeared in two of his books on genetic linguistics (Ruhlen 1994, 1996). These books fueled my own long-held suspicions that homologies in Ket and Athabaskan verb prefixes might be more than typological coincidence. I greeted his subsequent publication of 34 putative cognate sets linking Yeniseian and Na-Dene (Ruhlen 1998) as an important event, though most linguists took at best only cursory notice. I also corresponded at this time with long ranger John Bengtson (Minneapolis), and became familiar with his genetic comparisons of Yeniseian words with other languages. It was encouraging to me that other scholars were interested in this problem.

The one proposed cognate in Ruhlen's materials that struck me most was 'birchbark', which I reproduce here once more: Modern Ket *qu'j*, Proto-Athabaskan **q'ej*. I couldn't get the resemblance out of my mind. It taunted me. But when I attempted to use comparanda published by long rangers in an effort to develop some method for finding additional potential cognates, it proved impossible. Everything seemed like random coincidence rather than a system. I was not satisfied simply believing on faith that these words represented the genuine heritage of descent from a common proto-language. For me, a language family was more than a name or a shared color of shading on a map in a linguistics atlas. I wanted systematic, incontrovertible evidence that revealed something unique about the lexical and morphological development of each language involved.

As I pondered how to pursue this study further, I found my interest in Yeniseian historical linguistics suspended between the simple dismissal with which most linguists had greeted Trombetti or Ruhlen, and the equally categorical position by some long rangers that the problem of Yeniseian genetic linguistics had already been solved. The only thing both groups seemed to share in common was that neither appeared interested in working further on the genetic classification of Yeniseian. For most linguists, the problem remained unsolvable; for a few others, it had already been solved to satisfaction. I found myself partly sympathetic, partly frustrated with both positions.

The prospect of ever making Yeniseian comparative data relevant to Na-Dene historical linguistics

continued to appear as daunting as ever. In June 2000, when I drove over 1000 miles in my car to attend an Athabaskan conference in central British Columbia to present some of my comparisons of Yeniseian and Athabaskan verb morphology, the Athabaskanists in attendance were extremely interested but ultimately unimpressed with the meager findings I had to offer (Vajda 2000c). This conference would mark the beginnings of an invaluable collaboration with Michael Krauss and Jeff Leer, who generously took the time to read my early work probably more out of collegiality than with any serious expectation it would yield anything of value to the already highly developed field of Na-Dene historical linguistics.

During the years between 2000 and 2005 I vacillated between polar-opposite attitudes toward my own investigation. Sometimes I believed further work could validate the long-suspected connection between Yeniseian and Na-Dene. At other times I utterly doubted this was possible. I was also influenced by my friend and Ketologist colleague Stefan Georg (Bonn), who viewed work toward demonstrating distant language relationships as likely a waste of time. Stefan is the first westerner to perform original fieldwork with Native Ket speakers in the Yenisei basin and the author of the most impressive English-language grammar of Ket to date (Georg 2007). He is also one of the world's most erudite authorities on North Asian languages and I have always sought out his opinions. Stefan and I are temperamental antipodes, however. For one thing, I simply could never accept that there is nothing left to discover, or that the historical linguist of the future is destined to be nothing more than student of the past and critic of the present. Despite how much Stefan's skepticism tempered my idealism, whenever I set aside Dene-Yeniseian I was tormented by birch bark and verb affixes.

Two books proved especially helpful during this period. One was Johanna Nichols's (1992) *Linguistic Diversity in Space and Time*, which offered an innovative geographical perspective on assessing potential evidence of deep genetic links. When it first came out, I did not see how the general traits she discussed were relevant to my work on Ket. But her global perspective on language families has proven invaluable in helping me frame the typological uniqueness of Ket amid the other languages of North Asia. Michael Fortescue's book *Language Relations across Bering Strait* was also significant for its identification of a specific inventory of unusual morphological features shared between Yeniseian and Na-Dene, but not by other Northern Hemisphere languages (Fortescue 1998, especially pages 213–219). Fortescue's "language mesh" is a helpful concept for describing groups of languages sharing interesting similarities that can neither be readily identified as evidence of a genetic origin nor reliably attributed to language contact. To simply ignore the traits discussed by Fortescue and Nichols would mean their potential value in historical linguistics would remain without assessment. I believe both of these books will become more appreciated as time passes.

Using all of these sources as guidelines and examining both structural and lexical features, I slowly gathered potential evidence for Dene-Yeniseian, some of which I presented at various conferences (Vajda 2000a,b,c, 2001a,b). At these gatherings, certain of my comparisons caught the eye of individual linguists. My treatment of Yeniseian tones as deriving from consonant reflexes attestable in Na-Dene (Vajda 2001a) led Eric Hamp (University of Chicago) to conclude that the connection was valid. He was the first traditional linguist to take that view and state it publicly. At another talk a few months later in Santa Barbara (Vajda 2001b), my synchronic comparison of Modern Ket and Athabaskan tense/mood markers, notably the /s/-prefix, which had become a vestigial structural element in Yeniseian but remains productive in Na-Dene, led Athabaskanist Jim Kari (University of Alaska Fairbanks) to the same conclusion. At the time, I myself remained far less convinced. No real system was emerging across the entire phonology and verb morphology and I couldn't be sure if the similarities I was discovering were isolated coincidences or part of a larger pattern as yet invisible to me. By this time I had come to share little in common with the long rangers due to my conclusion that Haida was not a member of Na-Dene, and by the persistent skepticism with which I regarded not only their prior claims, but also my own efforts toward establishing a connection between Yeniseian and the remainder of Na-Dene.

In summer 2001 I met Bob Dixon and Alexandra Aikhenvald (formerly at the Research Centre for Linguistic Typology, La Trobe University, Melbourne) and was inspired by their call to document the world's

disappearing languages (cf. Dixon 1997). I resolved to help my colleagues in Russia and Germany by working with fluent Ket speakers to describe the language before it disappeared. From 2002 to 2004 I set aside the genetic comparison of Yeniseian and Na-Dene, devoting my energies instead to synchronic descriptions of Ket tones and verb morphology. I would revisit Dene-Yeniseian at the Max Planck Institute for Evolutionary Anthropology, Leipzig, where I spent most of 2005 and 2006 at the invitation of the Linguistics Department director, Bernard Comrie. Only on one occasion, near the end of my first visit in 2005, did Bernard ask me if I was continuing my work on Yeniseian and Na-Dene. This question is the reason I resumed Dene-Yeniseian studies at that time. In retrospect, I think Bernard Comrie has done more to unify the scientific study of languages across the continents than any other living linguist. Also important for me was the fact that during my presentations of research on Modern Ket verb morphology, Juliette Blevins of the MPI Linguistics Department, who had recently published the enormously useful book *Evolutionary Phonology* (Blevins 2004), encouraged me to return to serious work on the possibility that Yeniseian was related to Na-Dene. During the second half of my stay in Leipzig in 2005, among the numerous other tasks I set before myself and after traveling to Siberia from Germany to work with Native Ket informants, I methodically worked through every Yeniseian and Athabaskan dictionary I could find in the magnificent Max Planck library, leafing through them carefully page by page and compiling long lists of lexical similarities. Most of these turned out to be fruitless coincidences, in the end, and there were times I might have tossed Young and Morgan's (1992) magnificent Navajo dictionary right out the institute window had the tome not been so heavy. I also redoubled my comparisons of Yeniseian and Athabaskan verb prefixes, but this was hampered by the lack of any published overall reconstruction of Proto-Athabaskan verb morphology. In the end, I had to attempt a crude model of the Proto-Athabaskan verb string myself, with crucial suggestions from Michael Krauss, Jeff Leer, and Jim Kari, yielding a respectable approximation, which appears as Table 8 in my contribution to this volume.

In resuming lexical comparisons between Yeniseian and Na-Dene, I set aside the comparanda published earlier by Trombetti, Ruhlen, and other long rangers and started from scratch. Later, after convincing myself of the genetic relationship by gathering sufficient evidence to propose systematic sound correspondences, I returned to these lists and picked out which of the comparanda I thought I could validate as genuine cognates. These included not only Ruhlen's 'birchbark' and several others, but also what I believe may be the earliest proposed genuine grammatical cognate: the N-perfective affix cited in Yeniseian and Athabaskan by Blazhek and Bengtson (1995:41). The first real glimmerings that my lexical comparisons might yield more than random similarities came one afternoon in my office at Max Planck when I realized not only that roots meaning 'sled' and 'canoe' resembled one another, but words for their component parts, such as 'prow' and 'snow-sled runner' also looked plausibly cognate. Finally, here was the beginning of a *system* that struck me as beyond the realm of chance. For the first time in over a decade of off-and-on research into the question of Yeniseian and Na-Dene genetic relations, I became convinced that demonstrating the connection was actually possible. At that moment I understood how an archaeologist must feel who peers inside a freshly opened Egyptian tomb and sees what no one else has seen for thousands of years. That brief feeling of discovery was so overwhelming I had to leave my office and walk around among the birch trees in the park near the Max Planck Institute building for half an hour to take it in.

From these and other putative cognates representing lexical subsystems, including a pair of cognate roots for 'dark' and 'light', I began to construct the beginnings of a sound correspondence theory. This was difficult going and many of my initial assumptions proved wrong-headed. If I ever write an article describing all of my false starts, mistakes, and fruitless first assumptions, it would easily exceed in length my contributions to the present volume. In a number of cases, however, a correspondence suggested by the Yeniseian forms led me almost like magic to find a cognate in Na-Dene I would not otherwise have known existed. Phonological patterns among the Na-Dene and Yeniseian forms began to suggest explanations for irregular Yeniseian plurals and the distribution of certain vowel and consonant sounds in Modern Ket.

I presented some of these results at Max Planck in December 2005 (Vajda 2005), after which the Linguistics Department director, Bernard Comrie, who had invited me in the first place and who remained quietly but

persistently interested in my slow progress, funded a "Na-Dene Workshop" to be held at Max Planck in August 2006. The purpose of this meeting was to bring together specialists on Na-Dene reconstruction such as Michael Krauss and Jeff Leer, as well as noted Haida expert John Enrico, to examine whether Yeniseian or Haida comparanda could contribute anything to the historical picture emerging from progress made in reconstructing Proto-Athabaskan-Eyak-Tlingit. The results of this meeting, a summary of which appeared in the *SSILA Bulletin* (No. 242, Aug. 22, 2006), were three-fold. First, Leer's advances in understanding Na-Dene phonology and vocabulary (cf. Leer, this volume) yielded no evidence that Haida belonged to Na-Dene; in fact, some of the new patterns he found rendered previously proposed Haida cognates implausible, just as Enrico's study of loanwords between Tlingit and Haida removed others from consideration (Enrico 2004:267-295), though Enrico throughout the conference continued to voice support that the Haida link would eventually be validated. Second, advances in Na-Dene reconstruction demonstrated that the already established genetic relationship of Tlingit to Athabaskan-Eyak involved a larger number of systematic sound correspondences than previously assumed, with possibly up to a quarter of the basic roots being cognate. Finally, the guarded consensus of the participants was that demonstrating a genetic relationship between Yeniseian and Athabaskan-Eyak-Tlingit was now a serious prospect.

With this possibility in mind, we also discussed the issue of language family names. Michael Krauss somewhat jokingly suggested "Deniseic", but I stuck with the "Dene-Yeniseian" label I had been using already for the past year. The name "Dene-Deng", which combined both families' words for 'people' was also considered. Whether to keep the name "Na-Dene" was a thornier problem, since it appeared increasingly likely that Haida was not a member of this family. This term was first coined by Edward Sapir in 1915 (Sapir 1915) by combining Tlingit *na* 'people' with Athabaskan *dene*, with Haida *na* 'house' likewise represented in the name. Lyle Campbell (1997) and others who wanted to underscore the exclusion of Haida had replaced "Na-Dene" with the rather cumbersome "Athabaskan-Eyak-Tlingit" or "AET". Jeff Leer coined the ingenious "Tlina-Dine" by combining the Eyak and Athabaskan collective words for 'people'; Eyak *řina* 'people' also contains, and thus represents, the Tlingit syllable *na* 'people'. In the end, the established term "Na-Dene" will probably remain, regardless how the question of Haida's genetic affiliation is ultimately resolved.

For me, in retrospect, two results from the Leipzig Na-Dene Workshop stand out. First, Jeff Leer's novel application of Tlingit data in reconstructing Proto-Na-Dene opened several unexpected possibilities for Yeniseian comparison (some of these are explicitly discussed in my contribution to the present volume). Second, the reception of my two talks (Vajda 2006a, 2006b) at that meeting showed that demonstrating a genetic connection with Yeniseian would require me to gain a much more sophisticated knowledge of Na-Dene forms and patterns. Paging through dictionaries or skimming grammatical descriptions was insufficient for accomplishing the task I had set before me. Much time during my presentations at the Na-Dene Workshop was expended correcting or clarifying the Na-Dene forms I was attempting to use in my comparisons. In retrospect, this sort of critical input proved more valuable than anything else to make the case for Dene-Yeniseian. Even though Michael Krauss and Jeff Leer were probably more skeptical than I was over these years about demonstrating this language link, their generous sharing of knowledge and unpublished materials was absolutely invaluable, and I credit the demonstration of the Dene-Yeniseian link to them as much as to anyone else. Anyone hoping to demonstrate a new language link (or an old one) must become a serious student of, if not an expert in, all of the languages under consideration. Language families obvious from casual inspection have all long ago been established. It is easy to forget that Sir William Jones was, first and foremost, an accomplished scholar of the languages that came to be classified as Indo-European. Long before announcing his conclusion, Jones probably noted many similarities between these languages, the full significance of which he himself may have doubted for many years. In future investigations of potential language links, it will be essential for specialists with different bases of knowledge to collaborate closely and respectfully, as I have managed to do with Yeniseian and Na-Dene scholars. One of the reasons I presented material on Yeniseian and Na-Dene before I could demonstrate the relationship was to gain the interest and participation of Athabaskanists and other specialists whose knowledge was invaluable to me.

Thanks largely to crucial input from Michael Krauss and Jeff Leer, after the August 2006 Na-Dene

Workshop I made a number of advances in understanding how Yeniseian and Na-Dene vocabulary and verb affixes might represent a homologous system. These included a new understanding of the function of what I call the L-progressive and the N-perfective affix, which in Na-Dene are suffixed to the final verb root, but which in Yeniseian appear after the old auxiliary verb, a morpheme that became a tense/mood prefix in both families; consequently, these morphemes appear as prefixes in Modern Yeniseian, but remained suffixes in Na-Dene. I discussed this with Jeff after the workshop and he found the idea plausible. Krauss and Leer were also impressed by a few morphologically complex nouns that seemed unmistakably composed of cognate morphemes, such as the distinctive compound 'head-fur', meaning 'human head hair', and 'holding hook', derive from an instrumental noun suffix and a root meaning 'hook-shaped' or 'bent back'. Not only were each of the morphemes in these complex words likely cognate, they also occur in each family outside of the given compounds as well. During the month immediately following the conference, Leer's advances in Proto-Na-Dene reconstruction (cf. Leer, this volume) led me to detect a number of striking phonological patterns among my putative Dene-Yeniseian cognates (cf. Vajda, this volume). I first presented these findings at a Max Planck Institute Seminar talk on September 15, 2006 (Vajda 2006c). This presentation was sandwiched into a 36-hour stopover in Leipzig between my attendance of a conference in St. Petersburg, Russia, and my flight home to Washington State the next morning. The St. Petersburg event honored the centenary of the birth of E. A. Kreinovich, seminal scholar of Ket and pioneer in describing the verb morphology (Kreinovich 1968). His work, like that of every scholar who has performed original fieldwork documenting Yeniseian or Na-Dene languages, is at least as important as anyone else's in ultimately leading to a demonstration of genetic relationship.

One of the facts I became convinced of during my comparative work was that the urgent task of describing the world's disappearing languages and the seemingly not so urgent task of studying their historical interconnections are, in fact, intimately intertwined. The importance of documentation work on individual Yeniseian and Na-Dene languages, begun hundreds of years ago and far from complete today, could receive an important stimulus from the unexpected demonstration of genetic relationship involving an obscure Siberian language and a well-known and widespread Native American language family. Conversely, it was my interest in studying Ket linguistic prehistory that led me to describe the Modern Ket tones and verb morphology. Still, I remain convinced that the need to document endangered languages—a case so eloquently made by Bob Dixon, Mike Krauss and others—remains the single most important linguistic challenge of our generation. In the long run, the most important outcome of my study of Dene-Yeniseian may be its potential to inspire other linguists to document languages for which little description yet exists.

The case for cross-pollination between historical-comparative linguistics and the task of achieving observationally adequate descriptions as well as detailed lexical records of languages under imminent threat of extinction should be emphasized more broadly. This is another reason I have always been grateful for anyone else's contribution to Ket studies, regardless of their differences with me in interpreting the data. Any human language is so dauntingly complex that, even if all the world's linguists were to study it, there would still be work left to do. This is all the more poignantly true for a critically endangered language on the verge of taking with it into oblivion an entire universe of human experience and all it might reveal about linguistic structure and human prehistory. Anyone who has studied Ket is and always will be my colleague.

Interest in the possibility of demonstrating a language connection across Bering Strait stemming from these various 2006 meetings and presentations culminated in Jim Kari organizing the Dene-Yeniseian Symposium in Fairbanks and Anchorage during the last week of February 2008, out of which the present volume grew. Prior to the conference an email list was established as well as an electronic reading list/bulletin board through the University of Alaska Fairbanks Rasmuson Library. Interested specialists were able to correspond and circulate background readings as well as preliminary drafts of papers by me and Jeff Leer weeks in advance of the conference. The extensive critiquing of my drafts by Jim Kari, Mike Krauss and Jeff Leer in email exchanges over the Internet provided vital assistance to me in compiling the correct forms and meanings of the Na-Dene comparanda I presented in Fairbanks and Anchorage.

The symposium opened in Fairbanks with a serious debate over whether there was any evidence at all

in support Dene-Yeniseian. It ended three days later in Anchorage with anthropologists, archeologists and linguists debating what the Dene-Yeniseian cognates—yes, cognate!—for 'birchbark' might reveal about the original Na-Dene migration into Alaska. Pollen studies indicate that the birch growing in coastal Alaska during the Late Pleistocene and Early Holocene was apparently a dwarf variety too small for practical utilization of its bark. Perhaps 'birchbark'—Merritt Ruhlen's most captivating cognate—can provide evidence that the ancestors of the Na-Dene established themselves first inland, where tree-sized paper birch grew even during the Pleistocene, and not first along the coast. This would concur with other abundant Na-Dene internal evidence of an interior homeland (Jim Kari, p.c.).

This is my account of how Yeniseian and Na-Dene came to be accepted as genetically linked, at least by some linguists, including myself. To me, the Alaska Symposium of February 2008 marks the beginning, not the conclusion, of Dene-Yeniseian historical linguistics. The body of data supporting Dene-Yeniseian is now such that critical attention is likely to prove more beneficial than ever. Criticism can now be directed at perceived internal contradictions in the system presented, and need not be delivered, nor taken in terms of a wholesale rejection. Future progress holds the promise of contributing valuable data useful for the internal reconstruction of both Proto-Yeniseian and Proto-Na-Dene, as well as improving our understanding of trans-Beringian prehistory.

Dene-Yeniseian was founded on a volatile mix of inspired belief and determined skepticism, non-scientific intuition and rigorous methodology. Anyone hoping to demonstrate a new (or a long suspected) language family must learn how to agree with people who don't agree with each other, to assume that what others know might be more valuable than what you know, and above all to challenge your own assumptions again and again without abandoning them prematurely. I have tried to explain how and why a large number of individuals—past and present—deserve credit for the founding of the Dene-Yeniseian language link. I myself have studied these languages not out of desire for personal recognition but simply because I love them and want others realize their unique potential to contribute to a better understanding of human prehistory.

5.0. LANGUAGE LINK OR LANGUAGE FAMILY?

At this point I want to address the broader Dene-Caucasian hypothesis. My study of Yeniseian remains a work in progress in many respects, one of the most important being that I have not yet attempted a thorough analysis of existing proposals linking Yeniseian to other Old World families. I chose to limit my comparisons to Yeniseian and Na-Dene because I found a system of grammatical homologies in verb morphology shared specifically between Yeniseian and Athabaskan-Eyak-Tlingit. This system is rather striking and does not appear to be found in other putative members of Dene-Caucasian, including Haida, nor in other languages of the world. Nevertheless, it is premature to conclude whether Yeniseian and Na-Dene form a separate family or are related in the context of a larger family that includes other Old World members such as Sino-Tibetan, Burushaski (an isolate of northern Pakistan), North Caucasian, and possibly others. Until this question finds a firm answer, I would prefer to call my hypothesis the "Dene-Yeniseian language link" rather than the "Dene-Yeniseian family".

The most detailed evidence for Dene-Caucasian presented to date appear in Bengtson (2008), an article that came to my attention a few months after the February 2008 DY Symposium. In the ensuing year and a half that has passed I have heard serious arguments from George Starostin in favor of linking Yeniseian closer to Burushaski than Na-Dene.⁴ I have also discussed at length with Jeff Leer potential evidence that Sino-Tibetan could be related to Yeniseian and Na-Dene. At present, several logistic problems hinder me from integrating my Dene-Yeniseian research with these broader hypotheses. The original proposal by Starostin and Nikolaev (1994) linking Abkhaz-Adygh (the Northwest Caucasian family) and Nakh-Daghestanian (the Northeast Caucasian family) into a single North Caucasian family is difficult for me to assess based on lexical evidence

⁴ Previous claims of a genetic link between Yeniseian and Burushaski are numerous and the issue is worth more attention. See Vajda (2001c:357-359) for a complete listing of these hypotheses and the publications in which they appear. See also Van Driem (2002) for a more recent presentation in favor of a Yeniseian-Burushaski language connection.

alone, since it lacks the type of systematic comparison of morphological systems I have undertaken for Dene-Yeniseian. It has so far not been possible for me to compare Proto-North-Caucasian verb morphology with the system I have proposed for Yeniseian and Na-Dene. Nor have I addressed Nikolaev's (1991) North Caucasian and Na-Dene lexical comparisons, since that study's inventory of Proto-Na-Dene obstruents—shown most accessibly in Blazhek and Bengtson (1995:13) together with comparisons with other putative Dene-Caucasian branches—differs significantly from what Jeff Leer (this volume) has proposed for Proto-Na-Dene. Leer's system is based on more than 30 years of meticulous research, and I cannot easily reconcile it with the Na-Dene cited by Nikolayev.⁵

Certain lexical comparisons involving Sino-Tibetan seem especially promising to me in light of what I have found for Dene-Yeniseian. Note the following proto-forms for 'liver' in Sino-Tibetan, Yeniseian, and Na-Dene, the specific triple comparison of which first appeared, to my knowledge, in Blazhek and Bengtson (1995:18).

	Yeniseian	Na-Dene	Sino-Tibetan
'liver'	*sāŋ	*sənt'	*m-sin

The Yeniseian proto-form is from Starostin (1982), the Na-Dene from Leer (this volume), and the Sino-Tibetan from Benedict (1972:55). Blazhek and Bengtson (1995:19) originally cited Proto-Athabaskan *sād, 'liver' and Eyak *sahd* to suggest, following Nikolaev (1991), an original coda form something like *nt by analogy to the correspondence between Proto-Athabaskan *gunt' 'knee' and Eyak *guh* ~ *guhnd*. Leer (this volume), through independent work, has demonstrated this reasoning as valid within Na-Dene. Vajda (this volume) shows how the final nasal of the Yeniseian word can be derived from the glottalized coda *nt' posited by Leer. This triple resemblance in proto-forms for 'liver' across Yeniseian, Na-Dene, and Sino-Tibetan seems striking to me. Additional comparanda from other putative Dene-Caucasian languages, such as Starostin's Proto-North-Caucasian *cwājme 'bile' (S. Starostin 1995:272) also suggest cognates proposed between Yeniseian with other Eurasian language families should be examined seriously.⁶ Though I excluded Sino-Tibetan from the present study due to difficulty in assessing historical Tibeto-Burman verb morphology, I would single it out as a promising potential relative of Yeniseian and Na-Dene. Future testing of this hypothesis would require, at the very least, a fundamental comparison involving all that is known about historical Tibeto-Burman verb structure, analogous to what I have attempted for Yeniseian and Na-Dene, along with reconstruction of basic Sino-Tibetan vocabulary. As I have stated, I am sympathetic to the goal of demonstrating genetic links between established language families and suspect that some existing long-distance claims will ultimately be vindicated by amassing rigorous evidence that meets generally accepted historical-comparative standards of proof. The general issue of demonstrating language relationships is treated at length in the present volume by Bernard Comrie and Johanna Nichols.

To summarize my own position, the Dene-Caucasian hypothesis, just like my narrower hypothesis of

⁵ It might be worth mentioning that Sergei Starostin continued to regard as tentative Nikolaev's (1991) original connection of Na-Dene to North Caucasian, and consequently the implicit transitive linkage of Na-Dene to Yeniseian through Starostin's own earlier Sino-Caucasian proposal. His last assessment merely placed a question mark after Na-Dene as a possible member of a broadened Sino-Caucasian family (Burlak and Starostin 2001).

⁶ The first suggestion that Na-Dene was related to Sino-Tibetan appears to have been made as early as 1920 by Edward Sapir in his personal correspondence (cf. Bengtson 1994). As far as I can determine, the first published claim that Yeniseian was related to Sino-Tibetan was made by James Byrne (Byrne 1892:472-478) in a discussion of the world's language families that also happened to include the first description of Ket and Kott data in English (cf. Vajda 2001c:74-75). Claims that Yeniseian is related to Sino-Tibetan have been repeated by many other scholars during the past century, as have been suggestions that Sino-Tibetan could be related to Na-Dene; on the latter historiography, cf. Blazhek and Bengtson (1995). Trombetti was the first to explicitly connect Sino-Tibetan, Yeniseian and Athabaskan-Tlingit; cf. the English-language annotations provided for Trombetti's relevant publications in Vajda (2001c:280-281). Triple comparisons of Sino-Tibetan, Yeniseian, and Na-Dene words appear first in recent work on Dene-Caucasian, notably Blazhek and Bengtson (1995).

a Dene-Yeniseian language link, should be studied more thoroughly. Only after this has been done will it be possible to make a firm conclusion about the relationship of Yeniseian and Na-Dene to the other putative members of Dene-Caucasian. Dene-Yeniseian itself represents two distinct families: Yeniseian and Athabaskan/Eyak + Tlingit (in other words, Na-Dene excluding Haida). I am certain Yeniseian is not more closely related to Tlingit or to Athabaskan-Eyak but rather is related to Na-Dene as a whole. Yeniseian itself consists of several documented languages, all of which except for Ket are now extinct. Vajda (in press 2) estimates the breakup of Common Yeniseian occurred less than 2500 years ago in conjunction with the spread of pastoral peoples into South Siberia. Na-Dene consists of Athabaskan-Eyak, which is linked as a coordinate branch to Tlingit at a much greater time depth. Na-Dene languages share a large number of cognates (Leer puts the total at perhaps as much as one quarter of the vocabulary), as well as extensive homologies in grammar, most notably an intricate system of pre-verb root classifiers unique to Na-Dene. Yeniseian-Na-Dene cognates are probably no more than 10 percent of the basic vocabulary, while cognate roots shared by Tlingit with Athabaskan/Eyak are more than twice that percentage (Jeff Leer, p.c.). Most conspicuously, Yeniseian lacks the famous Na-Dene classifiers, a unique system of valence prefixes derived from a partial merger of three distinct morpheme classes, though I argue that most of the classifier components have Yeniseian cognates. I suspect the separation of Yeniseian and Na-Dene dates back to a migration of ancestral speakers of Na-Dene from North Asia into Alaska; the question of the timing of that separation remains open (cf. the discussion above). My comparison of Yeniseian and Na-Dene failed to turn up new evidence in favor of linking either family with Haida. If Haida is indeed related to Athabaskan-Eyak-Tlingit, it would appear to be at a time depth older than the link between Yeniseian and Na-Dene.

I included this section on broader proposals of genetic relationship involving Yeniseian because I wish my article to be received as a constructive contribution to long-range as well as mainstream historical linguistics. I also want to acknowledge all prior contributions to Dene-Yeniseian studies and emphasize that my own work on these languages did not arise in a vacuum, but rather builds upon a number of linguistic traditions.

6.0. CONCLUSION

During the past 15 years I have nearly frozen in central Siberia, grappled with the most extraordinary morphological structures imaginable, and enjoyed the privilege and challenge of working with some of the most brilliant and diverse minds in linguistics. The gulf between linguistic traditions has at times seemed more daunting than the geographic divide separating Yeniseian from Na-Dene. I think that future scholarship will fully vindicate conservative judgments on linguistic methodology as well as the plausibility of establishing new genetic linkages. The rigorous historical-comparative method developed two centuries ago remains the only reliable means of testing hypotheses of language classification. At the same time, some old attitudes seem in need of 21st century replacement. Not so long ago people named entire continents after themselves without bothering to visit them. The self-importance of mountain climbers often dwarfed the mountains they stood upon. Staking claims of language relatedness should not be a scramble for personal recognition, with little appreciation for those who provided the crucial prior documentation or who laid the groundwork with earlier hypotheses. With so many of the world's languages poised for extinction in the next century, it is more urgent than ever for linguists with differing assumptions and unique knowledge to forge a new collaboration by keeping the irreplaceable value of the languages they study as their guiding star. What is sorely needed in historical linguistics is an intellectual atmosphere that allows a middle ground for genetic hypotheses that are promising enough to warrant serious additional work and constructive critical attention. My article is offered up not as a new demonstration of an unexpected language link, but rather as an affirmation that today's seemingly irreconcilable linguistic positions can and must be bridged. Though there are conservative linguists and those who seek new horizons, there is only one science of historical linguistics.

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Part 2. The Interdisciplinary Context for Dene-Yeniseian

GENES ACROSS BERINGIA: A PHYSICAL ANTHROPOLOGICAL PERSPECTIVE ON THE DENE-YENISEIAN HYPOTHESIS

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1.0. INTRODUCTION

In the Boasian triad of race, language and culture (Boas 1940), anthropologists have long acknowledged that the process of change, or evolution, accelerates as one moves from biology, to language, to culture. Deducing deep historical relationships based on cultural elements is difficult, given the ease of borrowing (diffusion) and the rapidity of developing and adopting new ideas (innovation) or losing old ones (cultural drift/selection). Despite its comparable potential for horizontal as well as vertical transmission, language is still much more conservative than culture. Linguistic ties can often be perceived over many millennia, though there is no consensus among historical linguists on the temporal limits of establishing 'genetic' relationships. Given the well known case of Indo-European languages, most would agree that recognizable linguistic similarities can persevere for at least 5000 years. Beyond that temporal limit, the consensus among linguists falls apart. Manning (2006) sets the range from about 5000 to 10,000 years. Biology, in the form of observable (cf. skin, hair, eye color), measurable (cf. stature, cephalic index), morphological (cf. shovel-shaped incisors, fingerprint patterns), and genetic traits (red blood cell antigens, serum proteins, red cell enzymes, DNA polymorphisms), is much more conservative than language. Biological affinities are evident among populations whose linguistic ties are entirely obscured. For example, there is no obvious connection between Indo-European and Caucasian, but the biological similarities of speakers from these two language families is observed consistently across many biological systems. Eskimo-Aleuts and American Indians, whose linguistic affinities are blurred by the passage of time, also have biological ties that are clearly discernible. For these examples and more, see Cavalli-Sforza et al. (1994) for genetic markers and Scott and Turner (1997) for tooth crown and root trait frequencies.

The linguistic similarities between members of the Na-Dene and Yenisei language families demonstrated by Edward Vajda, Merritt Ruhlen (1998), and others (i.e., Dene-Yeniseian hypothesis), can only be fully appreciated by those with training in linguistics. Our goal is to survey the literature in physical anthropology and genetics that has some bearing on the linguistic hypothesis linking Dene and Yenisei speakers. In the case of Na-Dene, that involves populations from Alaska and western Canada who are referred to as northern Athapaskans (e.g., Kutchin, Tanana, Koyukon, Ahtna, Ingalik, Tanaina, Dogrib, Slave, Tutchone, Beaver, etc.), recent migrant populations to the American Southwest who are called southern Athapaskans (Navajo, Apache), and the more distantly related Tlingit on the coast of southeast Alaska. There are few biological data available for Athapaskan groups from California (Hupa), the Plateau (Nicola) and northern Plains (Sarsi). While the Na-Dene family is represented by several dozen distinct groups in North America, the only surviving speakers of Yenisei are the Kets of central Siberia.

In reviewing the literature, we found only one instance where geneticists tested explicitly the Dene-Yeniseian hypothesis (Rubicz et al. 2001). Most research deals more broadly with peopling of the New World, genetic differentiation among Siberians in a broader Asian context, or the interrelationships among Native American populations. Out of a substantial, albeit relatively recent literature, we focus primarily on genetic analyses that have the most direct bearing on the proposed linkage of groups in America (Athapaskans and Tlingits) and Asia (Kets).

1.1. Methods

We employ two primary methods to address the issue of biological relationships between Kets and Na-Dene-speaking populations in the New World. The first method is biodistance. That is, researchers compile data on multiple variables across a range of populations and then employ distance statistics to determine relative pairwise similarity among groups. Say, for example, you have three samples: A, B, and C. Assume further that the pairwise distance values are A-B (0.50), A-C (0.50), and B-C (0.25). In this instance, B and C are most similar to one another and both are equally distant from A. Given a number of assumptions about methods of observation, evolutionary mechanisms, number of variables, etc. (cf. Scott 1992), the inference is that B and C share a common ancestor more recently than either group shares with A. This could be illustrated in a dendrogram (tree) or two dimensional diagram. Of course, no analysis is this simple but the general principle remains the same. Relatively small distance values between groups suggest a recent common ancestry, while large distances indicate a common ancestor at a more remote point in the past. The second method revolves around the presence or absence of shared and unique alleles or haplogroups. For example, do Kets and Athapaskans share an unusual gene/haplogroup that is never, or rarely, observed in other groups? When focus is on a single genetic marker, no distances are calculated nor are trees plotted. If Kets and Athapaskans share a unique allele, this would support the proposition of direct biological affiliation.

Given the literature at our disposal, it would be difficult to summarize and reanalyze data from earlier studies. However, we can extract the essence of the issues we are addressing. For example, from a biodistance standpoint, where do Kets fall in relation to Siberian and Native American population? Do they cluster most closely with Siberian or New World populations? Are there any overall linkages to Na-Dene in any particular genetic system? Are there any unique or rare genetic markers that indicate shared ancestry between Kets and Athapaskans in the early Holocene?

2.0. BIODISTANCE

Ruhlen (1998:13,994) proposed a distant linguistic relationship between speakers of Yeniseian and Na-Dene based on "36 sets of cognate words that appear to be shared by Yeniseian and Na-Dene, but not (for the most part) by other language families." Given the distance involved between surviving members of these families, notably Kets in central Siberia and Athapaskans/Tlingits in the Americas, he ruled out borrowing as a possible explanation for the shared similarities. He concluded that many millennia ago, Na-Dene and Yenisei speakers formed a single population in Eurasia. "Part of this population migrated to the New World, giving rise to the Na-Dene languages, while the portion of the population that remained in Asia gave rise to the Yeniseian languages" (Ruhlen 1998:12,995).

Around the time Ruhlen (1998) was proposing a genetic relationship between Yeniseian and Na-Dene on linguistic grounds, Michael Crawford and his students and colleagues were pursuing genetic studies among Siberian populations. As Crawford had conducted field research in two Ket villages, he and his co-workers were in a position to test Ruhlen's hypothesis using genetic data. A genetic test of the proposed linguistic hypothesis was published in an article entitled "Genetic Evidence for the Phylogenetic Relationship between Na-Dene and Yeniseian Speakers" (Rubicz et al. 2002).

The genetic data used by Rubicz et al. (2002) included eight alleles at four blood group loci, three alleles at two immunoglobulin loci, and four mitochondrial haplogroups. The authors focused on the four mtDNA

haplogroups that characterize ca. 97% of all Native Americans (i.e., A, B, C, D), but they did not consider subtypes or other common Asian and Eurasian haplogroups. In their analysis, they employed the method of Harpending and Jenkins (1973) to calculate a matrix of pairwise population distances. The distance matrix was subjected to principal components analysis, the final product of which was two eigenvectors representing the first and second principal components (PC) that were plotted on a two-dimensional map. When samples are plotted by PC I and PC II, proximity on the map indicates relative genetic similarity. The method also allows researchers to plot the location of alleles/haplogroups on the map to show how each gene (or haplogroup) contributes to the pattern of relationships.

Two of the eigenvector plots provided by Rubicz et al. (2002) are redrawn as Figures 1 and 2. Figure 1, based on the analysis of seven alleles, includes seven Asian and ten New World samples. The first principal component (PC I) separates groups horizontally while PC II separates groups vertically. Kets are found in the upper right quadrant in close proximity to their Siberian neighbors, the Evenki and Selkups. Northern Athapaskans (Dogrib, Kutchin) and the Tlingit are distantly removed from the Kets on PC I and also show some separation on PC II. The Navajo are in the lower right quadrant, between two Algonquian groups (Cree, Ojibwa) and the Papago, a placement largely attributable to admixture with non-Athapaskan groups in the American Southwest (Cavalli-Sforza et al. 1994; Malhi et al. 2007; Scott and Turner 2008).

The key phenotypes or alleles that separate northern Athapaskans from Kets are RH^*R1 and RH^*R2 in the Rh system and ABO^*B in the ABO system. Genetically, Athapaskans show a number of distinct differences from North and South American Indians, although Algonquians and Northwest groups are exceptional to some extent (Szathmary 1979, 1981, 1984, 1993; Szathmary and Ossenberg 1978). For example, Athapaskans typically have a moderately high frequency of blood type A, an allele lacking in most Indian groups outside northern North America. In the complex Rh system, the RH^*R1 and RH^*R2 phenotypes dominate as they do with all American Indians but the ratio is reversed. In Athapaskans, RH^*R1 is less frequent than RH^*R2 while most other Indian populations consistently have much higher frequencies of RH^*R1 (O'Rourke 2006). North Asian populations, like the Chinese, Japanese and Koreans have an RH^*R1/RH^*R2 ratio similar to that of most American Indians (ca. 65% RH^*R1 , 30% RH^*R2). In central Siberia (e.g., Nganasan, Forest Nenets, Selkups), groups have a reversed RH^*R1/RH^*R2 (ca. 40% RH^*R1 , 55% RH^*R2) ratio, comparable to that of Athapaskans. The ABO^*B allele, extremely common throughout much of Asia, is rare or absent in Athapaskan and American Indian populations (Mourant 1954; Mourant et al. 1976; Roychoudhury and Nei 1988).

Figure 2 is an eigenvector map based on frequencies of the mtDNA haplogroups A, B, C, and D. In this instance, the Kets cluster closely with Siberian populations who have relatively high frequencies of haplogroups C and D. The separation from Athapaskans is also pronounced because of their high frequency of haplogroup A. Although the Apache and Navajo line up with other Native American on PC I, admixture with non-Athapaskan groups in the American Southwest has increased their frequency of haplogroup B. Northern Athapaskans either lack or have a very low frequency of haplogroup B. Most Athapaskans are characterized by a high (or fixed) frequency of haplogroup A and a low frequency of haplogroup D. In southern Athapaskans, this profile includes haplogroups C and D obtained through gene flow with surrounding non-Athapaskan groups.

Given the relative distances between Athapaskans and Kets, Rubicz et al. (2002) conclude that genetic data do not support Ruhlen's Dene-Yeniseian hypothesis. They note that genes are more highly correlated with geography than with language (Hunley and Long 2005, Novembre et al. 2008, but cf. Belle and Barbujani 2007) and conclude "Contrary to Ruhlen's interpretation of the linguistic data, analysis of the genetic data shows that the Na-Dene cluster with other Native American populations, while the Kets genetically resemble the surrounding Siberian groups" (Rubicz et al. 2002:743).

Insofar as their data go, the interpretation of Rubicz et al. (2002) of no Dene-Yenisei linkage is accurate. However, there are limitations to their analysis. First, they rely on a small set of nuclear loci and alleles. Although this is dictated in part by the tests they conducted and available data in the literature, it is a modest sampling of a genetic profile. In their worldwide analysis of nuclear genetic markers, Cavalli-Sforza et al. (1994) evaluate patterns of variation based on over 120 alleles. As Livingstone (1991) noted, the precision

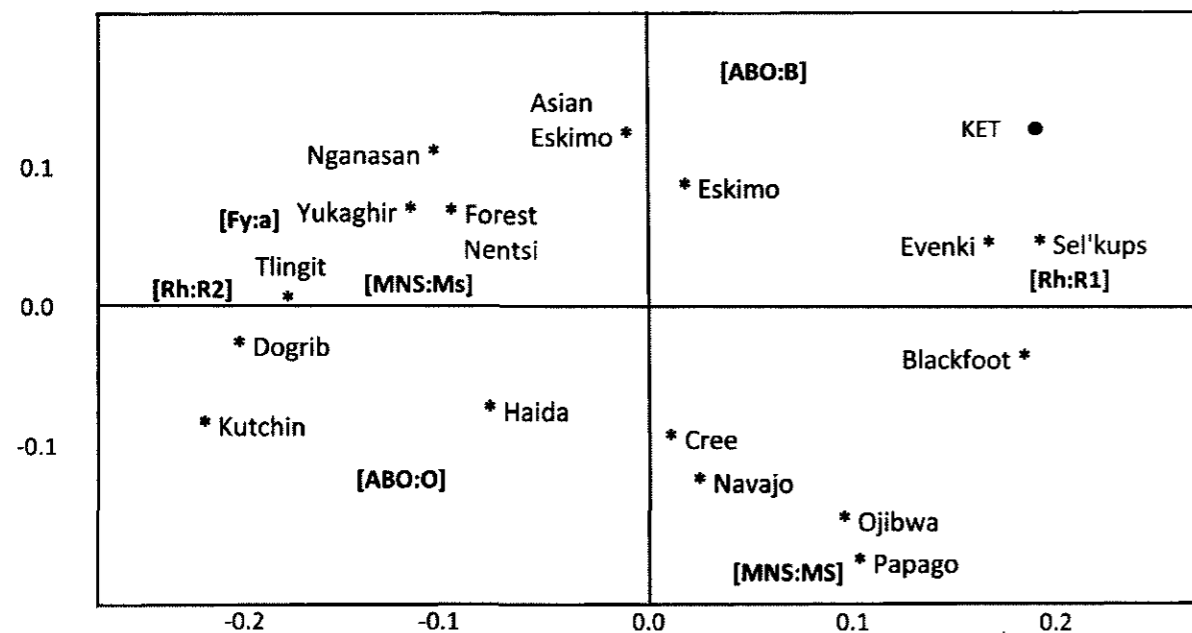


FIGURE 1. Relationships among Native American and Siberian populations based on six blood group alleles (adapted from Rubicz et al. 2002)

of a distance study is strongly influenced by the number of variables used. Second, the power of mtDNA haplogroups to detect subtle relationships would be enhanced by a consideration of mutations in the control and coding regions that help define the subtypes of A, B, C, and D.

While most recent research on human population history has focused on nuclear genetic markers and mtDNA or Y chromosome haplogroups, the human leukocyte antigen (HLA) system also provides useful insights into origins and affinities. Uinuk-ool et al. (2002, 2004) analyzed the frequencies of 33 HLA class II alleles at the system's three most polymorphic loci (*HLADR*B1*, *HLADQ*A1*, *HLADQ*B1*) in a wide range of world populations. We focus on the variation of Kets and Athapaskans in a broader Siberian-Native American milieu.

A dendrogram redrawn from Uinuk-ool et al. (2004) is shown as Figure 3. In the original and highly detailed dendrogram, there is a nested hierarchy of populations beginning with Africans, Europeans, and non-Siberian Asians. The only portion redrawn in detail shows the Siberian Asian and Native American branches. Beyond minor nuances, there are three major divisions in this section of the dendrogram. First, two Ket samples, along with the Evenki, Nanganasan, Tofalar, and Tuva, separate from other Siberians at the first division. The second division separates North, South, and Central American Indians from a multi-branched grouping that includes Athapaskans and Eskimos on the one hand and six Siberian populations (Negidal, Nivkh, Udegey, Koryak, Chukchi, and Siberian Eskimo) on the other. In some respects, this finding corresponds to the position of Rubicz et al. (2002) that Kets cluster with Siberian populations and Athapaskans cluster with Native American populations. However, the placement of Athapaskan within a group of Siberians adds another dimension to this study. American Indian groups south of the subarctic are the most highly differentiated from Asian populations while Athapaskans and Eskimos exhibit more genetic similarities to Old World groups for alleles of the HLA system.

Bortolini et al. (2003) analyzed eight biallelic and six microsatellite polymorphisms on the non-recombining portion of the Y chromosome in several dozen Asian and New World populations. They found that the most common haplogroup in American Indians was Q-M3 (77%), with much lower frequencies of Q-M242 (9%), Q-M19 (6%), P-M45 (4%), Y* (2%), and YAP (<1%). This contrasts markedly with their Na-Dene sample where the most common haplogroup is P-M45 (63%), followed by Q-M242 (25%), Q-M3 (6%), and C-RPS4y (6%). The latter haplogroup is lacking in American Indians, Africans, and Europeans but is very common in Mongolian

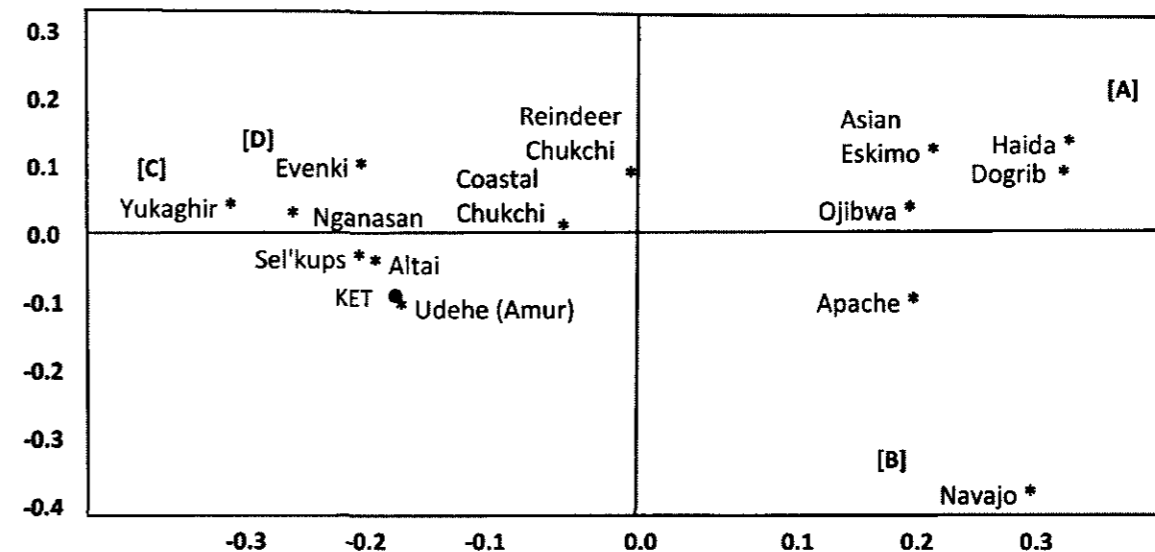


FIGURE 2. Relationships among Native American and Siberian populations based on four mtDNA haplogroups (adapted from Rubicz et al. 2002)

populations (56%).

Bortolini et al. (2003) analyzed Y chromosome polymorphisms by principal components analysis and derived a two dimensional map (redrawn as Figure 4). For ease of viewing, when many groups were clustered together in a two-dimensional diagram, they were drawn as a rectangle that encompasses most of the variation in a particular region. East Asians, Siberians, and North-South American Indians are represented in this fashion. The only groups plotted individually were the Kets and the groups most similar to them. Kets fall between several Siberian groups (Yukaghir, Altai, Yakut, Selkups) and two American Indian groups (Chipewyan = Canadian Athapaskan and Cheyenne = Plains Algonquian). Based on these results, Bortolini et al. (2003:535) conclude that "The principal component analysis . . . suggests a close genetic relatedness between some Native Americans (the Chipewyan and the Cheyenne) and certain populations of central/southern Siberia (particularly the Kets, Yakut, Selkups, and Altai), at the resolution of major Y-chromosome haplogroups."

Starikovskaya et al. (2004) tried to link New World and Asian populations through an analysis of 31 mtDNA subhaplogroups in 16 Siberian populations. They found that haplogroup A is relatively uncommon in Siberian groups but is nonetheless widespread in distribution. However, this haplogroup (defined by the 663 *HaeIII* site and HVS-I motif 16223-16290-16319-16362) is classified as A1. It lacks the mutation at np 16111 shown by A2 which distinguishes American Indians, Siberian Eskimos and the Chukchi. Haplogroup B, distinguished by a nine base pair deletion (8281-8289 del) and a control region motif of 16189-16519 was defined by five subtypes (B1-B5) in Siberian and Native American populations. Amerinds share five mutations (499, 827, 4820, 13590, 15535) with the Tubalar who are placed in the B1 subhaplogroup. The Native American subhaplogroup, designated B2, has additional mutations at nps 3547, 4977, 6473, and 11177 that have not been observed in Siberian populations. Haplogroup C, defined by the 13262 *AluI* site and HVS-I motif of 16223-16298-16327, was in high frequency throughout Siberia. The three subtypes of C (C1, C2, C3) all included mutations at nps 3552-9545-11914-13263-14318-16327. Of the three C subhaplogroups, Native Americans were most similar to the Ulchi, a Tungusic-speaking group from the lower Amur River region, sharing a mutation at 16325 and a 290-291 del. Additional mutational differences resulted in the placement of the Ulchi in C1a and American Indians in C1b. Starikovskaya and her colleagues (2004) found that haplogroup D, defined by the lack of an *Alu* site (-*AluI* 5176) and an HVS-I motif of 16223-16362, typically lacked subhaplogroup mutations in Siberia. However, they found five subtypes of D that are pertinent to the issue of Asian-New World relationships. D1,

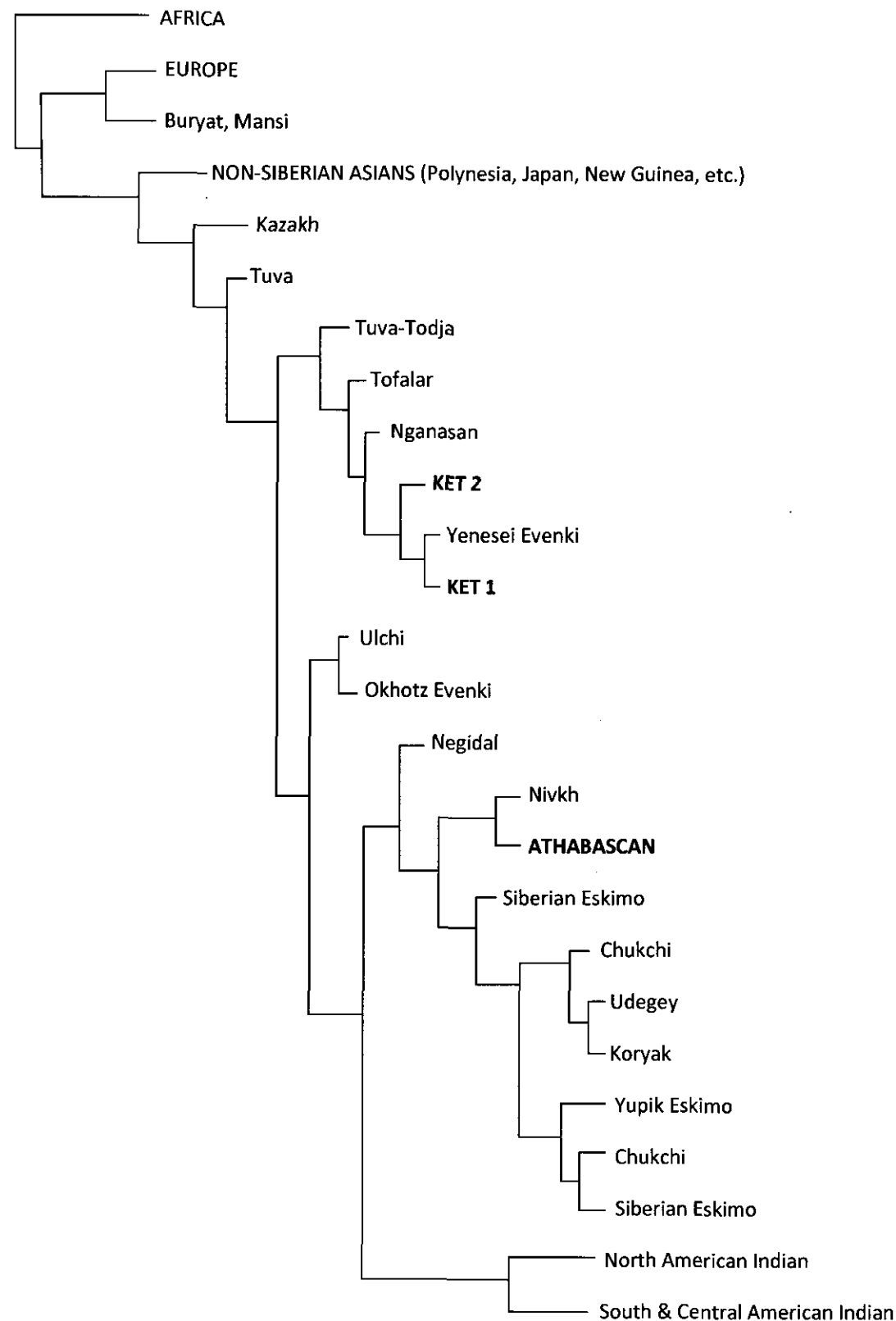


FIGURE 3. Dendrogram based on HLA class II genes (adapted from Uinuk-ool et al. 2004)

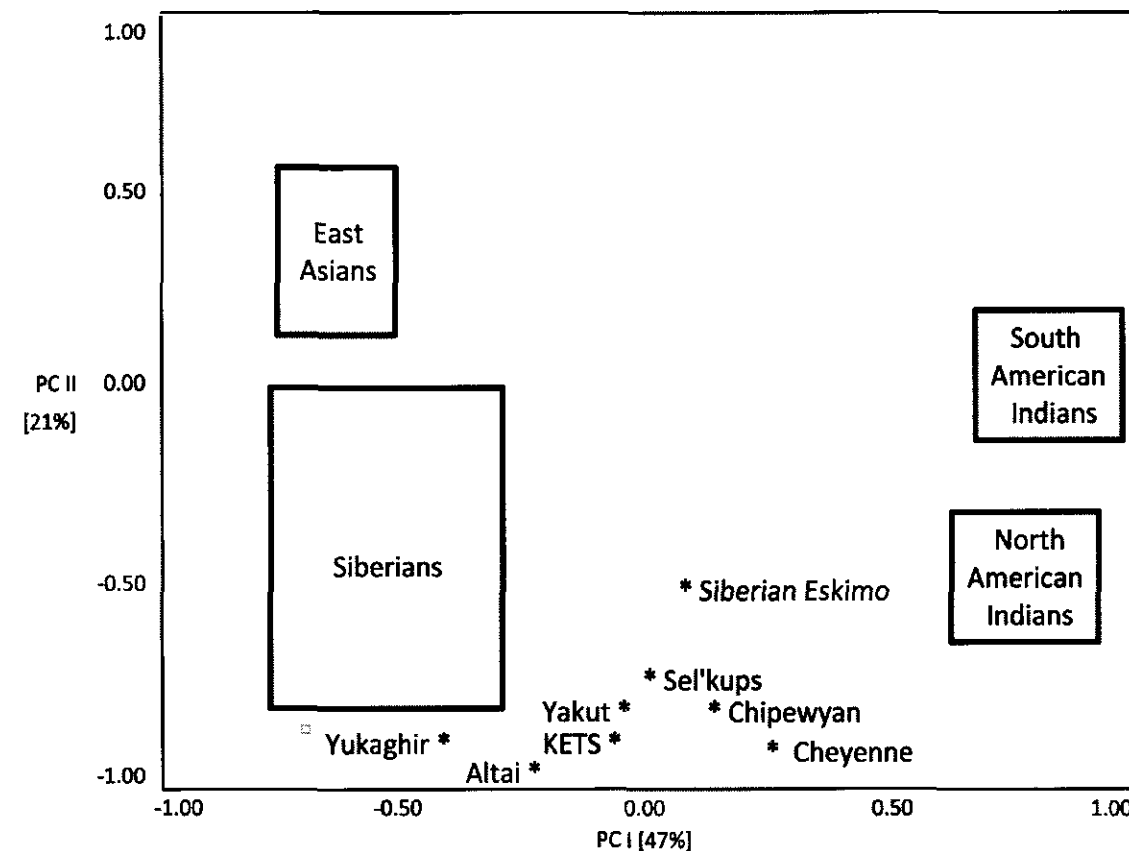


FIGURE 4. First and second principal components derived from analysis of Y chromosome polymorphisms (adapted from Bortolini et al. 2003)

defined by a mutation at np 16325, is typical of Native Americans who have haplogroup D. This subhaplogroup was also observed in four Ulchi but no other Siberian or east Asian population. The authors suggest a link between lower Amur River populations and Native Americans. Another D subhaplogroup, D2, is defined by the absence of the 3315 *HaeIII* site, the presence of the 8700 *AluI* site, defining substitutions at 16129 and 16271, and a motif of 3316-7493-8703-9536-11215-11959 (Tamm et al. 2007). Of interest here is that D2 is found only in Na-Dene (D2a), Aleut (D2b), and Eskimo (D2c) samples.

Using frequencies for 31 subhaplogroups of A, B, C, and D, Starikovskaya et al. (2004) derive a dendrogram for 16 Siberian and two Native American samples using a neighbor-joining method (Figure 5). Athapaskans are not represented in this tree, but Kets are included. In this milieu, heavily weighted by Siberians, the Kets cluster most closely with the Mansi, followed by the Nganasan and Tubalar. Their next closest ties are to other central Siberian groups. Groups from the Amur River basin and Kamchatka fall on another cluster. Not surprisingly, the two Native American groups (Haida, Aleut) are on the same branch of the tree, along with Siberian Eskimos.

From the standpoint of mtDNA, there are few subhaplogroups that directly link Siberian and Native American populations. Since Asian groups started making the trek across far eastern Asia and Beringia, enough time has passed to allow a number of unique mutations to appear in Native American groups. Despite this, Starikovskaya et al. (2004) feel they can make inferences about how Native American progenitors may go back to different regions of central and east Asia. For haplogroup A, the authors suggest that "the A1 mtDNAs observed in the Mansi and Kets are part of an A1 northward dispersal that presumably originated in the Altai-Sayan region, and gave rise to A2 after expanding into eastern Beringia" (Starikovskaya et al. 2004:85). For haplogroup B, the B1 variant is the only one that shares a coding region motif of 827-4280-13590-15535

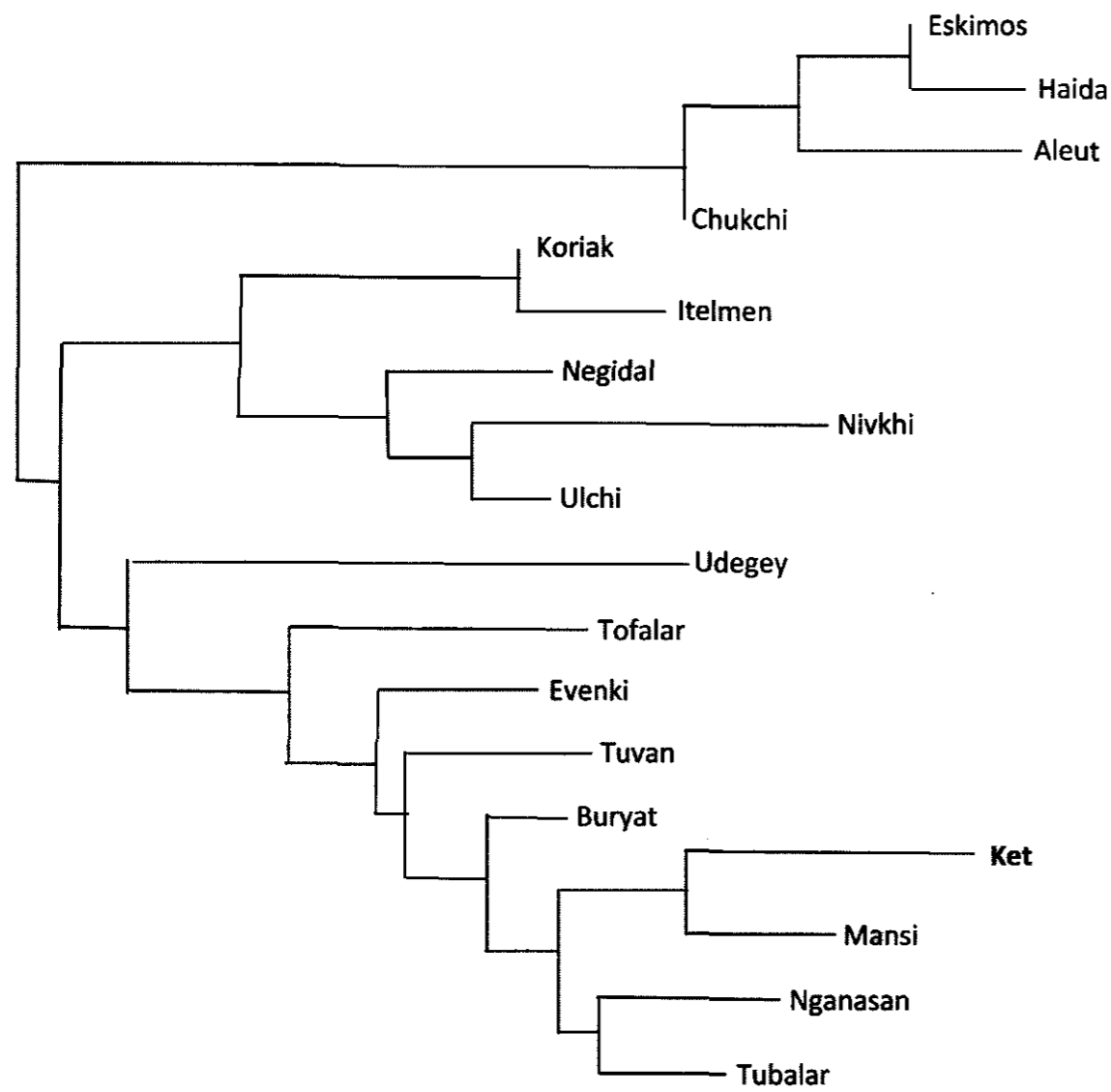


FIGURE 5. Dendrogram based on analysis of 31 mtDNA subhaplogroups (adapted from Starikovskaya et al. 2004)

with the Native American subhaplogroup B2. As this was observed only in one Tuvan and three Tubalar, this also points to the Altai-Sayan upland as the likely source of the Native American B2 subtype. For haplogroup C, the C2 and C3 subtypes are common in central Siberia but these differ notably from the C variant in Native Americans. Amerinds, who exhibit the C1b subhaplogroup, are most similar to the Ulchi who have the C1a subhaplogroup. This suggests that some Native American populations emerged from the Amur River region. Haplogroup D also seems to point to the Amur region. Subhaplogroup D1a, observed in four Ulchi, is the only variant related to the D1b variant that characterizes American Indians. While some subhaplogroups of C and D point to the Amur River region as a possible point of origins for American Indians, Native Americans also have C1c and C1d with specific coding region mutations that seem to be independent founding lineages not known in Asia (Tamm et al. 2007). In addition, D2 developed in Beringia, where Alaskan (Na-Dene, Aleut, Eskimo) and Chukotkan (Eskimos, Chukchi) populations express the variant.

From a dental standpoint, Athapaskans exhibit characteristics that are shared with other populations in

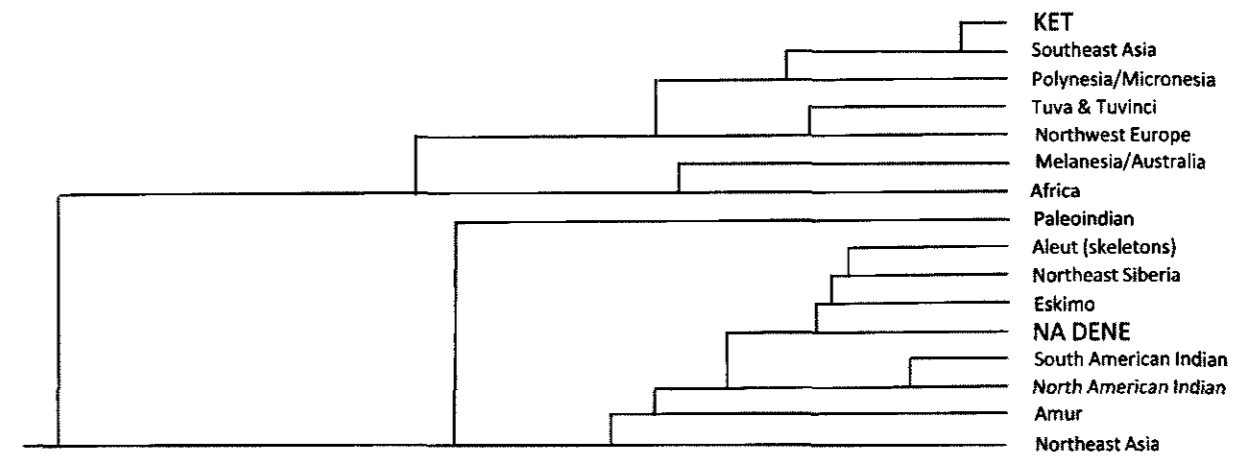


FIGURE 6. Dendrogram of world populations based on analysis of tooth crown and root morphology (adapted from Turner 1984)

the New World. That is, high frequencies of shovel-shaped incisors, incisor winging, cusp 6 and the protostylid of the lower molars, and low frequencies of lower premolar multiple lingual cusps and lower molar cusp 7. Carabelli's trait is common but is rarely expressed in cusp form. Two rooted lower canines, found almost exclusively in European populations, are absent in Athapaskans. Three-rooted lower first molars, the trait that gave rise to the three wave model of Greenberg et al. (1986), are in a frequency of about 20%, intermediate to Eskimo-Aleuts (>30%) and American Indians (6-8%) (Turner 1971).

While there are abundant dental morphological data on Athapaskans, comparable information is far more limited for the Kets. Turner (1984) observed a small sample of Kets for 29 tooth crown and root traits and calculated distance values between this sample and many Asian and New World populations. The dendrogram shown as Figure 6 is based on mean measure of divergence (MMD) distances between these populations. The Kets are the only small sample in the dendrogram. All others are composites based on hundreds or thousands of individuals.

Dentally, Kets do not exhibit the highly specialized dentition associated with Sinodonty (Turner 1987, 1990) that typifies populations in north and east Asia and all of the Americas. Instead, they show the more muted morphological profile that characterizes southeast Asian populations. In a worldwide analysis of dental morphological data, Scott and Turner (1997) found a similar grouping. East Asians (Japan and Taiwan) clustered with Native Americans while Southeast Asians and the Ainu clustered with central Siberians (Ugrian, Samoyedic, Altaian). Basically, the Kets dental profile is intermediate to the more distinctive European and Asian dental patterns, where the former is distinguished by morphological simplification and the latter is characterized by intensification of trait expression (e.g. shoveling, winging). For many other traits, Kets are intermediate to Europeans and north/east Asians (e.g. shovel-shaped incisors, double shoveling, cusp 6, hypocone, 2-rooted upper first premolars, etc.). For the hallmark trait Turner (1971) used to define three colonizing groups to the Americas (Eskimo-Aleut, Na Dene, Amerind), 1 of 20 Kets exhibited a three-rooted lower first molar. Although sample size is small, a frequency of 5% is closest to that of Amerinds.

Distance analyses that involve Kets, Athapaskans, and other Siberian, Asian, and New World populations show consistently the shared ancestry of all these groups. For the most part, however, Kets seem to be more closely aligned biologically with their Siberian neighbors than with any Native American population, including Athapaskans. However, Athapaskans, like Eskimo-Aleuts, have closer ties to Siberian populations than do most other American Indians.

2.1. Rare variants and unique genetic markers

Biodistance studies, by their very nature, may not be sensitive enough to pick up hints of deep common

ancestry between two specific groups. Rare markers provide another avenue to evaluate a potential ancient genetic linkage between Kets and Athapaskans.

2.1.1 *mtDNA: haplogroup X*

Mitochondrial DNA haplogroups are denoted by letters (with subtypes noted by numbers and small case letters) running the alphabet from A to Z. For historical reasons, the first four letters of the alphabet, A, B, C, and D, were the haplogroups associated with all Native American populations (Wallace and Torroni 1992). Later, it was discovered that these four haplogroups accounted for 97% of the variation but there was another haplogroup, X, that was present in about 3% of Native Americans. To date, haplogroup X is most common in Algonquians (Ojibwa) where it occurs in a frequency of about 25%. It is about half that common in Siouan and Northwest Coast samples (Bianchi and Bailliet 1997; Ward et al. 1993). It has not been reported for American or Siberian Eskimos (Shields et al. 1993; Torroni et al. 1993). Although Torroni et al. (1993) and Brown et al. (1998) found haplogroup X in six out of 92 Navajo (6.5%), it was not evident in small samples of Apache ($n=25$) and Dogrib ($n=30$).

Initially, the discovery of haplogroup X led some workers to argue that Europeans had brought the variant across the Atlantic because, at the time, haplogroup X had not been found in any Asian populations. This position has now been modified on two grounds (Reidla et al. 2003). First, there are two primary types of haplogroup X, X1 and X2. X1 is known almost exclusively from Africa. While X2 is the haplogroup found in both Europeans and Native Americans, the 225A variant of X2 (X2b) characterizes most Europeans (25 of 27; Brown et al. 1998). The X2 haplotypes without the 225A mutation (X2a) characterizes most but not all American Indians. Moreover, most American Indians have coding and control region mutations that are not found in Europeans. While the X2 haplogroup does suggest a common ancestral population for Europeans and American Indians, the mutational differences that set the two groups apart indicate great time depth for this shared ancestry.

When Siberian populations, including Buryats, Tuvinians, Koryaks, Evens, Yakuts, Khakassians, Shors, Soyots, Altaians, and Evenks, were tested for haplogroup X, it was found only in seven Altaians (2 North, 5 South) (Derenko et al. 2001). None of the seven possessed the 225A variant common in European populations. However, they also lacked the 200G and 16213A mutations that characterize most American Indian X haplogroups. Reidla et al. (2003) report that two Evenks from central Siberia also have haplogroup X but neither showed the mutations characteristic of the Native American X2a subtype (one was X2b and the other X2*). A reduced median network shows that Altaians are intermediate to European and American Indians for haplogroup X and may represent the stem ancestor for both groups (Derenko et al. 2001). Although central Siberian and New World populations share a low frequency of haplogroup X, the X2a subtype in Native Americans, defined by five mutations in the mtDNA coding (8913, 12397, 14502) and control regions (200 and 16213), has not been found in Asia. For the Kets, Derbeneva et al. (2002) did not report a single haplogroup X of any type, although the sample size was small.

2.1.2 *mtDNA: RsaI np 16,329 site loss*

For mitochondrial haplotype A, Native Americans have both subtypes A1 and A2, although the latter is more common. Significantly, there is a site loss associated with some A2 subtypes that has been found only in Na-Dene populations. Torroni et al. (1992:157) note that "This mutation occurs in all Nadene populations examined (50.0% of Tlingits, 26.7% of the Dogrib, and 27.1% of the Navajo), but not in Amerinds. Therefore, the RsaI np 16,329 site loss appears to be a specific genetic marker for the Nadene." Torroni et al. (1993) use this unique marker to argue that there was an independent origin of Na-Dene and American Indian populations in the New World. Interestingly, it is not present in the Haida (Merriwether 2006), a group that some linguists put in the Na-Dene language family while others do not. A genetic variant unique to Na-Dene would be the ideal genetic bridge to central Siberia. Unfortunately, the RsaI np 16,329 site loss has not been reported in Kets or any surrounding central Siberian group.

2.1.3 *mtDNA: A2a subtype*

The five major mtDNA haplogroup lineages that entered the New World (A, B, C, D, and X) are now specified more precisely in terms of subtypes defined by mutations in the hypervariable (HV I and HV II) and coding regions. For Native Americans, Tamm et al. (2007) distinguish four major founding subtypes (A2, B2, C1, D1) and three minor subtypes (X2a, D2, D3). Of particular interest is subtype A2a which differs from A2 in having a coding region mutation at np 3330. Tamm et al. (2007) show a phylogeny of human mtDNA with special emphasis on New World and Asian populations. The branch of A2 is dominated by North and South American groups, but the marker A2a was observed in a North American Indian, a Siberian Eskimo/Chukchi, and, importantly, one Selkup. How this rare variant ended up in a central Siberian group can only be conjectured. While the Selkups are not Kets and they speak a different language (Uralic), the Kets and Selkups are closely aligned in many dendrograms, perhaps reflecting the role of geographic propinquity on historical patterns of gene flow. Another possibility is that this marker was reintroduced from the east during the Holocene as proposed under one dispersion model by Fortescue (this volume).

2.1.4 *Autosomal locus D9S1120*

Zhivotovsky et al. (2003) analyzed 377 autosomal short tandem repeat loci in 52 populations to assess the broad pattern of differentiation and dispersal of modern human populations on a world scale. The authors found one private allele that was limited to Native American populations. In fact, this was the only private allele they found that was exclusive to one geographic area. The 275 bp allele at the autosomal microsatellite locus D9S1120 was found in frequencies ranging from 0.20 to 0.30 in four American Indian populations (Maya, Pima, Colombians, Karitiana). A fifth Indian group, the Surui, had an exceptionally high frequency of 0.97, probably attributable to founder effect and genetic drift.

The discovery of a unique allele at the D9S1120 locus stimulated Shroeder et al. (2007) to survey this polymorphism in additional Native American and Asian populations. Specifically, they assessed the frequency variation of the D9S1120 275 bp allele in one Aleut, one Eskimo, two Na-Dene, nine North American Indian, and seven Siberian populations. Their findings corroborated and extended those of Zhivotovsky et al. (2003). That is, the allele was found in moderately high frequencies in all the newly sampled Native American groups, including Aleuts (0.229), Greenlandic Inuit (.387), and North American Indians (0.100–0.529, mean = 0.301). Two Na-Dene samples (Dogrib, 0.309; Apache, 0.313) had frequencies similar to those of Eskimo-Aleuts and American Indians.

The D9S1120 allele is not unique to Native Americans as it was found in the Chukchi (0.238) and Koryak (0.174) who are reckoned as far eastern Siberian or western Beringian groups. This is not altogether surprising as these Siberian groups often show genetic similarities to Native American populations (cf. Cavalli-Sforza et al. 1994). What is more interesting is that central and south Siberian groups, often thought to be the most likely source populations for Native Americans, lack this allele entirely. Samples lacking the allele include the Even, Mongolians, Altai Kazakhs, and Yakuts, along with many additional groups from the Altai (southern and northern) and north, east, and southeast Asia. Unfortunately, the Kets were not one of the Siberian groups sampled for this 'private' Native American allele. Despite this, even if found among the Kets, it would still not provide evidence for a direct Dene-Yenisei biological linkage because the allele is about equally common in Eskimo-Aleuts, the Na-Dene, and North and South American Indians.

2.1.5 *Albumin Naskapi (AL*Naskapi)*

A rare albumin variant, referred to as albumin Naskapi, was first noted in a sample of Naskapi Indians from eastern Canada (Melartin and Blumberg 1966). Although originally found and named for an Algonquian population, a survey of this polymorphism in dozens of tribes and thousands of individuals in North and Middle America, has shown this variant to be as common in Athapaskans as it is in Algonquians (O'Rourke 2006). In fact, the overall frequency in Athapaskans (3.4%) is slightly higher than the frequency in Algonquians (3.1%) (Scott and Turner 2008). The most remarkable aspect of this allele is that it is found only rarely outside of Athapaskan and Algonquian groups and in every such instance, groups that did have

one or a few individuals with *AL*Naskapi* were adjacent to either an Athapaskan or Algonquian group (e.g., three Ungava Bay Eskimos, three Sioux Indians, one Maricopa Indians, one Mohave Indians) (Schell and Blumberg 1988). Gene flow is the likely explanation for those rare instances where it is found outside the realm of Athapaskan-Algonquian speaking populations. More recently, it was found in 11 Bella Coola Indians (Salishan) and one Nootka. For these Northwest Coast groups, shared common ancestry is a more likely explanation than gene flow (Smith et al. 2000).

Beyond its presence in Athapaskans and Algonquians, the pattern of absence of *AL*Naskapi* is interesting as well. Except for the three Ungava Bay Eskimos who were heterozygous for this allele, no additional cases surfaced in surveys encompassing over 1600 Eskimos, 100 Aleuts, and 450 Tlingit. In 20,218 Native North Americans (including some mestizos), over 95% of the *AL*Naskapi* phenotypes are exhibited by either Athapaskans or Algonquians. *AL*Naskapi* is almost totally absent in the Old World as well. In Eti Turks, an albumin variant referred to as Albumin Mersin exhibited a migration pattern on starch gel electrophoresis identical to that of *AL*Naskapi* (Franklin et al. 1980). In two samples of Eti Turks, the frequency of this variant was around 9%, but not all surveyed Eti samples had the allele. Kaur et al. (1982) also report an albumin variant with properties similar to *AL*Naskapi* in north India. Beyond these groups, this rare albumin variant has not been reported in any of the Asian populations that typically show genetic affinities to Native American populations. As deriving Athapaskans and/or Algonquians from Eti Turks or North Indians seems unlikely, the possibility exists that the gene arose independently in the New World and Old World.

Although using *AL*Naskapi* to link Na-Dene populations and the Kets is not possible at this time, this is the kind of allele that would be useful in demonstrating an ancient genetic link between two groups. If the gene arose through mutation in the New World, it would not help corroborate Ruhlen's (1998) view that Na-Dene and Yenisei groups were derived from a common Eurasian stem population. However, finding *AL*Naskapi* in the Kets could support one Fortescue model that holds there was an east to west movement of Dene-Yeniseian-speaking populations in the Holocene.

2.1.6. *Y chromosome markers*

Underhill et al. (1996) report a mutation on the non-recombining portion of the human Y chromosome that is unique to Native Americans. The locus, referred to as DYS199, is 201 bp and contains a C → T point mutation. In 173 individuals from Africa, Asia, Oceania, Europe, and the Americas, 45 exhibit the C→T point mutation and all 45 are Native Americans. The mutation is more common in American Indians (38/42, or 0.904) than Eskimos (4/6, or 0.667) and the Navajo (3/6, or 0.500), but the samples are too small to reach a conclusion on Native American heterogeneity. Suffice it to say that the allele is common to all Native Americans and seems to be in relatively high frequency. Unfortunately, the only Asian groups sampled were from China, Japan, and Cambodia.

Santos et al. (1999) evaluated Y chromosome polymorphisms in Native American and Siberian populations, including the Kets, and observed several interesting points. For example, most Native Americans fall in haplotype 31 which includes the DYS199 T SNP. Haplotypes 1 and 10 were the next most common in Native Americans; neither included the DYS199 T mutation but did include the 92R7 variant. For Kets, haplotype 20 was the most common and this was shared with one Native American, one Mongolian, and four Altaians. Two Kets also exhibited haplotype 32 which includes the DYS199 T mutation. However, we still face the problem that this seemingly unique American marker is not just in Na-Dene groups but is also found in many Eskimo-Aleuts and American Indians.

Karafet et al. (1999) evaluated additional Y chromosome markers in 2,168 males in 60 world populations, including Kets and Athapaskans, along with many European, African, Asian, Siberian, and Native American samples. They focused on 14 unique haplotypes, including what they refer to as 1G (i.e., DYS199 T). Among Native Americans, the 1G haplotype was the most common (53.5%), followed by haplotype 1C (35.8%). Additional haplotypes in a frequency above 1% include 1B (4.3%) and 1F (4.0). With but five exceptions (3 Siberian Eskimos, 1 Chukchi, 1 Even), haplotype 1G was limited to Native Americans. Two very interesting points are evident in this article. First, the authors propose that the 1G haplotype was derived from the

1C haplotype. The 1C haplotype is relatively common in Europe (37.7%; range 14-69%) but is rare in North (28/438, or 6.4%), Central (11/202, or 5.4%), and East Asia (4/307, or 1.3%). What is intriguing is that 1C is in high frequency among the Kets (10/12, or 83.3%) and Selkups (93/122, or 76.2%) which sets them markedly apart from all other Asian populations. Finally, the only other haplotype exhibited in the Ket sample was 1F (2/12, or 16.6%). In the Americas, 15 individuals were 1F, and, excluding two Wayus from South America, all others were either Athapaskans (Tanana, Navajo) or Algonquians (Cheyenne). Of course, 1F is very common in North and Central Asia so this does not link Athapaskans and Kets.

Articles on Y chromosome polymorphisms written before 2002 used a variety of terminological systems (Y chromosome consortium 2002). In that year, workers standardized the names applied to the various single nucleotide polymorphisms (SNPs), simple tandem repeats (STRs), and indels (insertions and deletions). It now appears that only two major Y chromosome haplogroups entered the New World, Q and C. Karafet et al. (2006) note that the three major SNP haplogroups in the Americas are Q-P36, Q-M3, and C. The two Q haplogroups are found in virtually all Native American populations. From our vantage, it is of note that the C (P39) haplogroup is restricted largely to Athapaskans, although it also appears in the Cheyenne and Sioux. While Zegura et al. (2004:172) argue that Y chromosome variation is best interpreted as indicating a single migration from Asia to the Americas, they add that "both of these lineages seem to have originated in the Altai Mountain region." The model that all Native Americans derive from a single common ancestral population that arrived in western Beringia during the latter stages of the Pleistocene is becoming increasingly popular (Mulligan et al. 2008; Tamm et al. 2007; Wang et al. 2007) and the geographic homeland of this ancestral population is often placed in central Siberia.

3.0. DISCUSSION

Speculation on the number of migrations to the New World has been a cottage industry in Anthropology and ancillary fields for the past two centuries (cf. Count 1950; Powell 2005). Splitters developed models that involved numerous migratory waves while lumpers favored two migrations, American Indians first and Eskimo-Aleuts second. More recently, single migration models are in vogue. Most theorists, but by no means all, have Native Americans emerging from somewhere in north, east, and/or central Asia.

In the mid-1980s, a three-wave model developed by linguist Joseph Greenberg, dental anthropologist Christy G. Turner, and geneticist Steven Zegura, proposed the Americas were settled by three separate migratory pulses out of Asia (Greenberg et al. 1986). The result of the first migration was all North and South American Indian populations, referred to collectively as Amerind or Macro-Indian. The progenitors of Na-Dene speaking populations of the interior western Subarctic and greater Northwest Coast arrived in the New World in a subsequent migration. Another colonizing population from Asia included the ancestors of Eskimo-Aleut populations who dispersed along subarctic and Arctic coasts from the Aleutian Islands to Greenland. By 1990, the three wave model was universally acknowledged if not invariably accepted.

Williams et al. (1985) concluded the pattern of variation in immunoglobulin markers (Gm system) among American Indians, Eskimo-Aleuts, and Na-Dene speakers was consistent with the three-wave model outlined by Greenberg and his co-workers (1986). In a massive worldwide analysis of nuclear markers, Cavalli-Sforza et al. (1994) found that genetic distances based on over 120 alleles were consistent with a model showing separation between American Indians, Na-Dene groups, and Eskimo-Aleuts, with the latter two more similar to one another than either was to American Indians. Some of the early research on mtDNA haplogroups also concluded that New World populations were derived through several migrations from Asia although the specifics were not in total accord with the three-wave model.

Today, most researchers agree that (1) all Native Americans share a common ancestor, and (2) this common ancestor(s) resided in Asia during the late stages of the Pleistocene. Turner (1986) is explicit in his model where he proposed that three separate colonizing populations, derived from a common base in Asia, crossed into Beringia during the late Pleistocene. He envisioned Paleo-Indians trending north and east from north China, eventually reaching the Arctic continental shelf before moving across Beringia into Alaska. A

few thousand years later, a second group moving in a more easterly direction reached the Amur River and Pacific coast where they developed an early maritime adaptation. These populations would represent the ancestors of Eskimo-Aleuts who settled initially along the southern coastline of Beringia. The Na-Dene were thought to have been derived from the wedge-shaped core, microblade producing populations represented archaeologically by the late Upper Paleolithic Diuktai culture. Turner proposed that the ancestors of the Dene entered Alaska after Paleo-Indians had migrated south through the ice-free corridor. Some recent research on mtDNA and Y chromosome haplogroups also indicates different Asian points of origins for New World populations, although this is usually given as two locations rather than three. Favored regions for deriving the ancestral populations of Native Americans are south central Siberia and the Amur River basin (Volodko et al. 2008; Schurr 2004).

As Mulligan et al. (2004:298) note, "The three-migration theory provided a provocative hook to frame a flood of molecular genetic studies that began in the 1990s." Shortly after mtDNA studies focused their sights on Native American origins, researchers started taking issue with the three-migration model (Bonatto and Salzano 1994; Merriwether et al. 1997). Geneticists did not feel the distribution of the mtDNA haplogroups A, B, C, and D exhibited the trichotomy of frequencies that might be expected had there been three distinct migrations to the Americas. Despite this conclusion, there is a patterned difference between American Indians, Na-Dene/Northwest Coast groups, and Eskimo-Aleuts. Based on data provided by Merriwether et al. (1997:417), the proportions of A:B:C:D in Amerinds are 27:34:19:18, in Na-Dene/Northwest Coast they are 72:9:7:8, and for Eskimo-Aleuts 63:1:4:29. The relatively uniform distribution of the four haplogroups in Amerinds stands in contrast to the dominance of haplogroup A in Na-Dene/Northwest Coast groups and the high frequency of A and D in Eskimo-Aleuts. It should be noted, however, that the high A-D pattern in Eskimo-Aleuts results from the near fixation of A in Eskimos and very high frequency of D in Aleuts. Lumping them into the linguistic category of Eskaleut obscures dramatic genetic differences and corresponding divergent histories. Also, the sublineage of D in Aleuts and the rare D in Inupiat Eskimos are different. As in teeth and blood groups, Na-Dene and Eskimo-Aleut groups are closer to one another than either is to North and South American Indian populations.

Recently, several lines of evidence suggest the ancestors of all Native Americans arrived as a single founding population in Beringia between 15,000 and 30,000 years ago (Goebel et al. 2008; Tamm et al. 2007; Kitchen et al. 2008; Wang et al. 2007). To generate the diversity observed among Native Americans, some models envision an original founding group stalled on Beringia for many millennia before colonizing populations could eventually follow one of two routes (coastal and ice free corridor) to gain access to the vast remaining areas of North and South America. Appealing on genetic grounds, there is no archaeological evidence for a protracted occupation of central Beringia prior to southward dispersal. Other workers feel the single origin model does not account for the genetic complexities of New World colonization and differentiation. Volodko et al. (2008) feel there were at least two founding populations in Asia, the first from the Altai-Sayan upland or mid-lower Amur region (ca. 25,000–30,000 years ago) and the second from the general area of Amur-Mongolia-Manchuria around the end of the Pleistocene (11,800 years ago) (see also Perego, et al. 2009, O'Rourke 2009). Additional recent work on mtDNA whole genome sequences by Perego et al. (2009), also indicates two separate migrations to the Americas. One of these would have been through the traditional Beringian interior, introducing mtDNA haplogroup X2a to northeastern North America, while a second Pacific coastal migration is required to account for the coastal range of haplogroup D4h3.

If all Native Americans were derived from a single founding population that arrived in Beringia 15,000–30,000 years ago, what ramifications would this have for an ancient linkage between the Yeniseian and Na-Dene language families? This 'single origins' (SO) model contends that American Indians, Na-Dene speakers, and Eskimo-Aleuts all branched off of a single ancestral population in Beringia at different points in time. If this model accurately portrays this situation, Kets would be equally related to all Native American populations, lacking no specific genetic affinity to Athapaskans and Tlingits. Such a model is consistent with the distribution of the private allele D9S1120 275 that is, at the same time, almost uniquely American (the neighboring Chucki and Koryaks being the only exceptions) with similar frequencies in American

Indians, Eskimo-Aleuts, and Na-Dene populations. Other researchers feel that mtDNA and Y haplogroups point in the same direction. If the SO model ultimately proves to be the most parsimonious explanation for patterns of genetic variation in the New World, it is unlikely that any direct linkage between Kets and Na-Dene groups will be found. This runs counter to the position set forth by Ruhlen of a shared common ancestor of Yenisei-Na-Dene in Eurasia followed by a migration to the New World. However, if the Dene-Yeniseian hypothesis is substantiated, an alternative explanation is that the Yeniseian family was derived from an east to west movement into Siberia of proto-Dene-Yenisei speakers during the Holocene (Fortescue, this volume). Although many recent studies point to eastern and central Siberia as the 'starting gate' for the colonization of the Americas, the time depth involved would likely obscure deep linguistic ties. If the colonization was in a reverse direction and occurred at a later date, this might help resolve the conundrum. Unfortunately, at this time, there are very few 'genes across Beringia' that support this scenario.

Based on the mtDNA profile of the Kets, some workers suggest they have admixed with Russians to a significant extent. Naumova et al. (2008) estimate that Asians and Europeans have contributed about equally to the mtDNA variation in Kets. Derbeneva et al. (2002) analyzed 38 Kets for mtDNA and found Native American haplogroups represented 26.3% of the total assemblage (A—7.9%; C—15.8%, and D—2.6%) with no B or X haplogroups. Other common haplogroups among the Kets were U4 (28.9%), F (23.7%), and H (10.5%). U4 is also relatively common in the Mansi (16.3%), Nganasans (20.8%), and Northern Altaians (18.5%) but is rare in Northern Europe and most Uralic populations (Derbeneva et al. 2002). Given the intermediacy of central Siberian populations, they could represent a mix of European and Asian genetic elements. The alternative position is that the unusual combination of European (H, U, J, W, and subtypes) and Asian (A, C, D, and Z) mtDNA haplogroups may have arisen from an early L3 lineage that arrived in Siberia from the Middle East during the early Upper Paleolithic (Derbeneva et al. 2002). It is difficult to sort out to what extent the similarities with neighboring populations for either the Kets in Siberia or Athapaskans in North America might have been modified by gene flow. In the western subarctic, there are indications of gene flow between Athapaskans and Algonquians (Malhi et al 2007; Scott and Turner 2008). In central Siberia, the Kets exhibit genetic ties to the Selkups, Nganasan, and Mansi. At this point in time, far removed from the original divergence dates, it is difficult to determine the degree to which the ancestral gene pool has been diluted by admixture with adjoining groups. Basically, greater gene flow with neighboring groups would tend to obscure ancient genetic ties.

Wang et al. (2007:2059) feel the pattern of variation exhibited by mtDNA and Y chromosome haplogroups in Siberia, along with the restricted distribution of the D9S1120 allele 275 in Asia, could be explained in several ways: "the ancestral population that migrated to the Americas may have already acquired a degree of genetic differentiation from other Asian populations . . . descendants of the original Native American founders are no longer present elsewhere in Asia, or these descendants have not yet been genotyped at loci that carry apparently private Native American variants." In our case, we can add the proviso that Athapaskans are numerous, widespread and well studied. Kets, on the other hand, are so few in number that even if they were more thoroughly sampled, this small remnant group would not necessarily represent a random sample of the original Yeniseian gene pool. This is one possible explanation for the absence of clear cut genetic ties between Kets and Athapaskans.

While linguists have developed a solid case linking the North American language family Na-Dene with Yeniseian, we have not found comparable parallels in the biology of these 'groups'. There are several lines of evidence that point to central Siberia as the ancestral homeland for some portion or even all of the Native American gene pool. However, there is no specific gene, haplogroup, or dental trait that provides a direct link between the Kets and any Na-Dene speaking population. Part of the problem may relate to the fact that the Kets, who now number only a few hundred individuals, are not as well known biologically as they are linguistically. The study of additional genetic markers could bring the Dene-Yeniseian linkage into clearer focus. At this time, we can infer that the ancestral populations of Na-Dene are linked to central Siberian and east Asian groups but can make no claim about their specific genetic affiliation with Kets.

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ARCHAEOLOGICAL PATTERNING IN NORTHEAST ASIA AND NORTHWEST NORTH AMERICA: AN EXAMINATION OF THE DENE-YENISEIAN HYPOTHESIS

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1.0. INTRODUCTION

The possibility of a common origin between Yeniseian speaking populations in the Yenisei valley in central Siberia and Na-Dene speaking populations in Northwest North America has been proposed using various primarily linguistic data for some time (Ruhlen 1998; Fortescue 1998). With recent work by Vajda (this volume), this possibility seems to have been placed on a firmer analytical footing. While at present, robust genetic data linking the extant groups speaking these languages (Ket, Tlingit, Eyak, and Athabaskans) appear absent (Rubicz et al. 2002), a variety of reasons may account for this, such as recent admixture with other groups and/or ancient time-depth of separation. A detailed examination of the archaeological record of the region, focused on evaluating the Dene-Yeniseian hypothesis, may provide additional clues in delimiting potential geographic and technological relationships among ancient groups in Northeast Asia and Northwest North America.

A genuine ancient link between these populations now widely separated in geography is intriguing from an archaeological perspective. Linguistic data can be used to reconstruct social and ideational patterning normally invisible or intractable from typical archaeological remains (in this part of the world, primarily lithic debris associated with ephemeral hunting camps). Reconstructions of kinship structures (see Ives et al., this volume), geographic naming conventions (Kari, this volume; Fortescue, this volume), social and political organization, and ideology have the potential to illuminate the relatively narrow range of behaviors typically interpreted through traditional lithic and zooarchaeological analysis.

The purpose of this paper is to synthesize and evaluate broad patterns of archaeological continuity/discontinuity in Northeast Asia and Northwest North America (Figure 1), primarily based on stone tool (and to a lesser extent pottery and harpoon heads) typologies by (1) providing a generalized summary of major cultural material continuities/discontinuities, and (2) evaluating a series of hypotheses about the divergence of Na-Dene and Yeniseian ancestors. The second objective is facilitated through identifying the nature of interactions that may have occurred if a given hypothesis is correct (or identifying limiting factors). This can provide useful information for linguistic analysis of cognate sets and may help elucidate time depth of divergence.

There are considerable difficulties with this endeavor, relating in part to differences in Russian and American archaeological theory and practice, significant gaps in empirical data, and lack of typological standardization in both regions. While genetic research focused on Siberian-American connections has grown in recent years (see review in Schurr 2004 and Schurr and Sherry 2004; Tamm et al. 2007; Kitchen et al. 2008), archaeological investigations on these topics on the American side are relatively few (see Dumond 1969, 1998b for exceptions). Ethnogenesis, the question of origins and dispersals of historic/modern ethnic groups using material cultural analyses, is a common paradigm in Soviet and Russian archaeology (Trigger 1989), often included as a key component in regional syntheses in the Russian literature (Okladnikov 1938;

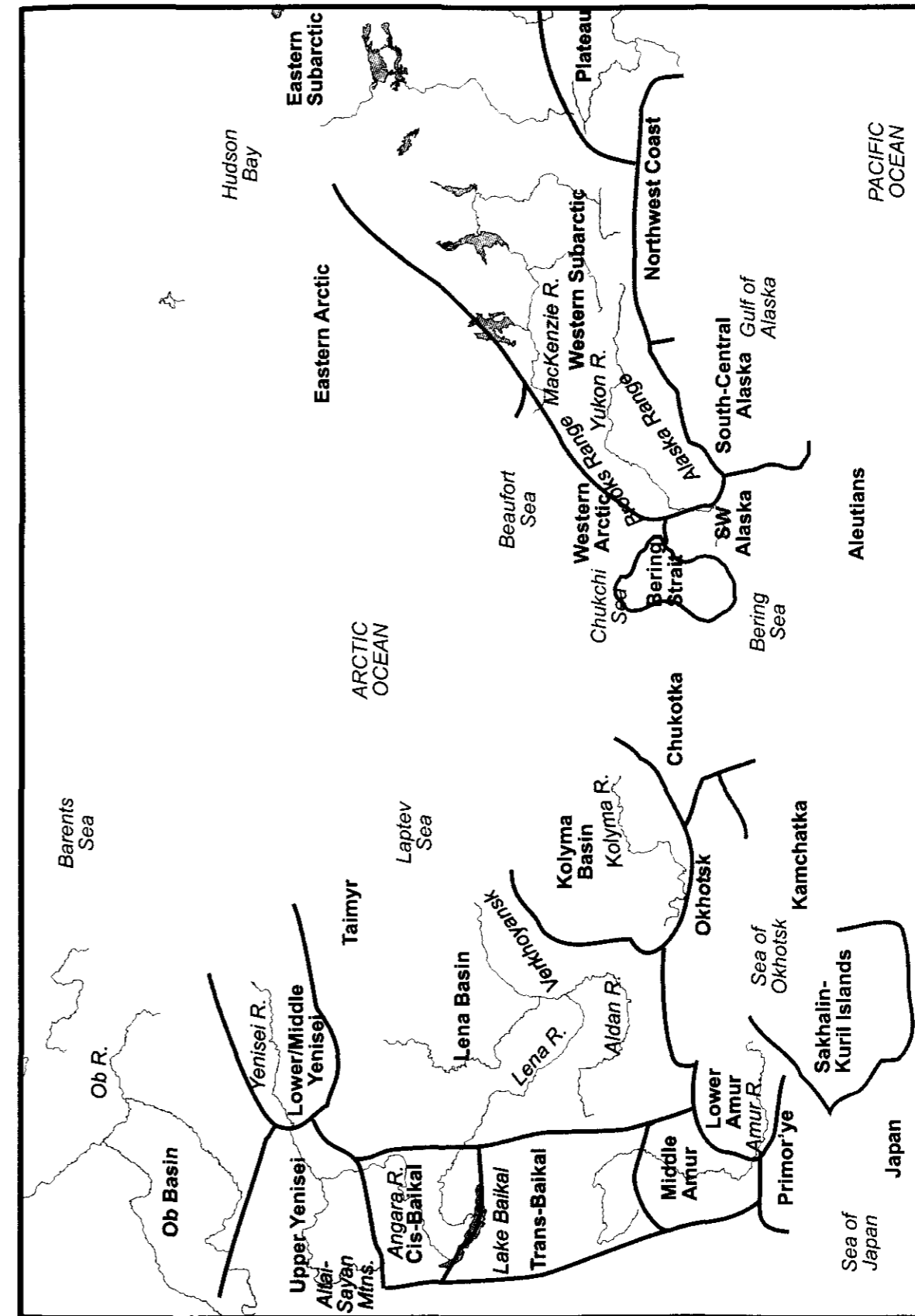


FIGURE 1. Northeast Asia and Northwest North America geography and archaeological areas. Shaded areas represent elevations above 1000 m ASL

Michael 1958; Dikov 1979; Khlobystin 2005); however, it is not generally addressed in the North American archaeological literature. Northern North American archaeologists, particularly since the advent of processual approaches in the 1960s and 1970s, have shifted from migration as an explanative mechanism (Adams 1968) and tended to focus on environmental changes and their effects on cultures (viewed as adaptive systems), reflecting the deep American connection of archaeology with anthropology (Russian archaeology is more directly associated with history) (Trigger 1989; Ehret 1976).

Regional Russian and Alaskan archaeologists typically use a variety of cultural historical approaches, which generally stated, rely on comparisons of material cultural traits (e.g. artifact attributes and types) to reconstruct past cultural affiliations and relationships. While many hypotheses of relationships between cultural units (typically *traditions*, following Willey and Phillips 1958) have been proposed (cf. American Paleoarctic tradition [Anderson 1968], Arctic Small Tool tradition [Irving 1962], Diuktai Culture, Sumnagin Culture [Mochanov and Fedoseeva 1986]), relatively few hypotheses directly relate Asian and American archaeological cultures. When posited, these trans-continental links typically involve a few artifact types (e.g. Gobi cores at the Campus site, Rainey 1939, or "Sumnagin" conical cores in southwest Alaska, Ackerman 1992). At present, there are only a few well-established links at the level of tradition between the continents (beyond the Bering Straits region), including Beringian/Diuktai/American Paleoarctic and Thule.

Another element that hampers detailed material cultural comparisons between continents is the relative lack of standardized typologies for many regions of Northeast Asia and Northwest North America (Dolitsky 1985). Even the few relatively comprehensive typologies created for these regions (Dikov 1979; Morlan 1973a; Workman 1978) have not been uniformly applied to newly discovered materials (compare with Gotthardt 1990; Hare 1995; Dixon 1985; Shinkwin 1979). This lack of standardization hampers identification of types that might prove useful in isolating or discriminating instances of migration and diffusion. The vast area under consideration can be broken up into numerous geographic regions where archaeologists have developed specific regional chronological sequences (these are illustrated in Figure 1). Quality and quantity of data vary by region, and in many cases researchers within specific regions are reluctant to use terminology/typologies developed in adjacent regions, a situation that may mask cultural association (see Vasil'ev 2001).

It is important to note the different levels of attention given to artifact and feature typologies in the early prehistoric Northwest North American record (pre-5000 cal BP). Formal descriptions of diagnostics are generally limited in the early Alaskan record. Data are often difficult to compare; e.g. the numerous houses at Ushki I, Level 7 (~12,000 cal BP) have no contemporary analogs in Northwest North America. The richly described burials in CisBaikal Mesolithic and Neolithic (Weber et al. 2002) can be contrasted with the lack of early burials for foraging groups in Late Pleistocene Beringia or Subarctic Alaska during the Holocene. Prehistoric structures are rare in the Alaskan record until after ~5000 cal BP. Pottery and metallurgy are commonly used to interpret ancient population migration and dynamics in Northeast Asia (e.g. Michael 1958; Khlobystin 2005; Kuzmin 2002). As an illustration, when describing a newly identified short-lived Iron Age Siberian culture, Mandryka (2008) details hypothesized relationships with nine different cultures, primarily on the basis of ceramic traits. Such detailed comparisons are difficult to establish using primarily lithic data in Alaska. Beyond pottery associated with Paleo- and Neoeskimo and other Alaskan coastal groups and copper use after 1000 cal BP, pottery and metallurgy are nearly absent. In a similar fashion, there is limited evidence for art traditions in Alaska prior to late Paleoeskimo constructs (e.g. Ipiutak, Okvik); Athabaskan tradition sites (*sensu* Dixon 1985) have very little art that can be profitably linked to more ancient groups (see discussion in Workman 1977).

Because of the lack of detailed typologies in Alaska and possible overreliance on types created/discovered in very early investigations (cf. Bacon 1987), currently defined Alaskan cultural entities may be problematic (i.e. conditioning factors of assemblages attributed to different traditions may reflect non-normative variation). For example, several Early Holocene non-microblade-bearing components in the Nenana basin have been variously ascribed to Denali Complex, Nenana Complex, or Northern Paleoindian tradition (Bowers 1980; Dixon 1993, 2001; Mason et al. 2001). Recent work by Potter (2008a, 2008b) has

indicated that much variability for these and other components in Subarctic Alaska may relate to changes in land use and economy rather than strictly typological changes. However, it is beyond the scope of this discussion to evaluate the viability of each cultural construct.

There is considerable debate about the validity of many of the cultural units illustrated in this presentation, not to speak of the hypothetical linkages discussed here. This work should therefore be seen as a first-approximation of temporal and geospatial material cultural variability. Given the relative lack of a comparable graphic overview of cultural units for these regions, I put forward this synthesis in the hope of stimulating discussion among archaeologists and those interested in broad patterns of cultural continuity and change for this area.

While detailed archaeological investigations on the topic of ancient population movements (linked with languages) are well developed in Russian archaeological practice, they are much less common in Northern North America (see Dumond 1969, 1998b; Ives 1990; Matson and Magne 2007 for rare exceptions). While migration has been proposed to explain material culture change in Northwest North America, it generally involves local groups or immediate ancestors (see Dumond 1998b). However, processual explanations of cultural change stressing internal systemic responses to external environmental vectors still tend to dominate in Alaska (e.g. Anderson 1968, Mason et al. 2001, Mason and Bigelow 2008) and synthetic efforts often focus on adaptive strategies of specific groups rather than changing strategies between groups (e.g. Yesner 1996). Dumond is an influential exception, who in a series of papers (1969, 1980, 1987) constructed scenarios of migration of Na-Dene and Eskimo-Aleut ancestors directly linked with archaeological materials. These scenarios will form part of the discussion below.

2.0. METHODS

Archaeolinguistic correlations have received considerable attention, primarily in the context of Indo-European prehistory (cf. Lamberg-Karlovsky 2002). The principal problem with secure reconstructions of ancient links between language and population and material culture is the problem of equifinality (different causes leading to the same observable result). Conceivably, arguments could be made for any number of correlations consistent (or at least not inconsistent) with the archaeological data. Such correlations are notoriously difficult to test (Spriggs and Blench 1997), if not impossible (Dolukhanov 2003:181), particularly for hunter-gatherers (Pejros 1997:153). In a more optimistic vein, Renfrew (2000) outlined how archaeolinguistic hypotheses could be developed, including linkage with demographic processes and integration with molecular genetics. Genetic data is beyond the scope of this paper, which relies exclusively on archaeological data. Paleodemography is even less well understood for these regions, as witnessed by the wide-ranging hypotheses about colonization of the New World (see references in Schurr 2004).

This situation is exacerbated in Northeast Asia and Northwest North America because of the limited stylistic variation in much of the archaeological record. Normative concepts of culture (i.e. that mental templates differing for each ethnicity are the primary conditioning factor for material culture variability) invoked when arguing for language-material culture correlations are generally seen by processual archaeologists as problematic (Jones 1997), particularly when other explanations such as adaptation to changing environments can be tested.

Because of the difficulty in providing definitive tests of archaeo-linguistic correlation, I explicitly state my assumptions.

(1) Unless there is a compelling reason for why language, archaeological (i.e. material) culture, and genetic population should not be broadly correlated in a particular instance, we may assume that continuity/discontinuity in material cultural variability reflects (at least in a general way) underlying continuity/discontinuity of populations (genetically and linguistically related) that used these technologies. This is not to say that similar technologies or archaeological units are considered equivalent to an ethnographic culture or groups speaking the same language, but merely that material culture-language associations are more likely than a single linguistic community associated with multiple contemporaneous archaeological

cultures (generally separated into different geographic and ecological areas).

I agree with Olsen (2002) that while exceptions can be found to the notion that material cultural traits and languages “move across the landscape as though they were people,” patterning consistent with this idea may also be found. We are in an early phase of understanding the prehistory of the far north—on the North American side, many basic concepts like microblade function (Potter 2005), Paleoindian presence and age (Bever 2001), and basic routes of colonization are still debated on the basis of archaeology and genetics (Perego et al. 2009; Straus et al. 2005; Goebel et al. 2008;). However, in reviewing broad-scale continuities and discontinuities of the archaeological record, a framework for initial testing of hypotheses for Na-Dene and Yeniseian prehistory can be provided, pending more detailed macro-regional syntheses.

(2) Proto-languages (i.e. Na-Dene or Yeniseian) were spoken by genetically related people, and daughter languages imply genetic descent. This seems justified given the generally close correlations between language families and genetic relatedness indicated by numerous studies (e.g. Barbujani and Sokal 1990; Cavalli-Sforza et al. 1994; Chen et al. 1995, but see Nettle and Harriss 2003). Specifically, analysis of Y-chromosome variation among Native Siberian populations by Karafet et al (2002) led those authors to conclude that the genetic patterns “correlated with language, indicating that language affiliation might be a better predictor of the genetic affinity among Siberians than their present geographic position” (2002:761). They also note that these patterns “may be a general feature characteristic of indigenous groups that have small effective population sizes and that have been isolated for long periods of time” (Karafet et al. 2002:761).

(3) If two contemporaneous archaeological cultures are present, but separated geographically (e.g. Arctic Small Tool tradition and Northern Archaic tradition in coastal and interior Alaska, respectively), this constitutes evidence for separate populations (i.e. genetically and linguistically distinct, following from the second assumption).

Because of the predominance of Indo-European prehistory in archaeolinguistic studies, I briefly summarize some fundamental differences with Paleolithic, Mesolithic, and Neolithic adaptations to Subarctic and Arctic environments. The long-term stability/feedback of food producing societies (Neolithic) of Southwest Asia and Europe (Rona-Tas 2002) can be contrasted with earlier Paleolithic peoples in Beringia characterized as small, mobile groups, with large territories (Goebel 1999) (similar in some ways to known ethnographic groups, i.e. Athabaskans and Evenki). How this situation may change expectations for antiquity of linguistic divergence based on a given number of cognates is unknown. However, Blench (2001) notes regarding Berber that “highly mobile populations already speaking closely related languages, constantly encountering one another in open terrain, helped maintain a remarkable uniformity over the past 7000 years since they expanded westward from the Nile Valley” (Blench 2001:184).

Nettle’s (1997) discussion is particularly relevant: his model links initial colonization with population fissioning (and thus more linguistic diversity) as niches are filled, after which fissioning rates decline and later periods are characterized more by lineage extinction (i.e. less linguistic diversity) (1997:3325). This model is important to the Dene-Yeniseian question, because the intervening area between modern descendants (Ket, Athabaskans, etc.) was colonized relatively recently, on the order of the last 18,000 years (Goebel et al. 2008).

In this paper, I present a tentative framework for describing broad-scale archaeological patterning in Northeast Asia and Northwest North America from colonization by modern humans (~16,000 cal BP) to nearly the ethnographic present (i.e. prior to Euroamerican settlement). To limit the scope of this article, I focus on the area between the present geographic distribution of Na-Dene and Yeniseian (namely eastern Siberia, east of Yenisei River, the Russian Far East, and Alaska). This framework utilizes archaeological constructs of populations using specific suites of material culture that relate in various ways (e.g. continuity, amalgamation, replacement) with preceding populations associated with other archaeological constructs. With the near absence of human remains associated with many of these groups, a broad correlation of material culture, genetic relationships, and language is assumed. Given the widespread similarities in much Upper Paleolithic and Mesolithic/Archaic technologies in high latitudes, many of the earlier archaeological constructs probably encompass multiple ethno-linguistic groups. Varying designations are used in the

archaeological literature (e.g. traditions, phases, complexes) and there are varying methods for delimiting these groupings. For the purposes of this study, I generally aggregate to higher level groupings (i.e. *traditions* for North America and *cultures* for Northeast Asia) to avoid the complications of site-by-site variability or mid-level complexes and phases that demonstrably have links within more inclusive cultural traditions. I use both terms to denote these higher-level groupings. A detailed technological and typological synthesis of such a vast area would fill several books, and would suffer from lack of data for many regions; therefore, only the broadest patterning is discussed here.

Demic arguments about prehistoric language dispersals have found the strongest archaeological support in major transformations of material culture, tied to economic change (e.g. Indo-European spread into Europe linked with Neolithic farming, Renfrew 1987; Bellwood and Renfrew 2002). There are no such major economic transformations apparent in the early archaeological record of these northern regions. In the North American subarctic, the record reflects foragers with various economic foci (typically fish, large mammal, and shellfish in later coastal sites). In the Northeast Asian subarctic, hunting and fishing subsistence economies predominate, with pastoralism (in the form of reindeer herding) appearing widespread only after ~2000 cal BP (Mirov 1945; Røed et al. 2008). In coastal regions of both areas hunting and fishing economies predominate until the middle Holocene; the first unambiguous evidence of maritime adaptations is found with the Ocean Bay Tradition (~6800–4500 cal BP) in south-central Alaska. More widespread maritime adaptations are present in coastal areas after ~5000 cal BP in northwest North America and ~3800 cal BP in northeast Asia.

What constitutes testing archaeo-linguistic hypotheses? Given the patterns of archaeological variability in this region in the Late Pleistocene and Holocene and the empirical limitations of the data, the archaeological record alone will not provide certainties regarding correlation of ancient languages, genetic populations, and material culture. However, we can generalize basic measures of material cultural continuity or change (the latter typically related to population migration or diffusion of technology). Hypotheses consistent with trends in material culture (continuity within a region or movement from one region to another) are considered to be more supported by archaeological data, whereas hypotheses that imply movement of populations between one or more archaeological cultures with distinct differences in technology or economies are considered less supported.

Archaeological continuity is inferred when substantial configurations of multiple tool types or classes are shared between cultural traditions through time along with minimal fundamental change in economic and settlement systems. Discontinuity is inferred when substantial differences in material culture and basic patterns of economy and settlement between successive cultural traditions are present within a region. Cultural traditions with associated radiocarbon dates are given preference over those based on typology alone. The temporal boundaries for all traditions were calibrated for fluctuations of atmospheric carbon (dates are provided in years cal BP), and maps were created for periods with substantial cultural change.

Generally, I follow previous investigators’ interpretations of relatedness of cultural traditions. Major regional syntheses include: Alaska (Anderson 1988; Dixon 1985; Potter 2008a), southwest Yukon Territory (Workman 1978), Northwest Coast (Alaska, B.C.) (Ames 2003; Ames and Maschner 1999), western Canadian subarctic (Gordon 1996), Bering Straits (Dumond 1984; Gerlach and Mason 1992), south-central Alaska (Clark 1992; Dumond 1998a), Aleutian Islands (Knecht and Davis 2001), Chukotka and Kamchatka (Dikov 1979, 1993; Kuzmin 2000; Slobodin 1999, 2001, Kiryak 2006), Lena/Aldan basin (Mochanov 1969a-c, Mochanov and Fedoseeva 1986), Trans-Baikal (Michael 1992), Cis-Baikal (Weber et al. 2002; but see Ayesev 2002), Yenisei basin (Davis 1998; Vasil’ev 1992; Vasil’ev and Semenov 1993; Makarov and Batashev 2004), Taimyr and northern Siberia (Khlobystin 2005; Pitul’ko 1999), Sea of Okhotsk, north coast (Lebedintsev 1990, 1998), Primor’ye and Lower and Middle Amur, and Sakhalin and Kuriles (Kuzmin 2005; Vostretsov 2006) (see Figure 1). There are considerable disagreements when generalizing from individual components to local complexes to regional traditions within each area, as well as hypothetical connections among these cultural traditions through time. It should be noted that *there is no widespread archaeological consensus on the internal validity and/or external relationships of many of these broader comparative links*. For the majority of these

broader comparisons, I generally follow Dumond and Bland 1995; Kuzmin 2002, 2005; Kuzmin and Orlova 2000; Potter 2008b-c; Powers and Jordan 1990, n.d.; Vasil'ev 1993, 2001. Later Athabaskan migrations (post-2000 cal BP) generally follow Matson and Magne (2007).

The major language families presently located between Na-Dene and Yeniseian speakers include Yukaghir (possibly related to Uralic), Chukotko-Kamchatkan, and Eskimo-Aleut (the last two distantly related, Fortescue 1998). Fortescue (1998) also links these groups with Uralic to form an ancient Uralo-Siberian language "mesh" at an even greater time depth. Tungusic (Altaic) speakers (Even, Evenk, and Sakha) present now in the Lena basin and elsewhere in North Asia appear to be relatively recent migrants (~700-300 BP). Peripheral to the Yeniseians are Samoyedic (Uralic) speakers to the north and west and Turkic and Mongolian (Altaic) speakers to the south. Peripheral to the Na-Dene are Haida and Wakashan speakers on the Northwest Coast of North America, Salishan speakers on the coast and inland to the south, and Algonkian speakers to the east (in the Eastern Subarctic). Where possible, hypotheses regarding archaeological correlation are discussed below.

The graphics illustrating the basic cultural sequences for these regions are created for heuristic purposes only (Figures 2-4). There are many areas that have received little archaeological investigation, particularly the middle and upper Kolyma and Yenisei River basins in Siberia and much of western Interior Alaska. There is no single widely accepted cultural historical sequence for many of the regions. Basic cultural units are still to be rigorously delineated in certain regions, such as Interior Alaska (see Potter 2008a). Definitions of many of the currently used cultural constructs are debatable. Finally, polygonal boundaries are used here where fuzzy centroids may better reflect our current understanding of these cultural manifestations (i.e. a center of few large, well-dated sites, separated by wide areas with few to no dated sites). However, the boundary approach is used here for clarity to draft a first approximation of cultural historical sequences over broad areas, even with the current gaps in empirical knowledge. The edges generally have less firm evidence for specific cultural expressions, and have more potential complications due to admixture of cultural traits from neighboring regions. Glacial limits and glacial lake data were derived from Dyke et al. (2003), Svendsen et al. (2004), and Siegert et al. (2004). Sea levels were derived from Manley (2002) for each period and mapped using a digital elevation model. All maps were prepared with ArcGIS software, using a North Pole Azimuthal Equidistant Projection.

2.1. Data limitations

There are key differences in Russian and North American archaeological methodology that are relevant, both theoretical and empirical. Ethnogenesis (the question of origins and dispersals of ethnic groups) while a common component in Soviet and Russian archaeology and history (Trigger 1989, see papers in Michael 1962) is not generally addressed in the North American archaeological literature. Ethnogenesis hypotheses are key components in regional syntheses in the Soviet literature (Okladnikov 1938; Dikov 1993; Khlobystin 2005; see reviews in Levin 1973). Soviet archaeological interpretations typically focused on autochthonous cultural development in each region (Trigger 1989).

American archaeologists, in contrast, have focused more exclusively on environmental change as the main driver for assemblage variability (Trigger 1989), particularly since the advent of processual approaches in the 1960s and 1970s. American archaeology is deeply connected with anthropology (with the latter's focus on the ethnographic present) rather than with history. Nevertheless, there is a long tradition of North American archaeologists using primarily cultural historical approaches to interpret archaeological patterning in Northwest North America.

In the Subarctic and Arctic, the assemblages in question are almost exclusively limited to lithic technologies and typologies, with harpoon heads and other organic tools used to define some coastal cultures after ~3000 cal BP. One element that hampers detailed material cultural comparisons is the relative lack of standardized typologies for many regions, particularly the northwest North American Subarctic. Even the few relatively comprehensive typologies created for this region (Morlan 1973a; Workman 1978) have not been uniformly applied to newly discovered materials (compare with Gotthardt 1990; Hare 1995;

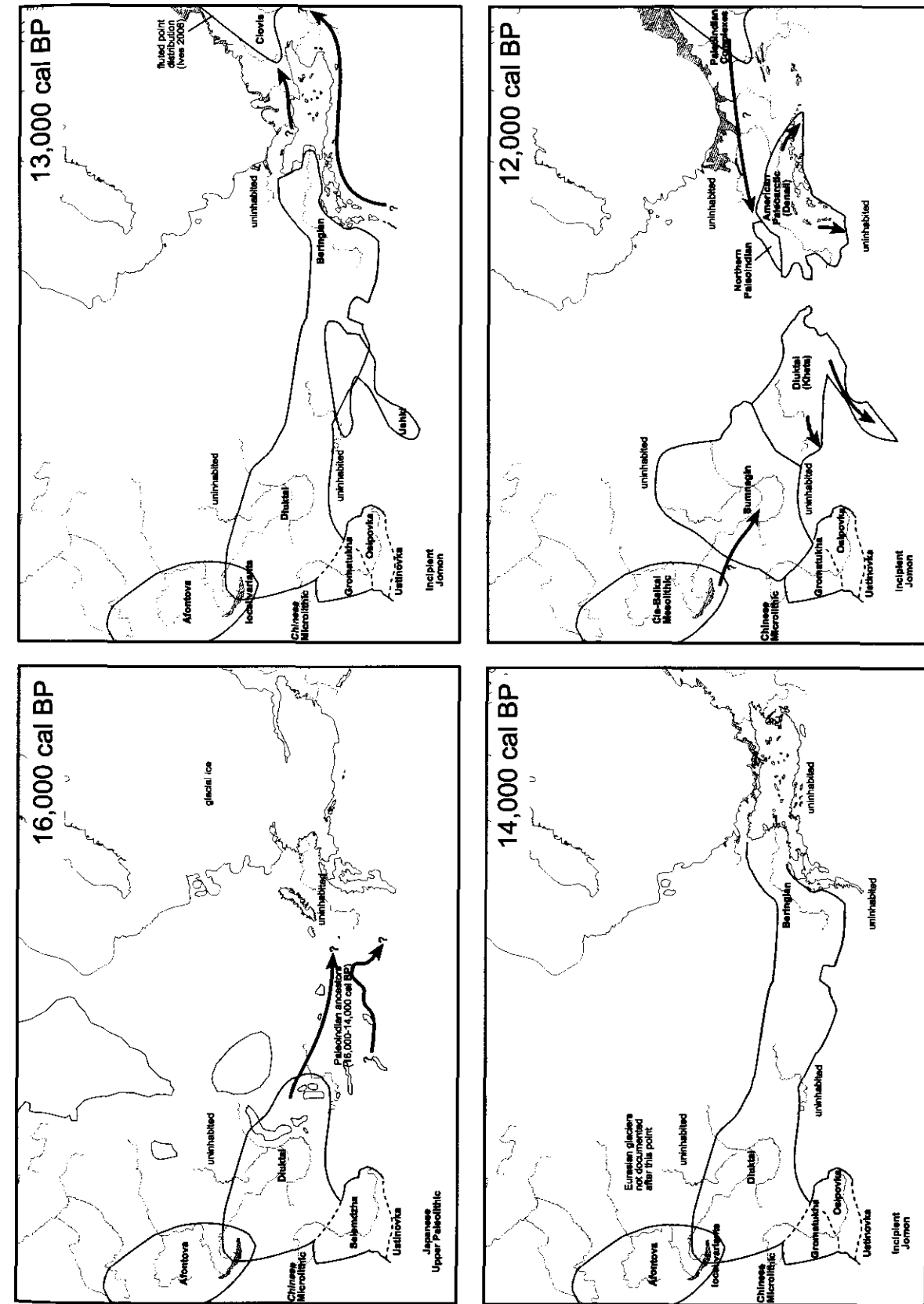


FIGURE 2. Archaeological patterning (16,000–12,000 cal BP). Red lines indicate boundaries between contemporary cultural traditions (solid lines indicate sharp breaks; dashed lines indicate regional variants), bold text indicates archaeological traditions, italics indicates languages or language families/stocks. Dark gray indicates exposed continental shelf during the Pleistocene (see Manley 2002). North American glacial ice distributions (white) are derived from GIS data (Dyke et al. 2003).

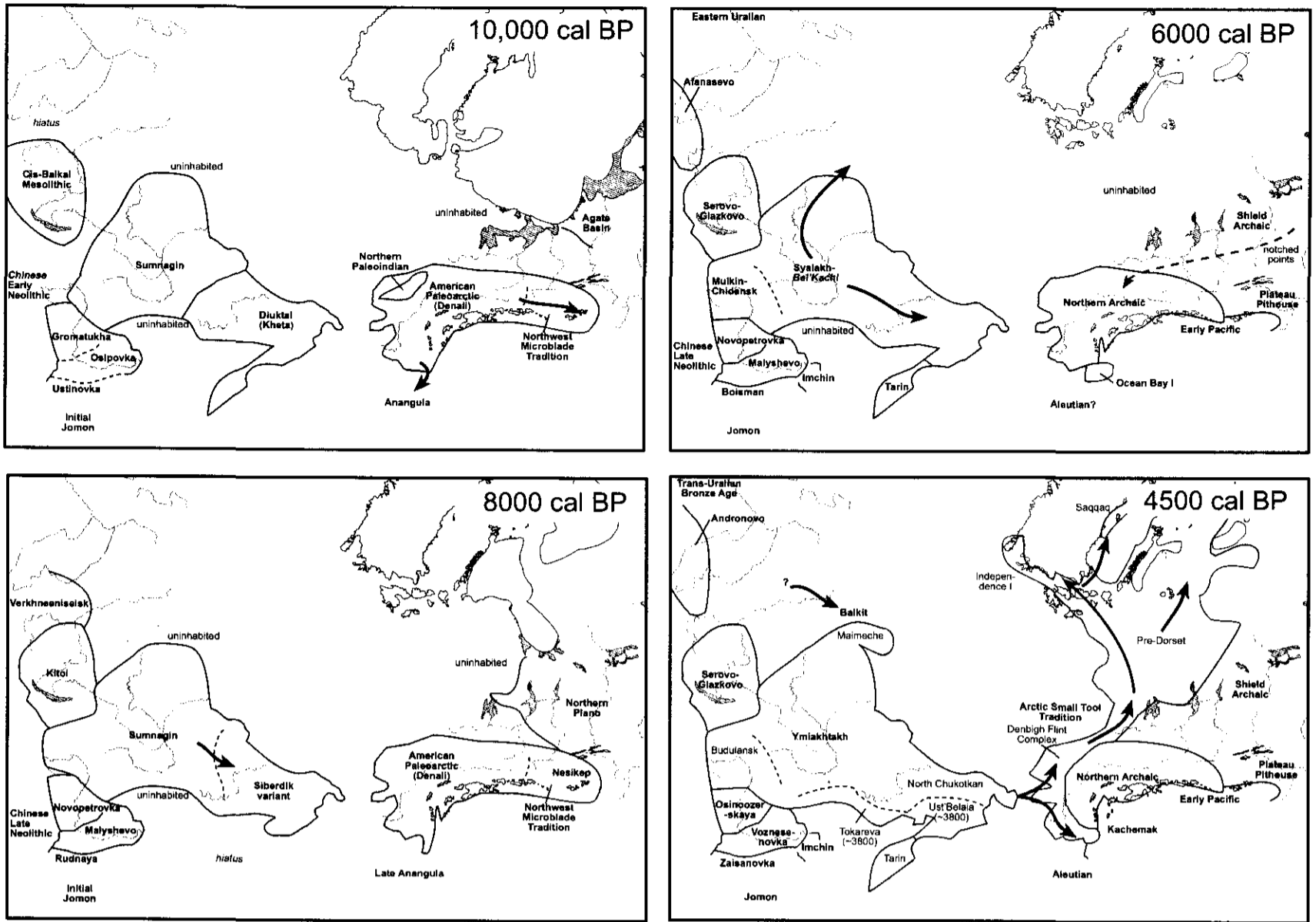


FIGURE 3. Archaeological patterning (10,000–4500 cal BP)

Archaeological Patterning in Northeast Asia and Northwest North America

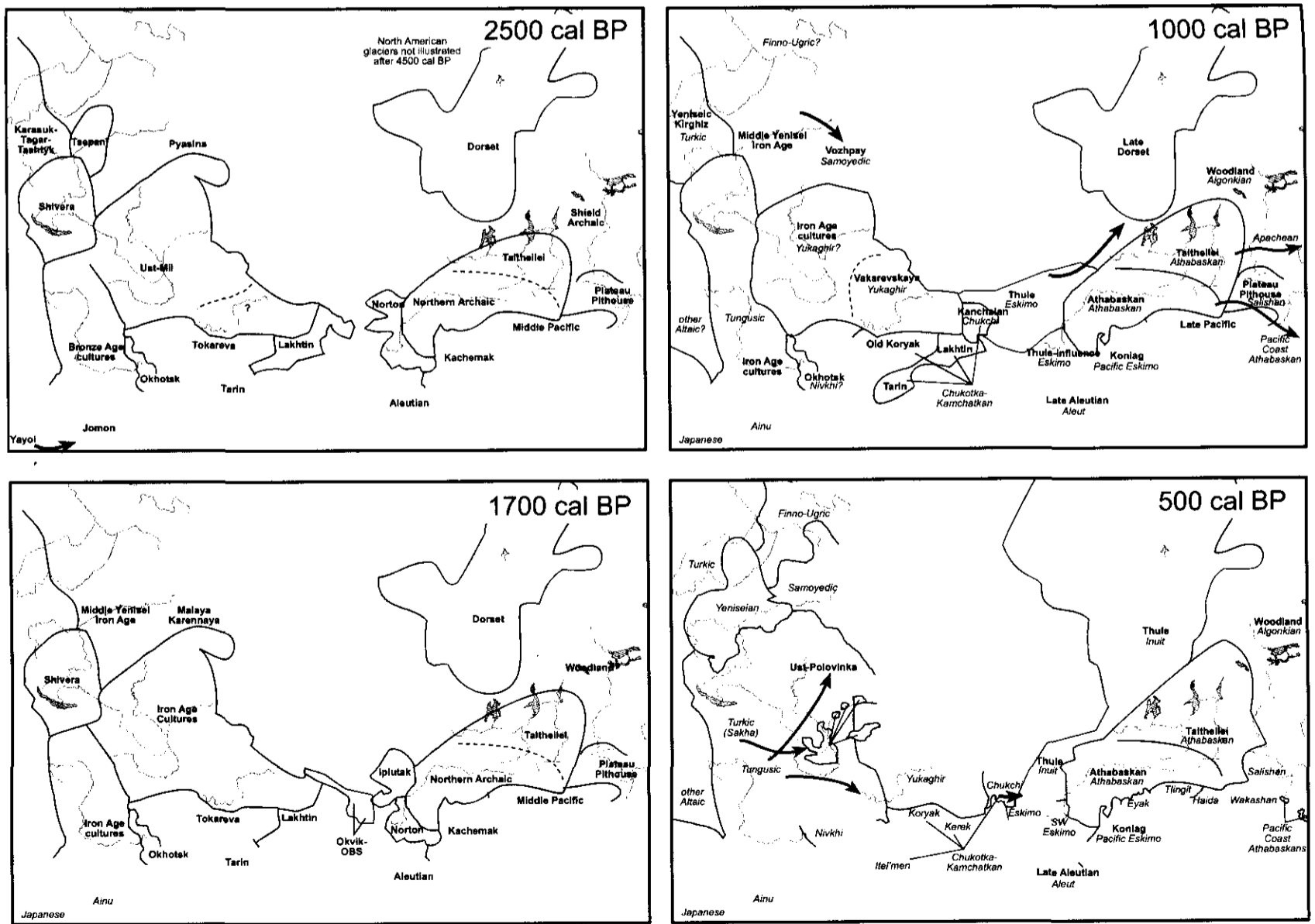


FIGURE 4. Archaeological patterning (2500–500 cal BP). Note: for 500 cal BP, the Yeniseian polygon is defined by 17th century (~300 cal BP) reconstructions based on fur-tax records (from Dolgikh 1960, cited in Pakendorf 2007) and Yeniseian toponym distribution (Vajda 2001)

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Dixon 1985; Shinkwin 1979). This relative lack of detailed typological research hampers identification of types that might prove useful in isolating or discriminating instances of migration and diffusion.

3.0. RESULTS

3.1. Patterns of Continuity/Discontinuity

3.1.1. Northeast Asian traditions

Two major technological traditions are apparent in the Late Upper Paleolithic of Siberia (Vasil'ev 2001): Afontova-Kokorevo (in the Baikal region), and Diuktai (centered in the Lena basin) (but see Abramova 1989, cited in Vasil'ev 2001, who has delineated multiple local cultural groups). Populations using Diuktai-related technologies originating in the Aldan basin (Mochanov 1986) or possibly south-central Siberia (Kuzmin 2007) expanded to the northeast during the late Sartan glacial and deglaciation period (16,000–12,000 cal BP), prior to evidence of human habitation in Northwestern North America (Figure 2). Key diagnostics for the Diuktai tradition are wedge-shaped microblade cores and foliate bifaces. The former artifact type has a wide distribution in northeast Asia, including Mongolia, northern China, Korea, Japan, and Siberia. While data from the Kolyma basin and Chukotka are sparse, extant data suggests an expansion of Diuktai-related materials to the northeast (Goebel 1999), coterminous with the oldest site in Northwest North America, Swan Point Cultural Zone 4, dated to ~14,000 cal BP (Holmes 2001, 2004). Apparent continuity of Diuktai and Diuktai-related groups in Beringia (east and west) are evident into the Holocene. Kheta (in Chukotka-Kamchatka) and American Paleoarctic (in Eastern Beringia) share many elements from the Diuktai culture (Dikov 1979, but see discussion in Yi and Clark 1985).

While the Ushki tradition, associated with stemmed points and lacking microblades, was present in Kamchatka at the terminal Pleistocene (Dikov 1979, Dikov and Titov 1984), it is younger than the earliest microblade-related site in Alaska, Swan Point (Goebel et al. 2003). Later occupations at Ushki Lake sites appear similar to the Diuktai tradition (Goebel and Slobodin 1999). These Late Paleolithic cultures shared terrestrial hunting economies with no evidence of a maritime or even coastal focus. The latest occurrence of Diuktai-related forms appears in Kamchatka and Alaska.

At ~12,500 cal BP, Sumnagin-related technologies spread from the Lena Basin. The material culture is distinct from Diuktai, including near-absence of bifacial points, dominance of blade blanks, and conical and pencil-shaped microblade cores (with few to no wedge-shaped microblade core forms) (Mochanov 1986). While there is disagreement between Russian researchers regarding association of materials from the Russian Far East and Eastern Siberia (Dikov 1979; Mochanov 1986), there is substantial similarity between Sumnagin and Siberdik in the early Holocene (Goebel and Slobodin 1999:146-147). However, there is little evidence of Sumnagin-related materials reaching Alaska (though see Ackerman 1992; West 1996:551). The spread of Sumnagin and variants may represent a demographic movement, possibly replacing populations using Diuktai-related technology (Figure 5). Lithic assemblages from Sumnagin and later Neolithic cultures in Northeast Asia (Syalakh, Bel'kachi, and Ymiakhtakh, ~7000-4000 cal BP) share common elements (Mochanov 1969a-c), including conical and pencil shaped microblade cores and multifaceted burin forms, though the re-appearance of bifacial point forms in Syalakh has not been fully explained (Mochanov and Fedoseeva 1986:677) (Figure 3). Later Ust-Mil (Bronze Age) and Iron Age Aldan cultures (like Vakarevskaya, Powers and Jordan n.d.) may be related to Ymiakhtakh, and ultimately associated with Yukaghir-speaking populations (Aleksiev 1996, see review in Pakendorf 2007:18-19) (Figure 4). This sequence shows an overall economic trend towards increased fishing, but remained predominantly based on terrestrial hunting.

In Cis-Baikal, local continuity of material culture across the Pleistocene-Holocene boundary from the Upper Paleolithic Afontova-Kokorevo to Mesolithic complexes like Badai-Verkholskaia, Ust'Belaia, and Khina appears evident (to ~8000 cal BP) (Aksenov and Medvedev 1968; Vasil'ev 1993; see Dolitsky 1985 for a more processual-oriented examination of the Baikal Mesolithic) (Figure 2). Okladnikov's (1955) model of a Isakovo-Serovo-Kitoi-Glazkovo sequence has been revised with compelling evidence ranging from radiocarbon chronology to human genetics (Weber 1994; Link 1999; Weber et al. 2002; Mooder et al. 2006).

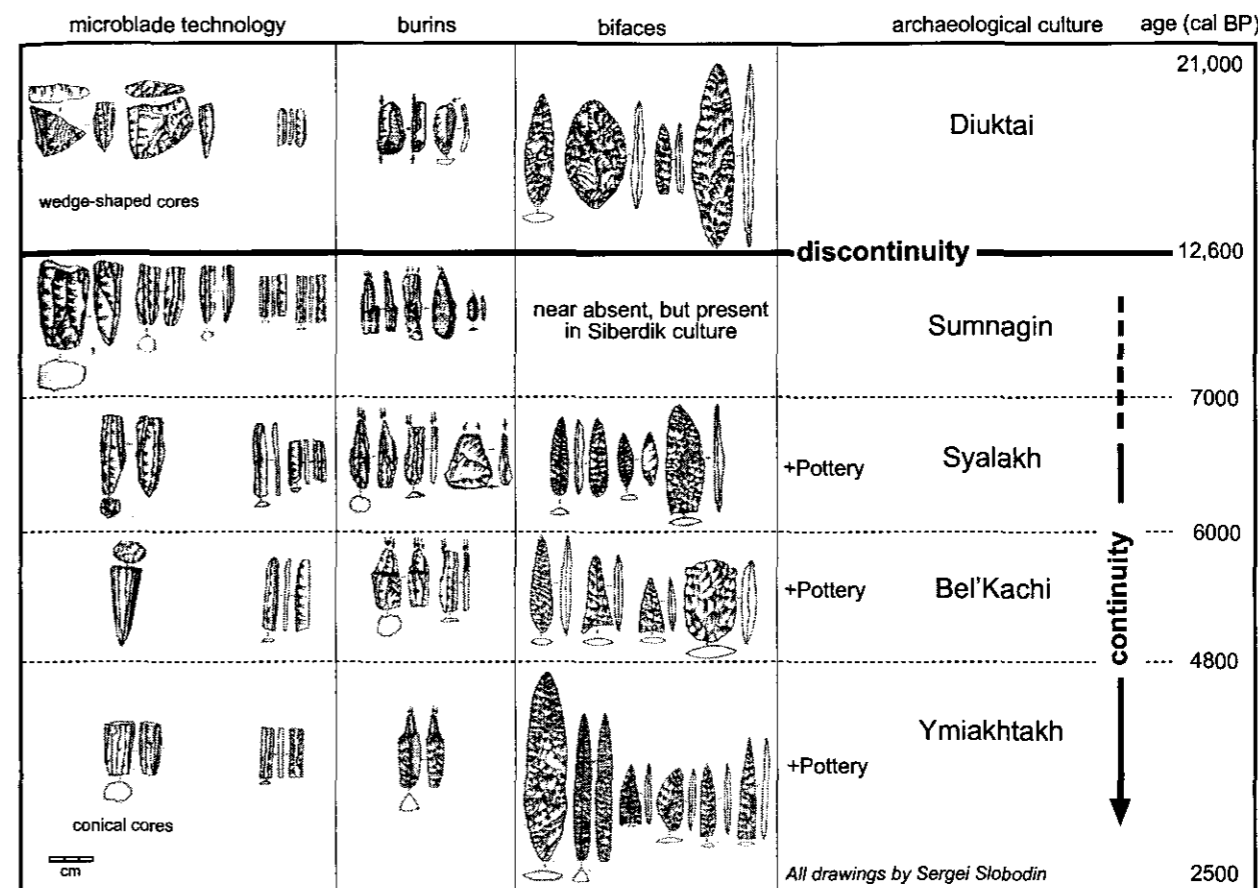


FIGURE 5. Examples of continuity and discontinuity in the Lena basin sequence (Mochanov and Fedoseeva 1984). All artifact drawings by Sergei Slobodin, used with permission (other graphics by Potter).

A hiatus of nearly 1000 years separates the Late Mesolithic and Early Neolithic Kitoi (8000–7000 cal BP) from the Late Neolithic Serovo-Glazkovo (6000–3200 cal BP) (Weber 1995) (Figure 3). This gap has been a key focus of the Baikal Archaeology Project (<http://baikal.arts.ualberta.ca>). The Serovo-Glazkovo culture is related to the succeeding Iron Age Shivera culture (3200–1500 cal BP), the latter possibly associated with Altaic speakers (Okladnikov 1955). The linguistic affiliation of the Kitoi populations is unknown, and may be related to Yeniseian groups. Mooder et al. (2006) indicates significant genetic differences between post-hiatus Serovo-Glazkovo groups that are similar to modern Siberians (mainly Altaic speakers), whereas older Kitoi populations “are significantly different from all but modern Ket and Shorians” (Mooder et al. 2006:349).

For the Taimyr Peninsula, Khlobystin (2005) suggests a geographic separation between Neolithic cultures in eastern Taimyr (post-4000 cal BP), associated with cultural trends in Yakutia (the Belkachi-Ymiakhtakh sequence), and western Taimyr, associated with the Ob' basin and western Siberia. The Baikit-Pyasina-Malay Karennaya sequence (~4500–1100 cal BP) in western Taimyr is correlated with Samoyedic populations (Khlobystin 2005:196–198). A later Iron Age culture, Vozhpay, is associated with Nenets-Enet ancestors (2005:198). After ~1200 cal BP in eastern Taimyr, the Ust-Polovinka ceramic type is associated with expanding populations of Tungusic-speakers (Khlobystin 2005:198).

Contrasting with the numerous archaeological investigations along the Upper Yenisei River (south of Krasnoyarsk) (Vasil'ev and Semenov 1993), very little is known about the prehistory of the Middle and Lower Yenisei (Makarov and Batashev 2004). One common view of the prehistory of the region is a sequence of Karasuk (Bronze Age) and Tagar-Tashtyk (Iron Age) groups in the Upper Yenisei (3000–1800 cal BP).

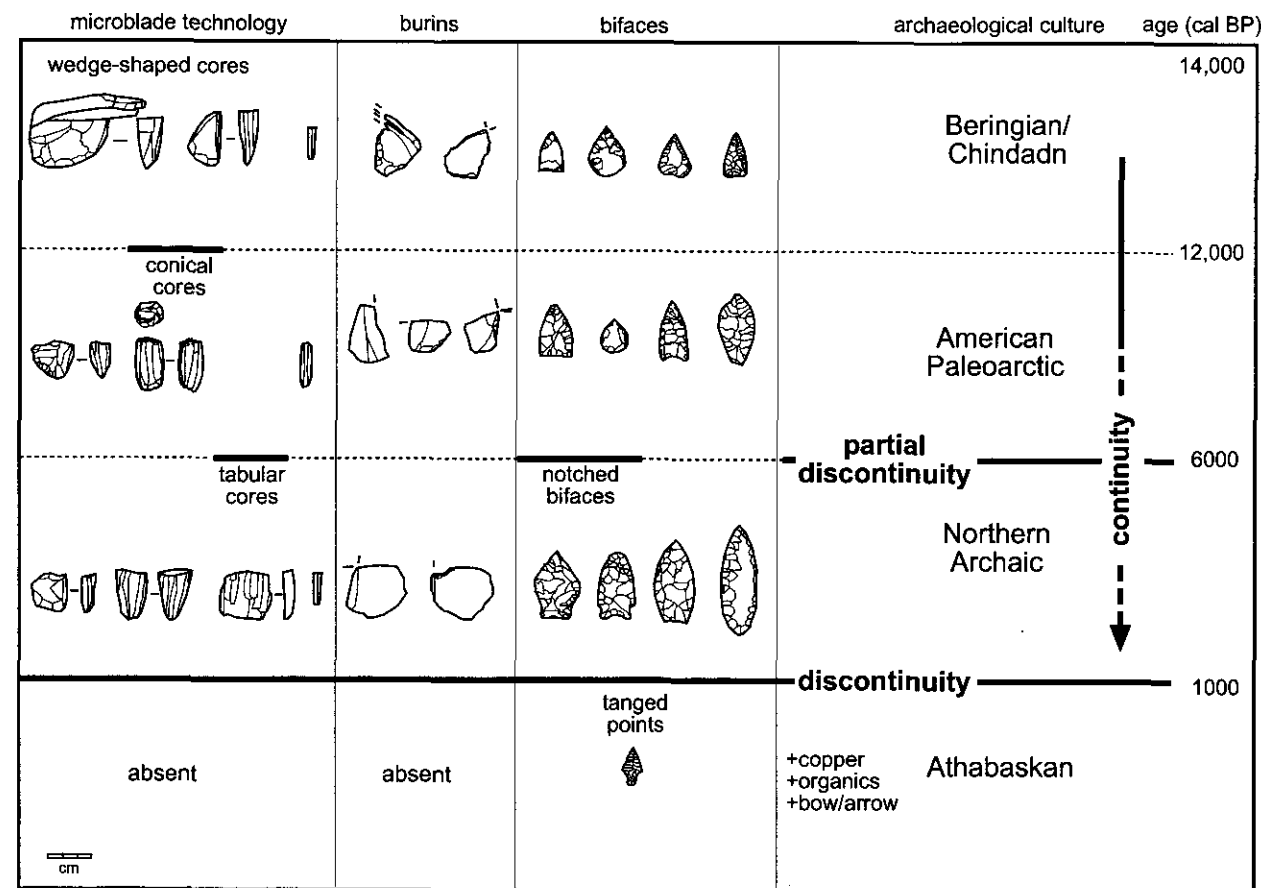


FIGURE 6. Examples of continuity and discontinuity in Interior Alaska. All artifacts drawn or adapted by Potter.

areas (e.g. Spein Mountain) (Bever 2001; Dixon 1999) (Figure 2). A similar assemblage of unfluted bifacial points possibly associated with dates of ~13,000 cal BP from Tuluq Hill (termed Sluiceway Complex) (Rasic 2000) may extend the lower temporal boundary of this tradition. These Alaskan materials may relate to a northward expansion of Agate Basin-related Paleoindian groups associated with Northern Plano tradition in the Canadian subarctic (MacNeish 1964; Gordon 1996; Bever 2006).

Regardless of their origin or age, the Northern Paleoindian tradition does not appear to extend beyond ~10,000 cal BP, with only the American Paleoarctic (or Denali Complex), or closely derived manifestations, expressed throughout Alaska in the early Holocene (Potter 2008a). The typological complexity with these early traditions are evident in that Nenana Complex (Goebel et al. 1991), Northern Paleoindian (Dixon 1999), and American Paleoarctic (West 1981; supported cladistically by Buchanan and Collard 2007) have all been considered antecedents to Clovis, the earliest tradition in central North America. Straus et al. (2005) argue for ultimate derivation of Clovis ancestors from the Siberian Upper Paleolithic.

Thousands of years after initial colonization, American Paleoarctic-related populations expanded southward to the coast of south Alaska and the Northwest Coast, later giving rise to variations like Paleomarine tradition, Northwest Microblade tradition and Ocean Bay (Davis 1990; MacNeish 1954, see review in Clark 2001; Clark 1992; Yesner 1998). Stable isotope data from human remains from On Your Knees Cave (~10,300 cal BP) in Southeast Alaska indicate early marine-oriented diets associated with microblade technology and bipointed bifaces (Dixon et al. 1997). Importantly, these human remains represent the only ones associated with the American Paleoarctic; and genetic analyses indicate relationships with modern Native American groups in North and South America, specifically not Na-Dene or Eskimo populations (Kemp et al. 2007). This strongly suggests that Early Holocene adaptations were sufficient to enable exploitation of a wide range of interior subarctic and coastal ecosystems and that at least part of the American Paleoarctic tradition represents ancestors of multiple language groups that dispersed throughout the Americas.

3.1.3. Northwest North American traditions (post-6000 cal BP)

While Early Holocene material culture in Northwest North American appears relatively homogeneous (if sparse in certain regions), major cultural changes are widespread around 6000 cal BP (Figure 3), from central and Northern Alaska, the Northwest Coast, and interior Plateau. Paleoindian complexes (Northern Plano) are replaced by Shield Archaic groups in the eastern Canadian subarctic (Gordon 1996), possibly associated with Algonquian-speakers (Wright 1981). The Nesikep tradition (with microblade technology) of interior British Columbia is replaced by the non-microblade Plateau Pithouse tradition (Stryd and Rousseau 1996), which extends from 5,700 cal BP to recent times. The Nesikep tradition is interpreted to represent non-Salishan speakers likely derived from earlier cultural groups of the Plateau (including Northwest Microblade, Old Cordilleran, and Western Fluted Point traditions), while the Plateau Pithouse tradition is interpreted to represent Salishan people moving into the region (Stryd and Rousseau 1996:196–197).

In Alaska, the American Paleoarctic tradition is succeeded by the Northern Archaic tradition at ~6000 cal BP (Anderson 1968; Workman 1978; Ackerman 2004). New technological/typological elements include side-notched bifaces and side-notched cobbles, inferred to be net sinkers, but many elements, including microblade technology, are similar to the preceding Paleoarctic (Figure 6). This transition has been interpreted as migration of new populations (Dumond 1969; Workman 1978), amalgamation of new and existing populations (Dumond 1987) or diffusion of technology but with underlying population continuity (Clark 1994; Morrison 1987). However, there does seem to be consensus that once established, Northern Archaic represents continuous populations, perhaps linked with Na-Dene (Workman 1978), given the extended dichotomy between interior-focused Northern Archaic and various coastal groups (related to Arctic Small Tool and/or Norton tradition) from ~5000 cal BP to recent times.

Northern Archaic tradition subsistence economy was focused on terrestrial hunting (principally caribou) and fishing. Recent work suggests that cultural changes associated with the Northern Archaic may reflect adaptation to the shift from white spruce gallery forests to black spruce-dominated boreal forests (Mason and Bigelow 2008; Potter 2008d). Almost all Northern Archaic sites are located in interior Alaska and

However, Makarov and Batashev (2004:239) argue that the contemporary Middle Yenisei Tsepan' culture (2600–2000 cal BP) is a more likely candidate for Yeniseian ancestors, with continuity in foraging economies (they note the lack of Yeniseian terms for domestication) (Figure 4). Unfortunately, earlier dated cultural units in this northern region are virtually unknown (Makarov and Batashev 2004:241). They further argue for northward movements of Yeniseians at 1,200 cal BP and 700 cal BP linked with movements of Yenisei Kirghiz and Mongols respectively from farther south (2004:240).

3.1.2. Northwest North American traditions (14,000–6000 cal BP)

In Eastern Beringia (present-day Alaska and Yukon Territory), the earliest cultural tradition appears to be derivative of Diuktai Culture, designated Beringian (West 1996), American Paleoarctic (Dumond 1977) or East Beringian (Holmes 2001) (Figure 2). In a recent survey of the literature, Bever (2006) noted diverse technologies (early microblades at Swan Point and a non-microblade Nenana Complex) in the Allerød-Bølling warm period followed by a ubiquitous Denali complex after the Younger Dryas in Eastern Beringia. Analyses by Potter (2008e) suggest continuity in microcore and blade technology and co-occurrence with specific habitat and resource exploitation strategies through the early Holocene, more consistent with a single broad archaeological tradition in the region during the climatic oscillations at the end of the Ice Age, a finding consistent with a number of earlier analyses based on lithic technology and typology (West 1996; Dumond 2001) (see Figure 6).

After ~12,000 cal BP, Northern Paleoindian tradition-related materials (generally unfluted lanceolate bifacial points and lacking microblade technology) appear in the Brooks Range (e.g. Mesa Complex) and other

western Subarctic. The very few Northern Archaic coastal sites either pre-date Arctic Small Tool tradition (Kuparuk Pingo) or are undated (Palisades and Putligayuk River). In addition, the cultural sequence at Onion Portage suggests a replacement of Northern Archaic populations by Arctic Small Tool tradition populations in coastal areas.

In interior Alaska, the Northern Archaic tradition extends from 6000 to 1000 cal BP. A somewhat later regional variant, the Taltheilei tradition, is present in northwest and north-central Canada from 2900-200 cal BP and is clearly linked with Canadian Athabaskan groups (Gordon 1996) (Figures 3-4). The Northern Archaic technological tradition is abruptly replaced by the Athabaskan tradition (*sensu* Dixon 1985) after 1000 cal BP in Alaska, characterized with reduction of formal flaked stone tools, increased reliance on organic technology, copper tools, and reliance on storage facilities (Figure 6). This transition is examined in detail in Potter (2008b), and likely represents an economic transition from high-mobility broad-spectrum hunting to logistically organized fishing-hunting economies associated with recent Alaskan Athabaskans. While some archaeologists argue for population replacement at ~1000 cal BP, perhaps associated with the White River Ash East Lobe eruption (Workman 1972; Derry 1975), other regional volcanic events with widespread ashfall do not correlate with technological change (Potter 2008b) and there are long cultural sequences in the Yukon Territory and Alaska suggesting continuity from Northern Archaic to Athabaskan (Workman 1978; Cook 1969). A number of researchers suggest Dena'ina Athabaskans moved into Cook Inlet basin after 1000 cal BP (Workman 1998; Reger and Boraas 1996; Boraas 2007) suggesting a minimum age for divisions within Alaska Athabaskans.

One possible scenario bridging these disparate ideas is that ancient Athabaskan populations with long-term continuity in the region may have nevertheless had local population displacements, shifts and migrations to accommodate changing environments related to Late Holocene ashfalls. Derry's (1975) model of partial replacement could describe part of this reorganization: Athabaskans with Kavik points but lacking microblade technology expanded to the north and east from the Southwest Yukon. The relative homogenization of northern Alaskan Athabaskan languages may reflect in part recent population movements. Matson and Magne (2007) argue for Athabaskan migrations from the Plateau south to the Pacific Coast at ~1000-800 cal BP (Pacific Coast Athabaskan ancestors) and southeast to the U.S. Southwest (Apachean ancestors), instigated by the White River Ash Eastern Lobe eruption around the same time (but see Ives's 2008 critique).

Along the Northwest Coast, Northwest Microblade tradition is succeeded by the Early Pacific tradition at ~6000 cal BP (Ames and Maschner 1999), with clear coastal adaptations, particularly salmon intensification (Figure 3). This sequence extends from 6400-200 cal BP and likely includes early ancestors of Haida, Tsimshian, Wakashan, Salishan, as well as Tlingit (Figure 4). But here, the economic/environmental adaptations appear to have forced broad cultural similarities among what are likely different language groups (Ames and Maschner 1999); however, there are possible links between archaeology and language in the Later Holocene (Fladmark 1982). Moss et al. (1989) identify a Tlingit settlement pattern on Admiralty Island extending to ~1500 cal BP, possibly to 3500 cal BP, though in a later paper, Moss (2008) found difficulty in isolating Tlingit and Haida ethnic signatures in faunal procurement in the region. One phase of the developed Pacific tradition in the southern part of the Northwest Coast, Marpole (~2400-1600 BP) may represent Salish-speakers (Matson and Coupland 1995), and may be linked to the earlier Locarno Beach culture (~3500 cal BP) (Mitchell 1990:352). Hobbler (1990:304) notes that distinctions between Wakashan and Salishan populations can be identified in the central Northwest Coast to ~1800 cal BP.

In the northern Gulf of Alaska, Ocean Bay tradition dates a little earlier (~6800 cal BP), containing the first evidence for maritime adaptation for this region. Clark (1996:224-226) notes that Ocean Bay is very different technologically and typologically from the subsequent Kachemak and related Koniag traditions (Figure 3). It is conceivable that while Arctic Small Tool tradition influences (see below) in later Ocean Bay II sites may relate to some of the changes around 4000 cal BP, the Kachemak probably reflects ancestral Eskimo-related populations (Dumond 1984).

In the Aleutian Islands, Knecht and Davis (2001) delineated a cultural sequence extending from 11,000

to 4500 cal BP (Anangula tradition) and from 4500 to 200 cal BP (Margaret Bay-Amaknak-Late Aleutian phases). There is evidence for archaeological continuity, particularly after ~4500 cal BP (McCartney and Veltre 1999; Knecht and Davis 2001; Knecht and Davis 2008). Knecht et al. (2001) also argue for continuity between Anangula and Aleutian traditions. Dumond (1987:47) has linked the Aleutian tradition with Aleut ancestors, citing similarities between Norton and Eastern Aleutian material culture.

3.1.4. Alaskan coastal traditions (post-5000 cal BP)

After the initial colonization of Northeast Asia and Northwest North America by Diuktai-related microblade-using traditions ~14,000 cal BP, there is little evidence for migration across the Bering Strait until ~4800 cal BP (or 5400 cal BP, Harritt 1994), when a significantly different archaeological tradition appears nearly instantaneously in various areas of coastal Alaska, Canada, and Greenland (Figure 3), generally termed the Arctic Small Tool tradition (ASTt) (Irving 1962; Giddings and Anderson 1986; Dumond 1977). Bearers of this tradition had bifacial, microblade, and burin traditions distinctly different from the earlier American Paleoarctic tradition, including characteristic finely flaked diminutive bifacial endblades and sideblades and mitten-shaped burins. Geographic distribution and faunal remains indicate early ASTt populations used both coastal and terrestrial resources (primarily caribou and seal), distinct from Northern Archaic tradition economies which had a wholly terrestrial character. The co-presence of both traditions in separate ecological zones (ASTt along the Arctic coast and adjacent hinterlands and Northern Archaic in the western Subarctic interior) for thousands of years suggests that they represent different genetic populations speaking different languages. There is some disagreement as to the relationships of the cultures or phases comprising ASTt in Alaska, with Giddings and Anderson (1986) arguing for Denbigh Flint Complex-Choris-Norton-Ipiutak sequence (~5000-1000 cal BP), where Dumond (1987, 2000) argues for more continuity in the latter three cultures (and termed the Norton tradition), with more pronounced maritime/coastal economies. While new elements are introduced, primarily diffusion of pottery styles (e.g. cord-marked and linear-impressed from Bel'kachi to Choris and check-stamped from Ymiakhtakh to Norton), there is remarkable continuity in lithic technology (Ackerman 1998:257). At least from Choris, archaeologists generally infer a relationship to Paleoeskimo (or Eskimo-Aleut) groups, though the specific relationships of Aleut and Eskimo, and the various branchings within Eskimo are not clear (Dumond 1977, 1987, 1998b). Mitochondrial DNA analyses of multiple ASTt and ASTt-related individuals suggest relationships with Aleuts, but have no relationship to Na-Dene populations (Gilbert et al. 2008, Hayes et al. 2002).

While there is considerable debate as to the origins of ASTt (Anderson 1970, 1988; Dumond 1984), Powers and Jordan (1990, n.d.) argue that it originated as a variant of Siberian Neolithic Bel'kachi, and thus related to the Sumnagin-Syalakh-Bel'kachi sequence centered in the Lena basin (Mochanov 1969a-c, 1986). Dumond and Bland (1995:437) concur, noting widespread similarities among Bel'kachi, Ymiakhtakh (and related groups) and ASTt; however, they do not see a direct ASTt ancestor in any single known Asian culture. After the initial expansion of ASTt across the Arctic, associated with Independence/Saqqaq in Greenland and Pre-Dorset in the Canadian high Arctic, archaeologists infer generally in situ development until ~1000 cal BP, when Dorset populations were apparently replaced or assimilated by Thule Neoeskimo populations, ancestors to modern Inupiat (Maxwell 1980, 1984:363; McGhee 1984) (see below).

3.1.5. Russian Far East coastal traditions (post-5000 cal BP)

There is currently no evidence of coastal or maritime adapted populations on the Northeast Asian coast (north of Japan) for the Late Pleistocene or Early Holocene prior to the middle Holocene (Dumond and Bland 1995; Ackerman 1998). Between 4800 and 3800 cal BP, various (primarily Neolithic) coastal cultures appear in the region, many with evidence of continuity to modern ethno-linguistic groups (Figure 3). On the north Okhotsk coast, Tokareva (3800-1400 cal BP), with ceramic stylistic similarities with Lower Amur cultures, has been linked with Old Koryak (1600-400 cal BP) (Lebedintsev 1990). In Northern Kamchatka, the Lakhtin(a) culture (3600-400 cal BP) which may represent the ancestors of the Kerek (Orekhov 1998). Orekhov (1987) also suggests a link between Lakhtin and Sumnagin (though Lebedintsev 1990 disagrees).

In interior Chukotka, North Chukotkan and Ust-Belaia (~4500–3000 cal BP) may represent different cultural traditions, both associated with reindeer hunting, linked with Ymiakhtakh (Kiryak 1993, cited in Dumond and Bland 1995) and possibly Norton (Dikov 1979). In southern and central Kamchatka, Tarin (Tarya) is somewhat older (6000–800 cal BP), following a long regional hiatus (10,000–6000 cal BP), and has been linked to Old Ite'l'men (after 800 cal BP) (Kuzmin 2000; Dumond and Bland 1995). Powers and Jordan (n.d.:28) link Kanchalan (~1000–500 cal BP) with ancestral Chukchi, representing primarily terrestrial reindeer hunters adopting more maritime sea hunting techniques.

Throughout these sequences, there is an increasing trend toward maritime resource exploitation, and pottery styles and particularly metal appear to be spread through diffusion, without major population migrations. While some archaeologists have argued for complex formation and development of Paleolithic and Neolithic cultures in the Russian Far East (including Sakhalin and Kuril Islands) (Lebedintsev 1990:17; Dikov 1979:106–128), there appears to be some evidence for broader similarities, perhaps ultimately derived from Bel'kachi and Ymiakhtakh Neolithic cultures (Powers and Jordan n.d.; Dumond and Bland 1995). This patterning suggests at least 5000 years of continuity for Chukotko-Kamchatkan-speaking groups in the region.

An unusual complex, Old Whaling culture (3400–3200 cal BP), found at Cape Krusenstern in western Alaska and on Wrangel Island in the Chukchi Sea, (Dikov 1979; Giddings and Anderson 1986) is an enigma, but may be associated with Choris (Dumond 2000), Independence (Ackerman 1998), or even Northern Archaic (cf. Mason and Gerlach 1995, who rename it "Chukchi Archaic").

After ~1000 cal BP, Thule Neoeskimo groups (associated with ground slate industries and pronounced coastal/maritime adaptations, including umiaks, dog sleds, and communal whaling) are present throughout coastal Alaska, from the Alaska Peninsula, expanding rapidly across the Canadian high Arctic to Greenland (Figure 4), probably replacing earlier Paleoeskimo groups (Dorset and ASTt). The origins of Thule are complex, particularly as the antecedent period (~1700–1000 cal BP) in the Bering Straits (primarily Chukotka and St. Lawrence Island) includes several cultural groups, Okvik and Old Bering Sea (~1700–1300 cal BP), Birnik and Penuk (~1300–1000 cal BP), and Thule (~1000–500 cal BP), grouped as the Northern Maritime tradition (Collins 1964). These groups partially overlap in time (Gerlach and Mason 1992) and may represent social complexity within a regional interaction sphere (see also Mason 1998). The relationship of Thule to Norton-Ipiutak is debated (Gerlach and Mason 1992): Dumond (1987:50–52) suggests Thule is derived from Norton in a gradual shift of increasing ground slate technology and maritime focus. Regardless of origin, Thule is directly linked with ancestral Eskimo populations.

3.1.6. Summary

While there is no firm consensus for explanative mechanisms (migration, diffusion, amalgamation, and/or autochthonous systems change) behind each transition or ethno-linguistic identities behind long periods of archaeological continuity, several points are relevant to the Dene-Yeniseian hypothesis:

- In Alaska, there is a long-term coast-interior dichotomy in material culture since ~5000 cal BP. While ASTt materials have been found in interior Alaska (particularly Norton and Ipiutak), no contemporary Northern Archaic materials are found in coastal areas.
- Beyond the initial colonization of eastern Beringia (~14,000 cal BP), there appear to be no cross-continental movements across the Bering Strait until possibly ~5000 cal BP, associated with ASTt (linked tenuously with the Bel'kachi culture). A third expansion of Birnik/Penuk-Thule from the northern Chukotsk coast to Alaska occurs very late (~1000 cal BP). For most regions on either side of the Bering Strait, the archaeological records exhibit in situ development for relatively long periods of time. Additionally, all three migrations/range expansions were from west to east—there is no evidence of east-west movements (with the possible exception of Old Whaling/Chukchi Archaic, which in any event appears localized to the Bering Straits area).

- Significant patterns of continuity include Sumnagin-Syalakh-Bel'kachi-Ymiakhtakh-(Ust-Mil) (12,600–2000 cal BP), Northern Archaic-Athabaskan (6000–200 cal BP), ASTt (5000–1000 cal BP), Thule-Eskimo (1000 cal BP-recent), Aleutian (4500–200 cal BP), Mesolithic-Kitoi (11,400–7000 cal BP), Serovo-Glazkovo-Shivera (6000–1600 cal BP), and Baikit-Malaya Korennaya (~4500–1100 cal BP).
- Significant cultural transitions are present as well, including Diuktai/Sumnagin (~12,600 cal BP), Kitoi/Serovo (7000–6000 cal BP), Northern Archaic/ASTt (5000 cal BP), and Dorset/Thule (1000 cal BP).
- There are certain time periods that exhibit dramatic change in technology, subsistence, and settlement systems, through many different ecological regions: particularly 6000–5000 cal BP and 1000 cal BP. These may be useful starting points for evaluating prehistoric population shifts.
- Subarctic regions exhibit homogeneity in material culture (e.g. Lena basin, Interior western Subarctic, Canadian Shield), while coastal regions typically exhibit increased heterogeneity (particularly south-central Alaska and the Bering Strait coasts).
- Farther south beyond the Subarctic (taiga) in Siberia and the Russian Far East, there are complex relationships among numerous cultural entities, particularly in the Bronze and Iron Ages. These relate in part to east-west movements associated with steppe cultures, many associated with domesticated animals and pastoral economies.

One avenue for evaluating time-depth of language divergence is establishing minimum age estimates based on material cultural continuity with ethnohistorically or ethnographically known ethno-linguistic groups. Several language groups can be reasonably traced back ~1000–2000 years, including Athabaskan (Athabaskan tradition), Haida, Wakashan, Salishan (Middle Pacific or Late Coastal Developmental), Alutiiq (Koniag), Tlingit (Late Pacific), and Inupiat/Inuit (Thule). Some sequences suggest earlier correlations: Canadian Athabaskans (Taltheilei, 2900 cal BP), Salishan (Plateau Pithouse tradition, 5700 cal BP), Kerek (Lakhtin, 3800 cal BP), Kamchatkan (Tarin, 3800 cal BP), Koryak (Tokareva, 3800 cal BP). Other connections are more speculative: Yukaghir (Ust-Mil, 2400 cal BP, Alekseev 1996), Nivkhi (Okhotsk, 2600 cal BP), Eskimo-Aleut or Paleoeskimo (Norton, 3900 cal BP), Athabaskan or Na-Dene (Northern Archaic, 6000 cal BP), and Samoyedic (~4500 cal BP). When incorporating linguistic data, numerous other age estimates could be derived (e.g. Abondolo [1998, cited in Pakendorf 2007:18] suggests a split between Samoyedic and Finno-Ugric at least 6000 years ago, necessitating a proto-Yukaghirs divergence prior to then). Therefore, only archaeologically derived estimates are used here. With these basic archaeological patterns, we can turn to specific Dene-Yeniseian prehistory scenarios.

3.2. Dene-Yeniseian hypotheses

Rather than reviewing the numerous ethnogenetic hypotheses on archaeo-linguistic correlation for these regions (e.g. Bandi 1969; Dumond 1969, 1987; Kari 1996; Laughlin 1963; Mochanov 1986; Mochanov and Fedoseeva 1986; Okladnikov 1941, 1955, 1959; Powers and Jordan n.d.), I have focused on six hypotheses of Dene-Yeniseian relationships suggested by the archaeological patterning described above. They mainly differ in age and location of divergence and direction of migration.

(1) Early Divergence (14,000–12,000 cal BP), migration from west-east, split in Asia

This hypothesis can be expressed as: Dene-Yeniseian ancestors used Diuktai technology in Siberia, along with many other groups, including Chukchi-Kamchatkan and Eskimo-Aleut (and probably Amerindian) ancestors. A technological continuum existed between Lake Baikal and Eastern Beringia between 14,000–12,000 cal BP. After 12,600 cal BP, a new cultural entity (Sumnagin) expanded from the Lena basin to encompass most of northeast Asia, effectively isolating Na-Dene ancestors in Alaska from Yeniseian ancestors in Asia (who remained in the Baikal region or along the middle Yenisei region) (Figure 5). In Alaska, the Beringian

(Paleoarctic/Denali) tradition likely represented multiple language groups, some of whom expanded south into central North America through the ice-free corridor while others expanded south along the Northwest Coast, while in Alaska, Na-Dene ancestors adapted to early Holocene climate change and the development of the boreal forest using conservative microblade technology and resilient subsistence economies (bison, wapiti, fishing, and fowling, with caribou hunting in upland settings becoming more important after ~6000 cal BP) within a framework of high residential mobility. A few new artifact forms (e.g. notched bifaces) diffused from western Canadian Subarctic ~6000 cal BP, but in interior, west, and northwest coastal Alaska, there was largely continuity in material culture. Late Holocene ashfalls in eastern Alaska, the introduction of bow and arrow technology, and possibly local extirpation of bison around ~1000 cal BP likely led to local population movements and a shift to Athabaskan tradition technological, economic, and settlement systems (Potter 2008b). Precise timing of Na-Dene subgroup splits (Tlingit, Eyak, and Athabaskan) cannot be made based on present archaeological data, but Tlingit arguably split from Athabaskan-Eyak by at least 1500, possibly 3500, cal BP.

In Siberia, the Sumnagin-Syalakh-Bel'kachi sequence is antecedent to a number of related cultures in Lena basin, Russian Far East, and Alaska between 5000-4000 cal BP (Ymiakhtakh, Tokareva, Tarin, North Chukotkan/Ust-Belaia, and ASTt), and appears ancestral to later maritime adapted groups (Lakhtin, Northern Maritime tradition). These groups collectively may be associated with Chukchi-Kamchatkan and Eskimo-Aleut ancestors, perhaps equivalent to an ancient subset of Fortescue's (1998) Uralo-Siberian language group. The later (post-3900 cal BP) ASTt sequence (Norton tradition) is linked by Dumond (1987:47-49) with proto-Eskimo-Aleut speaking populations, and is intermediate in time and space between proto-Na-Dene (American-Paleoarctic-Northern Archaic) and proto-Yeniseians.

Yeniseian ancestors could be associated with the Kitoi, which disappears in the Baikal area after 7000 cal BP. These populations may have moved northward along the Yenisei where their descendents reappear as the Tsepan' culture (2600 cal BP). The lack of information for earlier taiga cultures in the middle and lower Yenisei basin hampers this line of inquiry, but it is interesting to note that Utinyj Stolb and Monastyr River sites in this region contain late microblade cores (Makarov and Batashev 2004). The subsequent Baikal sequence (Serovo-Glazkovo-Shivera) relate to Altaic populations present in the region today. Another variant could have Yeniseian ancestors remaining in the lower Yenisei River basin through the Holocene period.

Overall, this hypothesis appears to be the best supported (i.e. most parsimonious, fewer *ex nihilo* entities, and no requirement for migrations across multiple different technological/economic systems). Others have suggested early Alaskan microblade-Na-Dene or Athabaskan correlations (Borden 1968; Dumond 1969); however, some variants of Northern Archaic (Taye Lake phase, Yukon Territory) did not contain microblades but form the base of a long sequence culminating in Athabaskan populations (Workman 1978). The American Paleoarctic/Northern Archaic transition (6000 cal BP) is not well understood, but some elements of continuity are present as well as evidence for new artifact forms from western Canada (Workman 1978; Potter 2008c). Various interpretations include migration of new peoples and continued local development of Athabaskans into recent times (Workman 1978:428), partial assimilation of existing populations (Dumond 1987), or diffusion of technology with little or no population replacement (Clark 1994). The latter two scenarios suggest a long period of occupation in Interior Alaska/Yukon Territory after the initial entry of Na Dene into North America.

(2) *Early Divergence (14,000 cal BP), migration from east-west, split in North America*

Generally, this scenario follows Hypothesis 1, except with the Dene-Yeniseian split occurring in North America, with Yeniseian ancestors migrating from North America to Asia. This hypothesis appears less likely, as there is very little evidence for migration (or diffusion) from Alaska to Northeast Asia across cultural traditions. However, there could be considerable movements *within* cultural traditions (e.g. Beringian). The clear expansion of Diuktai from west to east and the apparent continuity of Diuktai-related microblade-bearing groups in interior Alaska during the Holocene and replacement/assimilation of Diuktai-related groups in Siberia by 8000 cal BP is more consistent with Hypothesis 1 than 2.

(3) *Middle Divergence (10,600-10,000 cal BP), migration from west-east, split in Asia*

The earliest major cultural transition in northeast Asia was from Diuktai to Sumnagin (at 12,600 cal BP in the Lena basin, approximately 10,600 cal BP in the Russian Far East). Na-Dene ancestors could have crossed the Bering Strait at this time and amalgamated with existing populations in Alaska. The scenario for Yeniseian ancestors would be similar to Hypothesis 1. Hypothesis 3 appears unlikely, though more likely than Hypothesis 2. Some archaeologists have argued for Sumnagin traits (conical cores and lack of bifaces) in Alaska, e.g. at Anangula and the southwest Alaska early Holocene Kagati Lake complex (Ackerman 1992; West 1996), though others suggest these are local developments within American Paleoarctic (Clark and Gotthardt 1999:116-117). A suite of Sumnagin/Siberdik-like materials (including unifacial tanged points made on blades and multifaceted burins) is not in evidence in North America. In addition, there is no clear technological, subsistence, or settlement system change within American Paleoarctic during the early Holocene in the western Subarctic (Potter 2008a-b, e).

(4) *Late Divergence (6000-4800 cal BP), migration from west-east, split in Asia*

There is clear evidence for dispersal of populations with new technologies and economic adaptations from Asia to North America around 4800 cal BP (interior and coastal adapted ASTt). ASTt establishes a long sequence of cultures in Alaska, primarily on the coast and adjacent interior, generally with increasing maritime adaptations through time. If Na-Dene populations were associated with ASTt technology, these Na-Dene ancestors transformed technology, settlement, and subsistence systems from coastal to terrestrial adaptations at ~1000 cal BP, after which time the Athabaskan tradition (associated with ancestral Athabaskans) is present throughout the western Subarctic. Given continuity of some elements of technology from Denbigh Flint complex through Choris, Norton, and Ipiutak in north and western Alaska and the presence of a contemporary Northern Archaic in the interior, replacement by Thule must have taken place ~1000 cal BP, suggesting that some remnant of this lifestyle would be retained in the Na-Dene languages and material culture (e.g. Norton technology included toggling harpoon heads, pottery, and very distinctive lithic technologies). However, this is not the case. This scenario runs into other problems when minimum age estimates of Na-Dene sub-group archaeological signatures are considered (Tlingit 1500-3500 cal BP, Athabaskan 1000 cal BP).

While Norton/Ipiutak does have an interior component (at sites like Hahanudan and Lake Minchumina), it does not penetrate far into coterminous Northern Archaic cultural areas (the latter correspond almost exactly to later Athabaskan language distributions, see Figure 4). Throughout the period 3000-1000 cal BP, Norton/Ipiutak and Northern Archaic material culture are quite distinct. This distinction is maintained during the subsequent period (post-1000 cal BP) (Thule and Late Prehistoric Eskimo cultures in coastal areas and Athabaskan tradition in the subarctic interior).

No mechanism for a shift from a coastal/maritime-oriented Norton economy (seal, other sea mammals, caribou, fish) to a terrestrial-oriented Athabaskan economy (caribou, fish, moose, sheep) has been offered. Alternately, populations using early ASTt (Denbigh Flint Complex) technology may have migrated inland and amalgamated with Northern Archaic groups. However, no evidence of technological influence is present; rather, there appears to be a local replacement of Northern Archaic in coastal areas by ASTt.

While a few Northern Archaic forms (notably notched bifaces) indicate diffusion from earlier Shield Archaic groups to the west, the continuity in most forms (including wedge-shaped microblade core and burin technology and boulder spall artifacts, or tci-thos) suggests continuity in population. The long continuous archaeological sequences at several sites in the western and central Subarctic document the in situ transition from Northern Archaic to Athabaskan (see Cook 1969; Morlan 1973b; Holmes 1986; Workman 1978) and Taltheilei tradition to recent Athabaskans (Gordon 1996) and are strong evidence for local continuity in populations. These data suggest that (1) Northern Archaic technology was used by ancestral Athabaskan or Na-Dene speakers and (2) that the contemporary ASTt/Norton tradition with a prevalent coastal/maritime economy was not ancestral to Na-Dene speakers. In sum, Hypothesis 4 is possible, but suffers from unexplicated fundamental changes that must have occurred in order to transform coastal/maritime economies of ASTt-

related populations into terrestrial economies of Na-Dene ancestors between 5000 and 1000 cal BP. Additional conterindications of this hypothesis include (1) the lack of genetic connection between ASTt populations and Na-Dene populations and (2) the presence of a contemporary Northern Archaic tradition which shares many more linkages with later Athabaskans (e.g. tci-thos, notched bifaces, caribou fences).

(5) *Late Divergence (6000–4800 cal BP), migration from east-west, split in North America*

Hypothesis 5 suffers from the same problem as Hypothesis 2 (e.g. very little evidence for east-west movements), though it remains a possibility. During this period, the trends for the Siberian Neolithic (Syalakh, Bel'kachi, Ymiakhtakh) tended to reflect diffusion or migration from the Lena basin to the east rather than movement from eastern groups to the west. Between 6000 and 4800 cal BP, the expansion from west to east is even more evident with the ASTt expansion. Archaeological evidence indicates Chukotko-Kamchatkan ancestors were likely in place in Northeast Asia by ~3800 cal BP, possibly by ~6000 cal BP, suggesting that some evidence of linguistic or material cultural influence on Yeniseian or Na-Dene ancestors would be present if either migrated across the Bering Strait during this period. However, there is no evidence of material cultural similarities between Northern Archaic or Athabaskan traditions and northeastern Asian cultures (e.g. Tarin, Lakhtin, Tokareva).

(6) *Very Late Divergence (2500–1000 cal BP)*

Hypothesis 6 appears the weakest in terms of archaeological patterning. While there are clear cultural transitions at 1000 cal BP throughout interior Alaska (Northern Archaic/Athabaskan traditions), coastal northwest Alaska (Ipiutak/Thule), and southern Alaska (Kachemak/Koniag), Na-Dene or Yeniseian ancestors would have to "cross" several archaeological cultures to arrive in their respective historically known areas (e.g. crossing those with probable associations with Eskimo, Chukchi-Kamchatkan, Yukaghir, and Tungusic speakers). The presence of numerous intervening cultural groups (Chukchi-Kamchatkan ancestors, etc.) with archaeological continuity extending to ~3800 cal BP argues strongly against this hypothesis. For example, if this hypothesis were correct, Yeniseian ancestors using Northern Archaic technology for thousands of years would have abandoned this way of life entirely, becoming maritime-adapted foragers communally hunting walrus and whale with very sophisticated sea-mammal hunting technologies, then abandoned this technology in favor of Lakhtin, Kanchalan, and/or Old Koryak material culture, then shifted again to terrestrial reindeer hunting and herding economies with different technologies before finally reaching the Yenisei basin. A similar long-distance trek in reverse would await Na-Dene ancestors in central Siberia at 2500–1000 cal BP.

4.0. CONCLUSIONS

There are severe limitations in the archaeological record when attempting to link material culture with language, ethnicity, and genetic populations. There are likely no 1:1 correspondences between these disparate entities. However, there are relatively clear broad trends of continuity and discontinuity in the archaeological record of these regions. While no one hypothesis can be clearly supported or rejected on the basis of archaeological data alone, each has varying levels of archaeological support. Clear test implications can be drawn for each hypothesis given the geographic distribution of material culture during and after each time period considered. Among these hypotheses, Hypotheses 1 and 4 have the strongest archaeological support (in that order). In general, linguistic-material culture associations (at the level of family) appear to be robust in many of these areas from about 6000–3800 cal BP, generally precluding a more recent divergence between Na-Dene and Yeniseian ancestors, which may extend to 14,000–12,000 cal BP. Because of the antiquity of Dene-Yeniseian suggested by this patterning, it has an impact on important anthropological topics like the colonization of the New World and climate change impacts and human adaptive responses in the Late Pleistocene and Early Holocene. Archaeologists should consider population expansion/migration in addition to in situ adaptation as alternative hypotheses in exploring major cultural transitions or breaks.

Given the patterns of archaeological variability in this region, I believe the archaeological record alone will not provide certainties regarding correlation of language, genetic populations, and material culture, but may offer a framework to evaluate cognate sets and elucidate time depth of language divergence. The geographic and temporal patterning of fundamentally different economic practices in these regions (terrestrial hunting-gathering, fishing, fowling, reindeer herding, cattle herding [associated with relative late-comers, Turkic Sakha], coastal foraging, marine mammal hunting, etc.), as well as temporally and geographically delimited distributions of certain technologies (microblades, copper, bronze, iron, pottery, bows and arrows, atlatls, different forms of watercraft, etc.) may offer avenues for testing Dene-Yeniseian cognates, but more importantly, shared vocabulary with adjacent language groups. For example, Khlobystin (2005) notes that Yukaghir and Samoyedic speakers share the same word for copper, but different words for iron, suggesting the end of contact occurred prior to ~2000 cal BP, consistent with an intervening Yeniseian "wedge" (perhaps associated with the Tsepan' culture around 2600 cal BP). It is beyond the scope of this paper to evaluate these cognates, but clear test implications can be drawn.

This research also points to where we can focus our attention, primarily the empirical gap for the middle and lower Yenisei River basin. Are Diuktai-related forms present after 10,600 cal BP in southern Siberia? How can we characterize the continuity/discontinuity between Late Upper Paleolithic Afontova-Kokorevo, the "Cis-Baikal Mesolithic complex" and Mesolithic Kitoi? What happened to Kitoi populations after 7000 cal BP? How can early Tlingit and Eyak ancestors be identified from material culture and subsistence strategies? The archaeological patterns identified and summarized here can be profitably examined with independent data sets like mtDNA and Y chromosome analyses. Further research in areas with well-known lacunae in archaeological coverage (Kolyma basin, Chukotka) with these hypotheses in mind will also likely provide important data on these questions.

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THE PALATAL SERIES IN ATHABASCAN-EYAK-TLINGIT, WITH AN OVERVIEW OF THE BASIC SOUND CORRESPONDENCES

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Editor's Note: This article is a section of Leer's (2008b) 45-page paper presented at the Dene-Yeniseian Symposium (another portion was published as Leer 2008a). In this paper, he presents extensive data from a large sample of Athabaskan languages, Eyak, and Tlingit to reconstruct proto-Athabaskan-Eyak-Tlingit. He has compiled data from numerous sources, including the handwritten Comparative Athabaskan Lexicon manuscript, now available online at www.uaf.edu/anla/collections/ca/cal/, Krauss 1970, and various sources on Tlingit that mostly remain unpublished. In the last several years, there have been several new AET or proto-Na-Dene phonemes that Leer employs in the following analysis for the first time, rendering some earlier reconstructions obsolete (e.g. Krauss and Leer 1981). Vajda (this volume) has made extensive use of the 2008 version of this paper and has coordinated with Leer regarding updates to both papers.

1.0. INTRODUCTION: OVERVIEW OF REGULAR SOUND CORRESPONDENCES IN AET

In a recent unpublished paper (Leer 2008b) I outline the substantive progress that has been made in the reconstruction of Athabaskan-Eyak-Tlingit (AET) during the last few decades as a result of my work on the Comparative Athabaskan Lexicon (CAL, Leer 1996), as well as the related task of identifying Eyak and Tlingit cognates with the Athabaskan lexical entries in the CAL and comparing the Eyak and Tlingit lexicons with each other. By now, the bulk of regular sound correspondences have been identified, and the major problem areas for phonological reconstruction have been identified and researched in as much depth as possible. Although these problem areas cannot yet be regarded as definitively solved in all their desirable ultimate details, at least the problems have been exposed as such and their parameters measured.

The focus of this paper is describing and illustrating one of the key new findings of my work: the AET palatal series. In AE we find sibilants as the reflex of these AET palatals; these merge with the reflexes of the original AET sibilant series. In Tlingit, on the other hand, the AET palatals largely appear as unrounded velars, except that PAET *ky onset can yield either Tlingit *k* or *sh*.

In order to describe the AET palatal series and its relationship with the velar series with maximum clarity, however, we will first give an overview of regular AET sound correspondences and a brief description of some other key phonological developments that play a role in our reconstructions, in particular, the effect of AET rounded (labialized) consonants on neighboring vowels, a complex topic that deserves separate treatment elsewhere. This is the goal of section 1. In section 2.1, we will illustrate the development of the AET palatal series in detail. In sections 2.2 and 2.3 we briefly illustrate the development of the AET unrounded and rounded velar series, respectively. In section 3, we sketch out some of the more intractable problem areas in AET reconstruction. In section 4, we provide some of the sources for this paper.

1.1. Obstruent correspondences

As one might expect, it turns out that the degree of success in positing an internally consistent reconstructive system has been greatest for occlusives (stops and affricates) and somewhat less so for fricatives, since some of the fricatives reconstructible for AET do not fit neatly within the series reconstructible

for occlusives—fricatives show more series contrasts than occlusives. Although encouraging progress has been achieved with the reconstruction of vowels and sonorants (for the latter, see Krauss and Leer, 1981), there remains a residue of odd vowel and sonorant correspondences that are rarely encountered, sometimes hapax, and hard to place within the reconstructive apparatus that suffices to deal with the more frequent and internally consistent sound correspondences.

The comparative AET practical orthography used in this paper is largely self-evident, given the understanding that capital consonants are uvulars, the capital vowels are reduced vowels, and in PA the circumflex represents vowel constriction (glottalic phonation), which gives rise to tone in the daughter languages, as does a glottal stop (ʔ) in coda position. In general, the apostrophe after a vowel or a sonorant coda represents glottal stigma, which in Eyak and Hupa contrasts with an aspirate stigma (h) and in Tongass Tlingit contrasts with fading stigma (ʰ). For full details refer to Appendix A, Orthographic Conventions for Yeniseian and Na-Dene, for other conventions of this practical transcription system and for equivalencies of these symbols in Edward Vajda's paper (this volume) and other sources for Athabaskan-Eyak-Tlingit.

The following notational conventions should be noted:

- en-dash represents the object slot preceding a postposition or possessed noun (i.e. the possessor).
- hyphen represents affix boundary.
- = represents clitic boundary.
- # represents word boundary.
- ~ after an Eyak or Tlingit verb root indicates variable stigma.
 - With open stems, Eyak has the marked glottal subtype ~ʔ, and Tlingit has the marked fading subtype ~ʰ.
- ~* indicates an approximate reconstruction.
- R is a cover symbol for an unidentified sonorant
- () after a vowel within an approximate reconstruction indicates indeterminate stigma/length
- [...] indicates an informed guess.

Note: This is particularly useful in PA after a spirantized coda where we must infer that the spirantization was caused by a following obstruent (suffix or root-appendix) whose identity cannot be precisely determined but only certain possibilities remain, e.g. PA *-zÊts' ~ *-zÊs[d] 'skin', where obvious suffixes like *-t and *-gy can be ruled out.

The AET classifiers are cited by their component lexemes here and in the CAL (see also Krauss 1969). In Athabaskan-Eyak, for example, there are two classifier lexemes: *l-* and *D-*, where *D-* represents the reflex of PAET and PAE *dE-. The combination *l-D-* thus represents PAET *l-dE- > PAE *lE-, which in PA appears as *l/E- (voiced intervocalically), and which we Athabaskanists know as the *l*-classifier. In his landmark study "On the Classifiers in Athabaskan, Eyak, and Tlingit", Krauss implies that there must have been an ancient morphophonemic rule involving the perfective/stative prefix (PAET *yi-) that I will formalize as PAET */yi-(l)-dE-/ => *(l)-di-, which gave rise to the height variation in the vocalic classifiers: Eyak *dE-* and *di-* in one case and Eyak *lE-* and *li-* in the other. He goes on to show how the variation between *E and *i in these classifiers has left traces in the stem sets of Athabaskan zero-onset verb stems that have variants beginning with *y, such as 'to go (of one)'. In Tlingit, PAET *dE- and *di- predictably develop into Tlingit *da-* and *di-*. In my reconstruction of Tlingit classifier development, PAET *l-di- > Tlingit *dli-* (word-initially sometimes *li-*), whereas PAET *l-dE- > Pre-Tlingit *l-d- > Tlingit *l-*. The two other Tlingit affricate-series components *s-* and *sh-* develop in a manner analogous with *l-*.

Table 1 summarizes the regular obstruent sound correspondences that have been unearthed.

TABLE 1. PAET obstruent correspondences

PAET	PAE	PA	Eyak	Tlingit
*d	*d	*d	d	d
*t	*t	*t	t	t
*t'	*t'	*t'	t'	t'
*ɬ	*ɬ	*ɬ~l	ɬ	ɬ
*tɬ'	*tɬ'	*tɬ'	tɬ'	ɬ', tɬ'
*s	*s	*s~z	s	s
*ts	*ts	*ts	ts	ts
*ts'	*ts'	*ts'	ts'	s', ts'
*sh	*sh	*shr~zhr	sh (s)	sh (s)
*dzh	*dzh	*dzh	dzh	dzh
*tsh	*tsh	*tsh	tsh	tsh (ts)
*tsh'	*tsh'	*tsh'	tsh'	s', tsh' (ts')
*xy	*s	*s~z	s; sh	x
*gy	*dz	*dz, *s~z	dz	g
*ky	*ts	*ts	ts	k; sh
*k'y	*ts'	*ts'	ts'	k'
*x	*x	*xy~y	x	x(w)
*g	*g	*gy	g	g(w)
*k	*k	*ky	k	k(w)
*k'	*k'	*k'y	k'	x'(w), k'(w)
*xw	*xw	*shr~zhr	xw > x	x(w)
*gw	*gw	*dzhr	gw > g	g(w)
*kw	*kw	*tshr	kw > k	k(w)
*k'w	*k'w	*tshr'	k'w > k'	x'(w), k'(w)
*X	*X	*X~GH	X	X(w)
*G	*G	*G	G	G(w)
*q	*q	*q	q	q(w)
*q'	*q'	*q'	q'	X'(w), q'(w)
*Xw	*Xw	*/Xw/ > *X~GH	X	X(w)
*Gw	*Gw	*/Gw/ > *G	G	G(w)
*qw	*qw	*/qw/ > *q	q	q(w)
*q'w	*q'w	*/q'w/ > *q'	q'	X'(w), q'(w)
*ʔ	*ʔ	*ʔ	ʔ	ʔ
*h	*(h)	*(h)	∅	h
*ʔw	*ʔw	?	w	ʔ
*hw	*w	*w	w	h
*ʔy		*y		ʔ
Extrasytematic fricative correspondences				
*sx	*x	*xy~y	x	s
*shx	*x	*xy~y	sh	sh
*x(w) (1sg.)	*x(w)	*\$ (*sh~*xy)	xw > x; s	X

The reader will note that some of the expected affricate-series obstruents are not reconstructed for PAET, namely *dl, *tl, and *dz. These are found in the daughter languages, but they are quite rare in Athabascan and Eyak, and in a number of cases it is possible to show that they have evolved relatively recently. Most important from a comparative standpoint is that these rare obstruents do not match up from branch to branch; for example, I know of not a single example where PA *dl corresponds to Eyak dl (or Tlingit dl) and vice versa. In short, these rare obstruents appear to have developed separately in each branch, which had the effect of filling in the blanks in the consonant chart. All three branches now have these sounds, but each evolved them in its own way.

The lack of non-glottalized lateral affricates in AET is evidently an areal feature; such a gap is characteristic of Northwest Coast languages and language families further south, including Tsimshian, Wakashan, Salishan, and Chimakuan (Hamp, this volume) (see Map D). This gap would thus favor a hypothesis where the original homeland of AET was adjacent to one or more of these languages, possibly the Southeast Alaska and/or in the neighboring areas of the Yukon Territory, and disfavor the hypothesis that the homeland of AET was in the interior of Alaska.

In all languages that have preserved the retroflex series, *sh/zh is found largely to have merged with *shr/zhr; these languages have shr/zhr (Tsetsaut f/v) as the reflex of both *sh/zh and *shr/zhr. Compare, for example, the stem set alternation in perf. *7a:tsh' 'a pair goes', mom. imperf.-opt. *7â:sh > *7â:shr, prog. *7Âsh-l > *7Âshrl, as seen in Lower Tanana perf. 7ots, mom. imperf. 7oshr, prog. 7Ushr. The expected reflex of *sh is found, however, in the first person singular pronoun and pronominal prefixes, namely s in Deg Hit'an, Lower Tanana, and Tsetsaut; in Gwich'in and Han, on the other hand, the reflex of *xy is found in the first person singular, namely Gwich'in shy (subject ih-) and Han sh (subject ih)—this 1sg. *xy is an areal isogloss shared with a swath of nearby languages: Tanacross, Upper Tanana, Upper and Lower Tutchone.

Especially to be noted is the disparate development of AET rounded consonants AE and in Tlingit. The original AET rounded velars are best preserved in Athabascan, where they appear as the retroflex series. In Eyak, rounded velars were preserved into historic times, but in Cordova-area Eyak they had largely merged with unrounded velars by the time of Krauss' fieldwork.

The generalization that Eyak rounding correlates with PA retroflexion < Pre-PA rounding surprisingly does not always hold true, the most spectacular exception being the root for 'move hand; feel, sense': Pre-PA *ni'g > PA *ni:gy vs. Eyak le'gw (with labialization attested in early sources and confirmed by the unique reduced stem lug- clearly confirming Pre-Eyak *ne'gw, reduced stem nEgw-); compare the Tlingit cognate (Southern) ni'gw~, (Northern) nu'g~ in themes meaning 'feel, sense' and 'act'.

Original AET rounded uvulars and glottals are even harder to recover. The only certain examples are found in a few PA verb roots that exhibit the ablaut types *e: ~ *U and *a: ~ *U. From these we can internally reconstruct rounded uvular onsets and codas and glottal onsets, e.g. Pre-PA *qwe:ts' '(log, post, boat, etc.) falls, moves independently' > PA perf. *qe:ts' vs. prog. *qwets'-l/ > *qÛs-l (see 54); Pre-PA *tle:q'w (classificatory verb for a mushy mass), prog. *tleq'w-l > PA perf. *tle:q', prog. *tlÛX-l; and Pre-PA */7we:tɬ'/ '(several) float, drift, swim', prog. *7wetɬ'-l > PA perf. 7e:tɬ', prog. *7Ût-l.

Tlingit synchronically has rounded velars, uvulars, and glottals, but Tlingit rounding does not correspond with that of AE. One clear fact is that AET palatal onsets develop only into Tlingit unrounded velars—but in coda position we find either unrounded or rounded velars; see in particular (45). In general, the original AET rounded velars, uvulars, and glottals seem to have assimilated the neighboring vowel in Pre-Tlingit, whereupon the original AET rounding distinction disappeared in the consonant that caused the neighboring vowel to become rounded. Later developments, some internally reconstructible and others as yet unclear, gave rise to the set of rounded consonants we see today.

An important set of developments that we can reconstruct with some confidence occur when an AET rounded consonant stood next to PAET *i, e.g. in PAET *7wi:gw 'boil'. The Tlingit reflex is the rounded vowel u next to the consonant, which is no longer distinctively rounded: PAET *7wi:gw > Tlingit 7u'g~ 'boil' (where the coda is non-distinctively rounded [gw]). In AE, on the other hand, the rounded consonant remained rounded, but PAET *i underwent height dissimilation in this environment, PAET *7wi:gw > PAE *we:gw > PA

*we:dzhr 'cook, boil'. As a result, the sequences *wi(:) and *i(:)w are not found in PAE. They are extremely rare (and presumably due to late processes like nasalization) in PA and Eyak. Another example is given in (50); cf. also (75).

1.2. Sonorant correspondences

Vowel and sonorant reconstructions remain in part problematic, and the charts given here simply illustrate the major correspondences. Despite Krauss and Leer's (1981) study of AET sonorants, much remains unclear at the AET level. The following onset correspondence sets for sonorants, while undoubtedly not an exhaustive inventory, appear to be particularly useful.

TABLE 2. PAET sonorant correspondences

PAET	PAE	PA	Eyak	Tlingit
*w	*w	*w	w	w, ȳ
*y	*y	*y(~*ñ)	y	ȳ
*ñ	*ñ	*ñ	y	ȳ
*n	*n	*n	l~n	n
*ŋ	*n	*n	l~n	ȳ
*ŋw	*n	*n	l	w

Unaddressed in Table 2 is the PCA evidence stressed in Krauss and Leer (1981): PA *ñ appears either as *n or as *m in Proto-PCA. If we wish to distinguish these, we can reconstruct *ñ2 for cases where PCA has labial *m in contrast with the reflex of *ñ elsewhere in Athabascan. We can therefore reconstruct *ñ as the onset of the perfective/stative prefix, of the 2sg. pronoun, and of 'land/earth', whereas the onset of 'across' would be reconstructed with *ñ2, since, for example, Hupa has yi-man.

What is particularly difficult to understand about the correspondence *ñ2 is that it appears to occur at least once as a variant of *y. We see this in PA *dê:ye:n 'it is sharp', varying with *dê:ñ2e:n, that is, dê:ye:n ~ *dê:ñ2e:n 'it is sharp' outside of PCA but ~*di:me:n 'it is sharp' in Proto-PCA. From an AET standpoint, *ye:n is clearly the original stem, corresponding with Eyak yaN~ in di:yaNh 'stickleback' and XEdi:yaNh 'it is sharp', and even with the stem of Tlingit ȳa-ȳe'na 'whetstone'. But in some Athabascan, the whole stem syllable became nasalized, giving dê:ñ2e:n 'it is sharp'. At the point of its origin, then, the variant onset *ñ in *dê:ñ2e:n was clearly pronounced as a palatal nasal, since it resulted from the nasalization of *y. The labiality of the corresponding PCA onset, as in Hupa dime:n, Tututni dimi 'it is sharp', comes as quite a surprise here, since there is clearly nothing in Pre-PA or PAE that could be expected to give rise to labiality or lip rounding—quite the contrary. For this reason, I do not think that we should uncritically accept the premise that the labiality of the PCA reflex of *ñ2 reflects labiality at an earlier stage of Athabascan-Eyak. Nevertheless, the PCA facts are striking and demand our attention.

The following table is a slight restructuring of Hamp's conception of the AET consonant chart (p.c.). It differs from Hamp principally in putting the laterals before the s(h)ibilants rather than after them; this order of affricate series is traditional in AET since Krauss. I have not yet found a need to posit *hy, but this obvious gap may eventually be filled. The labels for manner of articulation are traditional since Krauss; those for place of articulation are traditional except the pair "sibilant" and "shibilant".

TABLE 3. AET consonants

	Alveolar	Lateral	Sibilant		Shibilant		Palatal		Velar		Uvular	
								+rnd		+rnd		
plain stops	*d				*dzh	*gy	*g	*gw	*G	*Gw		
aspirated stops	*t		*ts		*tsh	*ky	*k	*kw	*q	*qw		
glottalized stops	*t'	*t'l'	*ts'		*tsh'	*k'y	*k'	*k'w	*q'	*q'w		
fricatives		*l	*s	*sx	*sh	*shx	*xy	*x	*xw	*X	*Xw	
glottals							*ʔy	*ʔ	*ʔw			
							*h	*hw				
sonorants							*y		*w			
nasals	*n						*ñ	*ŋ	*ŋw			

1.3. Vowel correspondences

Following are the major regular vowel correspondences. It should be stressed that these are not exhaustive. Even within PAE we find vowel correspondences that are not accounted for here. Many of these may involve rhymes with sonorant codas, e.g. PAET *kya(:)y > PAET *tsa(:)y > Eyak tsa:, PA *tse: 'stone, rock' (see 29). These vowel correspondences are therefore not the final word on AET vowel correspondences, but suffice to support the reconstructions given here.

TABLE 4. PAET vowel correspondences

PAET	PAE	PA	Eyak	Tlingit
*i(:)	*i(:)	*i:, *E	i(:), E	i
*i(:) next to rounded cons.	*e(:)	*e:, *E	e(:), E	u
*i(:) next to uvular	*e(:)	*e:, *E	e(:), E	i~e
*e(:)	*e(:)	*e:, *E	e(:), E	a
*a(:)	*a(:)	*a:, *A	a(:), E	a
*o(:)	*a(:)	*a:, *A	a(:), E	u
*u(:)	*u(:)	*u:, *U	u(:), E	u

2.0. THE PAET PALATAL AND VELAR SERIES

Corresponding to Tlingit velars (and some instances of Tlingit sh) are three series correspondences in PAE. We can accordingly reconstruct three velar-like series for PAET, which we can illustrate using PAET *gy, *g, and *gw.

- palatal: PAET *gy > PAE *dz > PA *s~z, Eyak dz; Tlingit g
- velar: PAET *g > PAE *g > PA *gy, Eyak g; Tlingit g(w)
- rounded velar: PAET *gw > PAE *gw > PA *dzhr, Eyak k; Tlingit g(w)

These three PAET series and their reflexes are summarized in Table 5.

TABLE 5. PAET palatal and velar correspondences

PAET	PAE	PA	Eyak	Tlingit
*xy	*s	*s	s; sh	x
*gy	*dz	*dz, *s~z	dz	g
*ky	*ts	*ts	ts	sh; k
*k'y	*ts'	*ts'	ts'	x', k'
*x	*x	*xy	x	x(w)
*g	*g	*gy	g	g(w)
*k	*k	*ky	k	k(w)
*k'	*k'	*k'y	k'	x'(w), k'(w)
*xw	*xw	*shr~zhr	xw > x	x(w)
*gw	*gw	*dzhr	gw > g	g(w)
*kw	*kw	*tshr	kw > k	k(w)
*k'w	*k'w	*tshr'	k'w > k'	x'(w), k'(w)

Note in particular that PAET *ky, which like all other aspirated stops occurs only in onset position, ordinarily has the palatalized reflex *sh* in Tlingit. Occasionally, however, the Tlingit reflex is non-palatalized *k*. In all other cases, the PAET palatal series have Tlingit unrounded velar reflexes. In contrast, the two PAET velar series, unrounded or rounded, can yield either unrounded or rounded velars in Tlingit.

2.1. PAET palatals

Perhaps the most important development in AET comparison is the discovery of regular correspondences between Tlingit velars and AE sibilants, to account for which we can reconstruct AET palatals. It is not yet clear whether these were distinct phonemes or merely allophones of the velars in PAET.

TABLE 6. PAET palatal onset correspondences

PAET	PAE	PA	Eyak	Tlingit
*xy	*s	*s	s; sh	x
*gy	*dz	*dz, *s~z	dz	g
*ky	*ts	*ts	ts	sh; k
*k'y	*ts'	*ts'	*ts'	*k'

Note that in onset position, PAET *ky may yield either Tlingit *k* or Tlingit *sh*; the conditioning factor or factors are not clear. In the latter case, it is clear that palatalization was involved; since *ky > sh is a garden variety palatalization rule found in many languages. Thus we can say that in most cases, PAET palatals merged with velars in Tlingit, but in the case of PAET *ky > Tlingit *sh*, palatalization occurred instead.

Although cognate sets with PAET *gy are rare, one such cognate set with verb stem onset *gy develops to PA *z-s, apparently via *dz by deaffrication, i.e. PAET *gy > PAE *dz > PA *z-s (see 13a and 13b.) In coda position, PAET *gy > PAE and PA *dz appears to be the regular outcome—unless, of course, spirantization occurred in coda position before another obstruent (e.g. an obstruent suffix), which regularly yields PA voiceless *s in coda position.

Finally, alongside the regular development PAET *xy > PAE *s > Eyak *s*, we find a few verb stems with Eyak onset *sh* rather than expected *s. Three such examples are listed below (see 10, 11, and 12). There is reason to suspect that in such cases, PAET had a fricative classifier (*s-) before the stem and that the classifier plus stem onset contracted into a single consonant *sh* in Eyak instead of yielding the expected outcome *l-s. The phonological processes responsible for this unexpected and unusual contraction remain unclear.

2.1.1. PAET onset *xy > PAE *s > PA *s~z, Eyak *s*; Tlingit *x*

- (1) PAET ~*-xyets' 'skin (of fish)'
Pre-PA *-sits' 'skin, hide'; *-sits'{-d} 'skin bag (?)'
PA *-zÊts' 'skin, hide'; *-zÊs[-d] 'skin, hide; skin bag'
Chipewyan -dhÊdh 'skin, hide'; -dhéth 'skin bag'
Eyak -sits' 'skin (of fish)' (identical with Hupa -sits' 'skin, hide')
Tlingit -xá's'i' 'skin (of fish)'
 - (2) PAET ~*xye:g 'empty shell, skeleton'
PA *-ze:gye' 'corpse'; (in Koyukon and Hupa also) 'invalid, chronically ill person'
Cf. Eyak sah-xw 'cockle', probably not cognate.
Tlingit xág:g 'empty shell', poss. -xá:gi'
 - (3a) PAET ~*xyo(:)g/x 'sand beach; dry ground'
PA *sa:xy 'sand', possibly spirantized from Pre-PA *sa:g
Tlingit xágw 'sandbar'
 - (3b) PAET ~*O-s-xyo()g/x 'to dry O'
PA ~*O-l-(d)zâ:y 'to dry O (e.g. meat, fish)'
Chipewyan 7elddháyi 'dry fish' < *k'yE(s)-l-dzâ:y:
Galice da:aldzaya 'dried (meat)' < *na:=GHE-l-(d)zâ::
Tlingit xu`g- (event) 'to become dry': 7uwaxúg 'it is dry', caus. O-s-xu`g- (act) 'to dry O': 7asxu`g 'is drying it',
7awsixúg 'dried it'
Tlingit -xu`g (adj.) 'dried': tshá:dl xu`g 'dried halibut'
- Note that the vowel in the Chipewyan stem *ddháyi* in *7elddháyi* 'dry fish' matches that of *thai* 'sand' < *sa:xy. The PA verb stem coda *y was originally a fricative; this does not agree with the Tlingit stop; however, we find enough other cases like this to hope for an eventual resolution of this problem.
- (4) PAET ~*(s-D-)xyi(x)k' 'for one thing to fall, move through space'
PA ~*l-D-zÊk'y 'id.': GHElzÊxyi 'it is falling, moving through space' (prog.)
with suppletive perf. *l-D-nÊñ. The non-perfective root is attested only as lengthened (mom. IO) stem *zî:xy and reduced suffixed stem *zÊxy-, so its basic vowel grade is unknown in this theme. However, from Tsuut'ina and Southern Athabascan we can reconstruct
PA *O-l-zÊk'y 'to shoot O (arrow); to throw O (pole)'
Navajo 'í'ísi' 'I shot off an arrow' < PA *7Añ'=k'yE-GHE-y-l-sÊk'y.
Tlingit xí`x~ (motion) 'id.': da`g uwaxíx 'it fell down'
Tlingit sh-D-xi`x~ (motion) 'for one to run': ýa` nashíx 'is running along'
In this verb alone we find synchronic merger of classifier plus stem onset:
sh-xi`x~ ⇒ shi`x~ (where sh- is /sh-D-/).
The choice of classifier series sh- rather than s- may historically be due to palatal assimilation from the root onset.
 - (5) PA *O-zEd (motion) 'gouge, dig O'
Lower Tanana xo=xUghEsdhEt 'I dug a hole', with xo=(gh) 'up out' and areal object
PA *O-dE-nE-zEd (motion) 'to make mark(s), groove(s), design(s) on O':
Lower Tanana nE=yEdEnadhEt 'he marked it, drew it'
Koyukon nE=k'EdEnaldEt 'she drew, etched a design'
Tlingit O-ka-sh-xi`d~ (act): 7akawshixíd 'wrote it; photographed it; (original meaning) painted, drew a design'

- on it (with a brush)
Tlingit O-l-xi'd~ (act): 7awlixid 'made furrows in O (as a garden)'
- (6) PAET ~*O-xye(')t' 'to brush, sweep O'
PA *O-z:d (motion) 'to pour, spread O'
This root merged with *zEd in Alaska and B.C. languages.
Tsuut'ina ...zi'(d-)/zi'(d-) 'to spread O (sand, a mass)'
Navajo O-z:d/z:d (motion) 'pour O (liquid, sand); rake O (sand, dirt)'
Tlingit O-xi't'~ (Ga act) 'to sweep, brush O': axit'gw 'is sweeping it'
- (7) PAET ~*xye(')d 'to extend or to be configured (?)'
Eyak sid (7i-state) 'for several to extend': 7u:-tsh' 7i:sid '(roads) reach there' 7u:-tsh' '3-towards', i.e. 'to there'
Tlingit Op-de` xa'd~ (ga state) 'for one to stick out or hang from Op': 7a`dé: ýaxád 'it sticks out, hangs there'
Tlingit MANNER ka-xa'd~ (ga state) 'to be shaped (so)': yé' ka` xád 'it is shaped so'
- (8) PA *l-zE[n]Exy > *l-zin:xy (act.-state): *hElsin:xy 'it is numb'
Chipewyan í-l-dhuN/dhúN (transition): íthúN 'it got numb'
Navajo í:l-ziih/zí' (transition): yiisí' or (emphatic) yiisxí' '(body part) has gone numb', 'fallen asleep'
Tsuut'ina ...zi: [ziy] 'to be numb' (Note zero classifier.)
Tlingit NEG u-xwázh-g (ga state): tlé:l uxwázhg '(body part) is paralyzed'

Set 8 has an obvious problem: the Tlingit form is lexically negative, and so logically means '(body part) is not responsive to sensation', so *xwázh-g* should mean 'responsive to sensation', the opposite of 'numb'.

- (9a) PAET ~*xye()-l 'evening', with instrumental noun suffix *-l
Eyak se:l 'evening'; l-se:l (event): GEse'l 'it is becoming evening'
Tlingit xá'na` 'evening', with instrumental noun suffix -(n)a`

The Tlingit incorporated noun *xi/e`* lacks any trace of a suffix:

- (9b) Tlingit (Southern) xi(')-, (N) xe(')-, (incorp.) 'dusk', found only in
xi/e`-7a`d~ or *~xi/e`-7a`d~* (event): xi`wa7ád, xe`wa7ád 'it became dusk; darkness fell' nom. xi(')7a`d,
xe`7a`d 'dusk' (stem also -7ád)
The verb stem is 7a`d~ 'several go'; hence the idiom visualizes dusk as an army of darkness.

The above cognate set depends crucially on the coda sonorantization hypothesis, which explains the progressive suffix /-n/ and the /-n/ of the instrumental noun suffix /-(n)a`/ as being due to sonorantization of PAET *l, which functions both as progressive suffix and instrumental noun suffix in PA and Eyak. Specifically, Pre-Tlingit *l sonorantized to *l > Tlingit /-n/. Unfortunately, there is little evidence for this particular correspondence other than these two suffixes.

The Tlingit instrumental noun suffix /-(n)a`/ seems to be composed of the putative original suffix *l > *l > /-n/ plus a second element that looks like it could have been the partitive noun and pronoun 7a` 'one, some; one (which, who)', as noun exclusively found as the head of the NP, evidently cognate with Eyak ya: 'something, a thing' and -ya: 'one (which, who)'. It would appear that Tlingit 7a` '...one' was pleonastically added to instrumental nouns to increase their recognizability, since /-n/ appears as -n only after vowels; after consonants it conditions reduction of the stem vowel and then disappears. In sum, Pre-Tlingit */-n=7a`/ > Tlingit /-(n)a`/.

In some cases we find Eyak *sh* (rather than expected *s) corresponding to Tlingit *x*. In some cases this may be due to a very ancient classifier-stem contraction confined to Eyak: PAET *O-s-xy... or *O-s-s... > Eyak O-sh...

- (10) Eyak O-she~ (act): shEshehl 'killed it'
Compare Eyak siNh (act): sEsiNhl 'died', which may be cognate with the Athabascan qualifier prefix *s/zE- (? < Pre-PA *sEn= 'death') only in one theme
*O-s/zE-l-ghe: (s-act) 'to kill O' (? < 'to make/cause (l-ghe:) O's death').

- This ancient contraction could also explain the Eyak onset *sh* in the following:
- (11) PAET ~*O-s-xye/i(t)' 'to scrape O (inner bark, cambium)'
Eyak O-she:t' 'to scrape O (inner bark, cambium)'
Tlingit O-l-xi't'~ (Ø/na act) 'id.: 7axí't' 'is scraping it (cambium, e.g. off hemlock)'
- (12) PAET ~*O-s-xya/i(t)' ~'to erase, remove O'
Eyak O-sha'tl' (act) 'to sweep O (removing O from something)': 7Esha'tl' 'sweep it!';
Tlingit O-ka-(l-xi't'~ (act): 7a`X 7akaxí't', 7a`X 7agłaxí't' 'is rubbing it off, erasing it'

2.1.2. PAET onset *gy > PAE *dz > PA *dz, *s~z, Eyak dz; Tlingit g

- (13a) PAET ~*(s-D-)gyind (motion) 'for one animate to fall or to undergo an experience'
PA *zEd (motion) 'for one animate to fall' (this meaning kept only in Oregon PCA); 'for one animate to undergo an experience involving the passage of time'
Tututni sEd (motion) 'to fall'; Tututni na=D-sEd (gh-act) 'to fall down (again)': naghEdsEd 'fell down'
PA *dEne: yí:ghEñzEd 'reached manhood', originally literally 'fell (*zEd) into (*-yí:=(gh)) [being] a man (*dEne:): Ahtna dene: yighized 'became a rich man', Carrier dEne=yinzEd 'reached manhood'
Tlingit O-s-D-gi`d~ (motion) 'for O (one animate) to fall': wudzigi`d 'fell'
Tlingit (yé') O-s-D-gi`d~ (na act) 'for O to act, do, behave (so)': yé' wdzigi`d 'acted, did, behaved so'

Note especially the shared idiom:

- (13b) PA *tshr'e:=zEd (n-mom.) 'to wake up': *tshr'e:=nEñzEd 'woke up'; causative *tshr'e:=O-l-zEd (n-mom.):
*tshr'e:=yEñEñzEd 'woke O up' with *tshr'e:=(n) 'outside, into the open'
Tlingit ke`=O-s-D-gi`d~ (event) 'for O to wake up': ke`=wdzigid 'woke up'; causative
ke`=O-s-gi`d~ (event) ke`=7awsigid 'woke O up' with ke`= 'up'
- (14) PAET ~*MOUTH=D-gya(nk'y (act) 'plead, implore, beg, pray'
Eyak dE-D-dzaN:ts' (act) 'plead, implore, beg, pray': dEdEdzaN:ts' 'plead (e.g. with God)!'
Tlingit sh=ká-x' X'e-D-ga`x'~ (act): sh ká' X`adagá`x' 'is praying' related to O-D-ga`x'~ (event): wudigáx' 'is bothered by, tired of noise, talking' and causative O-s-ga`x'~ (event): 7awsigáx' '(noise or maker of noise) bothers O, irritates O'
- (15) PAET ~*gyu: 'good, pleasant'
Eyak k'u-dzu: 'good'
Tlingit s-gu: (state): sigú: 'it's pleasant, brings joy'; sagú 'joy'
PA *zhu: (state) 'to be good', although similar, is probably unrelated.
- (16) PAET ~*O-(s-)gyo(n)G (motion) 'to push O end forward, poke O (as a stick)'
Eyak 7Ed l-D-dza(N)hG (motion): 7EdGEEdzahGl' 'you're walking with a cane; you're pushing yourself along (e.g. on a sled along ice)'
Eyak 7Ed l-D-dziNhG (motion): 7EdGEEdziNhGl' 'you're poling yourself along in a boat'
Tlingit O-gu`G~ (motion) 'to move O end forward, push O, poke O (stick)'
Tlingit O-s-gu`G~ (motion) 'to throw O (as a spear) end forward'
Tlingit O-ka-gu`G~ (motion) 'to throw O (as a stick) end forward'; O-ka-gu`G~ (act): du ji` dé: 7akagú:G yá: chá:dl 'is pushing halibut to him'
Tlingit O-ka-s-gu`G~ (act) 'to drop O (anchor)': shayé:na` hí:nde` kawdudzigi`G 'they dropped anchor' (i.e. pushed the anchor overboard)

The different stem vowels in the above Eyak themes could be historically attributable to vowel gradation.

The following assumes the sonorantization of coda *xw to Pre-Tlingit *w:

- (17) PAET ~*O-gyux (motion) 'poke, stab O'; ~*O-s-gyux (motion) 'move or alter O by poking';
Eyak O-dzux (motion) 'stab, pierce, spear, poke O'; O-l-dzux 'poke O out of position'
Tlingit O-s-gu~: (motion) 'poke, stab O' < Pre-Tlingit ~*O-s-guy

The rhyme of the following potential cognate set is problematic:

- (18) PA dzEl 'mountain'
Tlingit gu`dl 'bump, hump' and gu`dzh 'hill'

2.1.3. PAET onset *ky > PAE *ts > PA *ts, Eyak ts; Tlingit k

- (19) PAET ~*kyi(t)l' 'ashes'
PA *tsi:t' ~ *tsi:ts' ~ *tsi:t' 'hot coals, embers'
Eyak tsiN'tl'-g 'ashes'
Tlingit kél'-t' 'ashes'; O-sh-ke'Y~ (act) 'to make ash of O': 7ashkél't' 'is making ash of it', 7awshikél' 'made ash of it'
- (20) PAET ~*-kyo:n 'hem, hanging end (of garment)'
PA *tsa:n 'breechcloth'
Eyak dE-tsiN'-G (state) 'be naked': di:tsiN'G 'is naked', with privative -G, could also be related.
Tlingit -kú:n 'hem (of coat, shirt)'
- (21) PAET ~*O-s-kyo:ŋ 'see O'
PA *O-ŋ:-l-tsa:ñ (transition) 'see, catch sight of O': *yî:tsa:ñ 'saw O'
Eyak O-(u)-lE-l-tsa~ (perf. state, event): xu'lilitsahñh 'is staring at me, looking at me piercingly' (lE- 'face')
Eyak O-(u)-l-D-tsa~ O-l-D-tsa~ (event) 'O becomes visible; O appears, seems, looks (so)': 7u'slitsahl' 'it became visible', also Eyak O-l-D-tsa~ (event) 'O becomes visible'
Tlingit O-s-ku~: (event): 7awsikú: 'knows O; came to know, recognized O'
- (22) PAET ~*l-kyo(x) 'be(come) dry'
PA *l-tsa:y (state): *(ghE)ñEltsâ:y 'it is dry'
Navajo yîtsaii 'it is dry, desiccated, withered'
Hupa niłtsay 'it is dry, dried up'
PA *na:=l-D-tsa:y (gh-act): *na:=ghEltsâ:y 'it dried (out), became desiccated' with *na:=D- 'again, re-'
Tlingit ka-l-ku`x~ (event): 7a kát kawlikúx '(container) has gone dry'; lit. 'it (e.g. water) dried up on its (the inside of the container's) surface'; 7i`X kawlikúx 'the oil has drained out' [lit. 'gone dry']

Causative:

- PAET ~*O-s-kyo(x) (act) 'dry O'
PA *O-l-tsa:y (gh-act) 'to dry O' (often with *na:=): (na:=)yEltsa:xy 'is drying it'
Hupa O-l-tsay' (s-act): k'yiwhtsay' 'I am drying (deerhide, salmon), seasoning (acorns, wood)'
Tlingit O-ka-s-ku`x~ (act) 'bail O': 7agsaku`x 'is bailing it out', 7akawsikúx 'bailed it out'

The preceding pair of etymologies deserve some comment. First, note that what we reconstruct here as PA *tsâ:y has the perf. stem *tsâ:y and the impf.-opt. stem *tsa:xy in most Athabascan, but the PCA languages show the stative root *tsa:y as opposed to the transitional root *tsa:y'. Based on the Tlingit cognate, it would seem that the latter are innovative, and that PA *tsâ:y < Pre-PA ~*tsa`x.

Second, this appears to be a case where Tlingit has preserved the contrast between the original PAET *l- and *s- classifiers. The second theme is an ordinary causative with Tlingit O-s-, PA *O-l-. The first theme is more interesting. Athabascan has very few intransitive stative verbs with *l- classifier; *(ghE)ñEltsâ:y 'it is dry' above (attested only in Southern Athabascan [SA] and PCA) is one of them. Some of them take an unusual gh-stative in most Athabascan, but appear as plain statives in PCA (and sometimes SA); another example is *(ghE)-ñElgyEd 'it is rotten'. Others take s-statives in some languages but plain statives in PCA (and SA), e.g. (Alaska and British Columbia) *sEltsr'El, (P) *ñEltsr'El 'it is wet'. At any rate, the l- classifier in these verbs obviously has nothing to do with valence. It seems rather to refer to a natural process eventually resulting in a state, such as drying out, getting wet, rotting. We may compare also Tlingit wuh'ix '(meat or fish) is rotten (still firm but smelly)', wuh'wán '(wood) is rotten and powdery'. Tlingit may thus provide evidence that this particular type of valence-unrelated classifier was PAET *l- rather than *s-.

- (23) Eyak tsu'd ~ tsuhd (event) 'to sleep': sEtsu'/hdñh 'fell asleep, slept'

- Eyak tsu'd ~ tsuhd 'sleep (n.)'
Tlingit 7a-ki`d~ (act) 'to snore': 7aki:d 'is snoring'

- (24) Eyak (ya:-)tsidz-g 'thin'
Compare also Eyak (ya:-)dzhidz-g 'very narrow, skinny, thin', probably a sound-symbolic variant.
Tlingit =kéxw-gw 'light, fluffy'
- (25) PA *nE-tseZ ~ *nE-tseZ (s-act): *nê:ztsEz~tsAz 'the fire went out'
Tlingit ka-ki's'~ (event): ka`wakís 'the fire went out'

2.1.4. PAET onset *ky > PAE *ts > PA *ts, Eyak ts; Tlingit sh

There appears to have been a split in the Tlingit reflex of PAET onset *ky. In 2.1.3 we have seen an impressive number of cognate sets where PAET *ky yields unpalatalized Tlingit k, but below we will see an equally impressive number where PAET *ky yields Tlingit sh, a garden variety result of palatalization. But I cannot as yet ascertain the prehistoric phonological environment(s) that conditioned this palatalization that yielded Tlingit sh. We can merely note that most of these etyma begin with PAET *kyi or *kye.

The most productive member of this correspondence set is:

- (26a) PAET ~*-kye/i(:)ŋ 'head'
PA -tsi' 'head'
Eyak tsiN'-dE- 'neck' (tsiN'- originally incorporate, with dE- gender)
Tlingit -shá 'head'

Especially interesting are compound forms of 'head' ending with a nasal in Tlingit and Carrier:

- Carrier -lasinghai', Dena'ina (l) -tsinghun 'brains', elsewhere PA *-tsî:-gha:ñ'
Carrier -lasingEz 'scalp', elsewhere PA *-tsî:-zÊts' or *-tsî:-zÊs{d}
Carrier -lasingEn 'skull', elsewhere PA *-tsî:-ts'Ene'
Tlingit -shan-tú 'inside of head' (-tú 'inside')

Note also Tlingit -shán, which in Interior Tlingit refers to psychic receptors on either side of the forehead, but in Coastal Tlingit occurs only in the idiom -shán yá:ŋw '— has a headache' (as opposed to -shá yá:ŋw '—'s head hurts').

The nasal does not occur in the following compound:

- (26b) PAET ~*kye/i(:)ŋ+Xa(w) 'hair of the head', lit. 'head+hair'
PA *tsî:-gha:, poss. *-tsî:-gha' 'id.' > Carrier -lasingha'
Tlingit sha-Xa`w, poss. -sha-Xa`wú: 'id.'

A related etymon seems to be:

- (27a) PAET ~*kyi(:)ŋ ~'above'
Tlingit (di-)kí: 'up above' and (di-)kín-de` 'upwards'
Tlingit kí: ~ kín- is no doubt also related to 'head'.
For the semantics cf. Eyak -lE-tsiN'-d 'above (tsiN') the head (lE-) of'. Note also the nasal in kín-de` 'upwards' like that in -shan-tú 'inside of head'. I cannot explain why PAET *ky becomes Tlingit sh in the case of 'head' but Tlingit k in the case of 'up above', other than to suggest that the root vowel may have had different ablaut grades in PAET.

- (27b) PAET ~*kyi:w(-C) 'first, ahead'
PA *tse:(-d) 'first, ahead', *tse:-d-i: 'first one, elder'
Tlingit shú:g-u= (followed by a possessed noun) 'first': shú:gu=7a`yí: 'the first one'
Tlingit -shú (-shú:- before postpositions) 'end', evidently from *'ahead'
Note also the less common meaning ~ 'in anticipation of', e.g. ts'u`ta`di 7adXa`yí: shú:-d 7á: 'is sitting down to breakfast (ts'u`ta`di 7adXa`yí:)', more literally 'sitting in anticipation of breakfast', and the place name l'ug-shú 'Kluckshoo', from l'u`g shú 'place [to camp] in anticipation of the coho [run]'.
The reflexes of the PAET rhyme *i:w posited here mirrors that of roots beginning with *Cwi(:); see section 1. In Tlingit, the coda w assimilates the vowel to u. In Athabascan, however, the presumed coda *w first dissimilates the preceding vowel from *i: to *e: and then disappears. Thus:

PAET ~*kyi:w > Pre-PA *tse:w > PA *tse:

PAET ~*kyi:w > Pre-Tl ~*shi:w > ~*shú: > Tlingit shú:(-)

- (28) PAET ~gu:-kyi/e:(R) (particle indicating a situation envisioned by the speaker)
Pre-Ahtna *gyu:-tse:, Ahtna (CLW) gyu-tse ~ gyi-tse, (Mentasta) gye-tse (with optative) 'I hope'
Compare Dena'ina tsadi 'I hope, I wish' ? < PA *tse:d-i: 'the one ahead' from *tse:(-d) 'first, ahead' (27b)
Tlingit gu-shé 'I don't know'; =gwshé 'I wonder', also found in gu7a`=l(=gwshé) (with prohibitive/optative impf. or perf.) 'I hope'

Other comparisons:

- (29) PAET ~*kyay 'rock, stone'
PAE *tsay 'stone, rock'
PA *tse: 'stone, rock'
Eyak tsa: 'stone, rock'
Tlingit sha` 'mountain'
- (30) PAET ~*O-kye:y 'to bark at O'
~*7yE-kye:y 'to bark', with *7yE- indefinite object (cf. 71)
PA *yE-tse:[y] (gh-act) 'to bark': *yEts: 'is barking'
Tlingit O-sha~ (act) 'to bark at O': Xad=shá: 'is barking at me'.
7a-sha~ (act) 'to bark': 7ashá: 'is barking'
- (31) PAET ~*kye/i: (or *kyey) 'blood'
PA *qU-tse: 'menstrual blood', incorp. *tse:=
Koyukon tla 7EdEghinik 'she stopped menstruating', lit. '[her] menstrual blood (tla=) stopped -E=dEghinik'
Koyukon b-En-tla=k'EnadlEtUł 'he got a nosebleed; a blood vessel in his nose (-En-tla=) burst (k'EnadlEtUł, lit. 'something stringlike burst')'
Hupa tse:-liŋ 'blood'; tse:=lin (gh-state): tse:=wiliŋ 'it is bleeding' (/lin/ 'to flow')
Tlingit shé, (Northern) shí 'blood'
- (32) PAET ~*kyi:(y) 'limb, knot', with a problematic vowel correspondence.
PA *tsu: 'limb, branch'; cf. Alaskan *-zu:-kyEne 'limb, branch, knot'
I cannot explain the PA vowel here.
Eyak tsi:N(y) 'limb, branch, knot'
Tlingit shí y 'limb, knot'
Tlingit shí 'song'; 7ad=shí 'song, singing, music'
- (33) PAET ~*O-kyi:ŋ 'to sing O'; with indef. non-human object: 'to sing'
O-tsiN~ 'sing O': tsiNhiN 'is singing it', k'utsiNhiN 'is singing'
Tlingit O-shi~` 'to sing O': 7ashí 'is singing it'; 7ad=shí 'is singing'
- verbal noun:
PAET ~*kyi:ŋ 'song'
Eyak tsi:N(y) or tsiN 'song'; k'u-tsiN 'song, music'; gerund k'u-tsiN:l 'singing'
Tlingit shí 'song'; 7ad=shí 'singing, music, song'
- (34) PAET ~*kyo:(-) 'undergo pangs (of pain, starvation, death)'
PA *dâ:=tsa: (s-act): *dâ:=tsâ:X '(one) is dying', *dâ:=sEtsa:ñ '(one) died'
The proclitic *dâ:= very likely comes from incorporated *da:ñ ~ *dAñ 'famine', in which case the original meaning of this PA idiom could have been 'to undergo the pangs of starvation'.
Tlingit O-ka-shu~` (na event): ka`washu` 'O is delirious, out of one's right mind (esp. due to chronic pain); O is intoxicated (as from alcohol)'
- (35) PA *k'yE-tsa: 'hawk'
Tlingit sha`yá:l 'hawk', possibly < ~*sha:-ya:l 'hawk=MODIFIER'

2.1.5. PAET onset *k'y > PAE *ts' > PA *ts', Eyak ts', Tlingit x' or k'

- (36) PAET ~*-k'yaw' 'crosspiece, thwart'
PA *-ts'a' 'crosspiece (of snowshoe, sled, canoe), thwart (of canoe)'
Tlingit -ÿaXa-k'á'w-u` 'crosspiece (of canoe, snowshoe)'
-ÿaXa- is not obviously analyzable, but perhaps comparable further with Interior Tlingit
-yaX-7a-dú:x'u` 'lashing along the inner edge of the frame (of snowshoe)'
- (37) PAET ~*s-(D-)k'yin()d (motion) ~'fall over'
PA *l-D-ts'Ed 'to fall (of one thing)': *ná:=ghElts'Ed 'it fell down'
Eyak l-ts'in't' 'to sink, settle; to flop (of a fish)': yEX GElt's'in't'l 'it's sinking, settling'
Tlingit sha-s-x'i'd~ (motion): ke`=shawsix'id 'tree has fallen uprooted' (sha- 'head' refers to a top-heavy object)
- (38) PAET ~*k'yi/a()q'w ~'adhesive'
PA *ts'e:q' 'glue' (traditionally made from fish skin)
Eyak ts'a'q' 'soft feces, diarrhea'
Tlingit k'ú'X' 'pitch'
- (39) PAET ~*k'ye/i:- or ~*k'yey- 'straight'
PA *ts'i: 'straight (in a certain direction)' (used with directionals)
Tlingit x'é:-Ga` 'true, truly'
- (40) PAET ~*k'y...s 'overflow'
PA *ts'ÉñEs ~ *ts'Ez 'aufeis, frozen overflow, thin fresh ice'
Tlingit x'a's 'waterfall'
- (41) PAET ~*...k'yi()t'l' (or the like) 'occiput, nape of neck'
PA *-ts'Ét'l' 'id.'
Tlingit -la-k'i'tsh' 'id.'
- (42) PAET ~*...k'yi()t'l'=wi: 'bird sp.', lit. 'nape-white'
PA (A) *ts'Ét'l'E-we: ~ *ts'El-we: 'arctic loon', lit. 'nape-white'
Lower Tanana tth'EdlEba
Koyukon (CU) t'l'EdlEba
Dena'ina (Tyonek) ts'Elba
Ahtna ts'elbe:
Tlingit (Tongass) la-k'i'tsh'-wu, (N) la-k'i'tsh'-wú 'scoter duck', lit. 'nape-white'

The coda correspondence between Tlingit and PA is problematic, but the semantic match is perfect. Moreover, only very rarely can one reconstruct whole compounds shared by Athabascan-Eyak and Tlingit. One prime example is 'hair of the head' cited in 26b above; another is in the above bird name:

Eyak lE-k'ush 'grebe' and sE-l-k'ush-l 'duck sp.' look similar to Tlingit la-k'i'tsh'-wú 'scoter', but lack any trace of PAET *=wi: 'white'.

2.1.6. PAET coda *gy ~ *xy > PAE *dz ~ *s > PA *s, Eyak dz ~ s, Tlingit x

The most important example of this paired set of sound correspondences is 'ahead', which is complicated by a hapax set of onset correspondences, but in addition shows variation between the original coda PAET *gy and the spirantized form *xy before the locative suffix *-d (see further Leer 1989, esp. pp. 603, 622).

Note that spirantization of the coda before this obstruent suffix is found in all three branches of AET, which suggests that spirantization, which is synchronically productive only in Athabascan, was once productive in the ancestral language PAET.

TABLE 7. PAET palatal coda correspondences

PAET*	Tlingit	PAE*	PA*	Eyak
gy ~ xy	x	dz ~ s	dz ~ s	dz ~ s
gy	g(w)	dz	dz	dz
k'y	x'	ts'	ts'	ts'

- (43a) PAET ~*7yEngy 'ahead, out in front; out on the water'
 ~*7yEnxy-d '(at/to a point) ahead, out in front; out onto the water'
 PA *(...)-ñEs[-d] '(at a point) ahead, out in front; out on the water; on/over the fire'
 *(...)-ñEs-e' '(toward) ahead, out in front; out onto the water; onto/over the fire'
 (The voiceless s here is probably analogical.)
 Eyak lahdz= 'forward, out in front; out to sea, south'
 -lahdz 'in front of; out to sea from; south of' (usually with postposition)
 -lahs-d '(in position) in front of, on open side of; out to sea from; south of'; the variant lahs occurs
 only with postposition -d and vice versa.
 7i:Ndz-i' 'in bow of boat' (only with postposition), perhaps from Pre-Eyak ~*7i-nEndz-7e' 'indeterminate.
 obj.-front-place/stead'
 Tlingit 7i:x 'downriver', 7ix-kí: 'downriver; south'
 7ix-de' '(toward) downriver'

The expected PA stem *ñEdz without spirantization shows up only in 43b.

- (43b) PA (Alaskan) *k'yE-ñE(d)z-e', (Eastern) *k'yE-ñEs-e' 'elder, old person'
 Ahtna k'ye-nedz-e' 'id.'
 Lower Tanana tsh'E-nEddh-a' 'id.'
 Gwich'in (Western) tsh'a-ndzhàà', (Eastern, Arctic Red River) 7a-ndzhòò' 'id.' [N.B. < *k'yE-ñEz-e']
 Chipewyan 7e-neth-é-kuyi 'old man' (with -kuyi plural), -7e-neth-é 'husband'

The PAET onset reconstructed *7y here is problematic. It is clear from the PAE evidence that there was a nasal after the vowel, which in turn could have nasalized the onset, which would then regularly give PA *ñ. PAET *7yE would quite organically yield Tlingit 7i... as well. But Eyak l is problematic. We would expect PAET *7yEngy to yield Eyak *[yaNhdz] rather than lahdz. Perhaps the PAET onset was actually a preglottalized nasal of some sort.

Finally, we come to a very interesting kin term based on this 'ahead' directional. This and other kin terms based on directionals are discussed in more detail in Leer 1989. The cultural-semantic implications of such kin terms are quite intriguing; this topic deserves further research.

- (43c) PAET ~*7yEngy-DIMIN 'woman's brother'
 Tlingit -7i:k' 'brother (of woman)', with diminutive suffix -k', possibly from earlier ~*7i:x-k'i
 Eyak -i:Ndz-kih 'brother (of woman)', with dimin. -kih

In Leer 1989:603 I suggest a typological comparison between this and the pair Tlingit -dla'k' 'sister (of man)', Eyak -tsa'-kih 'older sister (of woman)'. This last comparison is phonologically most odd, but nonetheless tempting given the same onset correspondences in Tlingit -dli'y, Eyak -tse', PA *-tsEñ' 'flesh, meat'. I do not see a way to reconstruct these for PAET without having to posit that PAET clusters of fricative plus aspirated stop can become unaspirated stops in Tlingit. Although I have entertained this hypothesis many times, it is just too ugly for me to take very seriously. Besides, it requires too many *dei ex machina*: we would apparently have to posit Pre-Tlingit fricative prefixes, e.g. *l- in Pre-Tlingit ~*l-ky(a)n-k'i or ~*l-tsha(n)-k'i > Tlingit -dla'-k', that have no counterparts in Athabascan-Eyak.

2.1.7. Coda PAET *gy > Tlingit g(w), PAE *dz

- (44) PAET ~*Xi(')gy 'shoulder'
 PA (A, E, Witsuwit'en) *-GHEdze', (S, Carrier) *-GHUs 'shoulder'
 The variant *-GHUs may have been suffixed in Pre-PA.
 Eyak O-Xe'dz 'shoulder O'
 Tlingit -Xi`g 'upper arm', -Xig-shá 'shoulder'

- (45) PAET ~*Xa(w)gy '(finger)nails, claws'
 Eyak -yE-l-Xahdz-l 'id.' (with yE- 'hand')
 Tlingit Xa`gw, -Xa`gú: 'id.'

Compare Ahtna *de-l-gha:dz* 'is making a scratching, grinding, crunching noise' and Navajo *ts'i-ghaz* 'a scraping-scratching sound'.

- (46a) PAET ~*7e'gy (motion) 'to step'
 PA *7ê:dz (motion): 'to move one's foot, step': *yEGHAN=nEñ7ê:dz 'stepped through it'
 PA *O-7ê:dz (motion): 'to touch, nudge, act upon O with foot'
 Eyak O-7e'dz (motion) 'to touch, affect, act upon O with foot'; with indet. obj.
 Eyak 7i-7e'dz (motion) 'to move, position one's feet, step': 7iGE7e'dz 'take a step!'
- (46b) PAET ~*7E-(s)-D-7e'gy (motion) 'to misstep', with PAE ~*7E-D- 'in error, mis-'
 Carrier O-nE-D-7es/7ez/7Es (motion): 'to act wrongly on O with one's foot':
 l-ts'e=init'ez 'wrongly cut it by the middle with the foot'
 Lower Tanana tEnh GHU=natht'atth 'he accidentally stepped through the ice'
 Tlingit 7a-sh-D-7a'g~ (motion): 7awdzhi7á'g 'staggered (of person or animal, with lack of muscle control, as when wounded); flopped, floundered (of fish)'

This is a rare instance of the survival of PAET ~*7E-D- > PA *nE-D- 'in error, mis-' as Tlingit 7a-D-. (The sonorant correspondence is the same as that of 'face'.)

The Tlingit *sh*-series classifier in (46b) presumably reflects palatalized *s-. Palatalization of *s- to *sh*- might be attributable here to the originally palatalized coda of the root, as it might be attributable to the originally palatalized root onset in Tlingit *sh-D-xi'x~ 'to run' < PAET ~*s-D-xyi(x)k'; see (4).

A possibly related theme, curiously lacking the D- element and with an as-yet inexplicable Tlingit coda:

- (47) PAET ~*nE-s/l-7e(')gy-g ~'to limp'
 PA *k'yE-tE-nE-l-7Es-gy (act): *k'yEtEnEl7Esgy 'is limping'
 with *k'yE- indef. obj. and tE- 'off'
 Tlingit 7a-ka-l-7e's (motion): 7akawli7e's 'staggered (as when drunk)'
 where ka- could conceivably be related to PA *tE-

In the following, Tlingit has a stop coda but PA has a fricative coda:

- (48) PAET ~*(s/l)-D-Xe(')gy~Xexy 'to shrink back, retract'
 PA *l-D-GHEz (motion) 'start (when startled), flinch, duck, dodge'
 Tlingit D-Xa'g~ (event): wudiXág 'it shrank, is shrunken'
 Tlingit l-D-Xa'g~ (event): wudliXág '(limb) is withered'
 Tlingit s-D-Xa'g~ (motion):
 7a=tú:de' yu' dziXágg '(snail) keeps retracting into (its shell)'
 7ád wudziXág '(branch, elastic band) lashed/snapped back and hit there'

2.1.8. Coda PAET *k'y > PAE *ts', Tlingit x'

- (49a) PAET ~*t'i(k)y 'ice'
 Eyak t'its' 'ice'
 Tlingit t'í:x' 'ice'
 Tlingit t'í'x'~ (event): 7uwat'íx' 'it got frozen by itself'
 Tlingit ka-t'í'x'~ (event): ka`wat'íx' 'it is hardened, caked together'
- (49b) PAET ~*(t)-D-t'i(k)y (event) 'to freeze, solidify'
 Eyak D-t'its' (event?): qa`sdit'its' 'it's frozen'
 Tlingit l-D-t'í'x'~ (event): wudlit'íx' 'it froze, is frozen'
- Causative:
 PAET ~*O-l-t'i(k)y (act) 'to freeze O, let O solidify'
 Eyak O-l-t'its' (act) 'to freeze O, make O icy, turn O to ice'
 Tlingit O-l-t'í'x'~ (act): 7alt'íx'X 'is freezing it', 7awlit'íx' 'froze it'

- (49c) PAET ~*O-s-t'i(k)y (event) 'to freeze, solidify O together (into a configuration)
 Passive: Eyak l-D-t'its' (perf. state and event) 'for an object to freeze in such a way that its position or material relation with another object is affected':
 7Ew-X 7ilit'its' l 'it's frozen to it', qa' slit'its' l 'it froze and came up out'
 Tlingit O-sh-t'i'x~ (event): 7awshit'ix' 'held O steady'
- (50) PAET ~*qwi:k'y (motion) 'to fall (as of a pole)'
 PA *q[w]e:ts' (motion): 'to fall, move independently (as of a log, pole, boat)
 The underlying rounding in PA */qwe:ts'/ is revealed when the stem vowel is reduced; the PA momentaneous stem set has full Impf./Opt. *qê:s and Perf. *qe:ts' versus reduced Fut./Prog. *qûs-l and Rep. *qûs-gy.
 Ahtna qe:s/qe:ts'/qos (motion): i'tezqets' 'a loaded boat left'
 Chipewyan kéth/kedh/kóth (motion): nághiNkedh 'a long object) dropped'
 ts'iy 7el-e=déthkedh 'canoes met each other'
 Navajo keeNs/kééNz/koNs (motion):
 naakeeNs/náákééNz 'to fall down (as a pole, rifle, wedding basket, etc.)'
 Tlingit ya-s-qu'x~ (motion): yawsiqu'x' '(tree) fell over'
 Tlingit sha-s-qu'x~ (motion): shawsiqu'x' 'it fell over (as a pole with something attached to the top)'

The s-classifier in Tlingit is evidently a late addition, referring among other things to a branched object or a long object with something attached to the end (such as bristles, straps, a line).

The last two sets below apparently involve spirantization. The Tlingit coda ...x seems to be the remnant of an original coda cluster:

- (51a) PA *q'Ey=ts'â:ts'e' (or *ts'â:dze') 'rotten birch (soft and crumbling)'
 Koyukon q'iyh=t'odle' 'decayed birch wood (soft and crumbling)'
 Chipewyan k'Ei=tth'ádhé 'decayed birch'
 Tlingit s'i'x 'dust, dirt, scraps, crumbs, trash'

- (51b) Koyukon dE-l-D-t'odl (gh-act): dElEt'odl '(rotten birch wood) crumbles'
 where the Koyukon root t'odl < PA *ts'â:ts' or the like.
 Eyak l-ts'iyats' (event?): ya' sElts'iyats' l 'it (e.g. meat, food, clothing) got completely rotten or moldy, went to pieces'
 Tlingit l-s'i'x~ (event): wulis'ix' 'it is rotten, spoiled (of meat or fish, still firm but smelly)'
 Tlingit ka-l-s'i'x~ (event): (S) kawlis'ix, (N) kawlis'ux 'it has soured'
 Tlingit ka-l-s'i'x-ú: (state): (S) kalis'i'xú:, (N) kalis'u'xú: 'it is sour'

Now here's the tricky part. The Tlingit onset s' reflects either PAET *tsh' or *ts', so the most probable reconstruction (ignoring the vowels etc.) would be PAET ~*tsh'...k'y. The expected PAE reflex ~*tsh'...ts', which would have been uncanonical, and therefore assimilated to *ts'...ts'.

We find further evidence for this hypothesis in:

- (52a) Eyak (Cordova) 7iN:-l-tsh'iyak', (Yakutat) 7iN:-l-tsh'iyak'w-l 'rotten fishheads'

Here we see a doublet in Eyak ...ts'iyats' 'completely rotten' vs. ...tsh'iyak'(w) 'rotten (fishheads)'. This looks suspiciously like the Tlingit doublet ...s'i'x~ 'rotten, spoiled' vs. ...s'i'xw~ 'sour'. On the basis of this, we might reconstruct a PAET doublet, one with a palatalized coda and one with a rounded coda:

- PAET *tsh'...k'y > Eyak ts'iyats', Tlingit s'i'x~ (where coda x comes from a cluster)
 PAET *tsh'...k'w > Eyak tsh'iyak'(w), Tlingit s'i'xw~ (where xw comes from a cluster)

Now, however, we have opened up another Pandora's box, namely:

- (52b) Eyak l-tsh'iyak'(w) (prog. state): GEltsh'iyak'l 'it smarts, burns, stings'
 Eyak l-ts'i:k' (event): sElts'i:k'l 'it ulcerated (of untended sore)'
 PA l-tsh'i:k'y (s-state): *sElts'h'i:k'y 'it smarts, burns, stings'

We must also mention Tlingit k'ink' 'aged fishhead(s)', meaning the same as Eyak 7iN:ltsh'iyak' 'rotten

fishheads (a piquant food)', which if related to the above would have a regular coda correspondence but an odd onset correspondence.

A semantically similar etymon involving spirantization before an obstruent suffix is:

- (53a) Eyak t'its' 'dirt, dust'
 Tlingit t'i'x 'trash, debris, dirt'
 Tlingit t'i'x 'trash, debris, dirt'

Compare also Eyak t'Edzh 'slush', t'Etsh'-g 'snot, gelatin' and PA *t'Êtsh' ~ *t'Êsh[gy] 'mud, goo, slime', as well as the following:

- (53b) PA *qU-t'Êsh[gy] 'mud'
 Tlingit qútl'gw 'mud' < Pre-Tl ~*qu-t'igw
 The Tlingit labialization may be due to very late spread as in the case of Tlingit -húnXw, (Carcross) -húnX 'older brother (of man)' < Pre-Tlingit ~*-hunEX, cognate with PA *-unEgh-e: 'older brother'.

2.2. PAET unrounded velars

Table 8. PAET unrounded velars

PAET	Tlingit	PAE	Eyak	PA
*x	*x	*xy	x	x(w)
*g	*g	*gy	g	g(w)
*k	*k	*ky	k	k(w)
*k'	*k'	*k'y	k'	x'(w), k'(w)

2.2.1. PAET *x > PAE *x > PA *xy~y, Eyak x, Tlingit x

- (54) PAET ~*xV(')tsh' 'knot'
 PA *xyâ:sh, *xyâ:tsh' 'knot'; O-yâ:tsh' (s-act) 'to tie O with knots, knot O'
 Eyak xa'tsh'(-l) 'knot'; O-xa'tsh' 'to tie O (a knot, a cord); to tie O (to something)'
 Tlingit ka-xí:s' 'wire'; ka-xi's'~ 'to become tangled'
- (55)¹ PAET ~*(-)xi(ŋ)ts' 'shin; bow (of boat)'
 Pre-PA *xEts' '[arc,] ridge'
 PA *xyÊs 'hill, ridge', poss. *-yÊts'e'
 Eyak GE-lE-xi'ts'-l '(some kind of) hill', evidently a nominalized progressive stative based on the unattested verb theme *l-D-xi'ts' (prog. state) 'to extend in an arc (as a ridge)'
 Eyak -xi'ts' 'shin'
 Tlingit -xí:s'i' 'shin' and
 -xí:s' 'bow (of boat)'
- (56) PAET ~*-xV(R)d 'breastbone, sternum'
 PA *-yEd-e' 'breastbone, sternum'
 Tlingit -xe'd-ká 'breastbone, sternum'
- (57) PA ~*xya:s/ts' or ~*xyAghEs/ts' (reconstruction problematic) 'brown bear'
 Gwich'in syih < *xya:s
 Carrier shaz < *xya:z or *xyats'
 Hupa sa:ts'
 The Hupa synchronic underlying form is /sa:ts'i/, but historically probably comes from earlier ~*sAghEs'; cf. the following Oregon PCA forms coming from Pre-P(Or) ~*sEghEs:
 Galice sas, Chasta Costa sEghEs, Tututni sEghEs
 Tlingit xu'dz 'brown bear'

¹ Thanks to Sharon Hargus for pointing out the connection between 'shin' and 'hill, ridge'.

- (58) PAET ~*O-(s-)xo(dzh 'to tan, soften O (skin)'
 Pre-PA *O-xidzh-g (with rep. suffix) >
 PA *O-yEshr-gy (gh-act) 'to rub O (skin) to soften it' (exhibiting merger of earlier *sh with *shr)
 Tlingit O-l-xwa`dzh~ (act) 'to tan O (skin, by scraping)'; 7aḵwádzhs 'is tanning it (a hide)'

2.2.2. PAET *g > PAE *g > PA *gy (rare), Eyak g, Tlingit g

- (59) PAET ~*-g [repetitive suffix]
 PA *-gy [repetitive/customary suffix]
 Eyak -g [repetitive suffix]
 Tlingit -g(w) [repetitive suffix]
- (60) PAET ~*gu7aR 'would that...!'
 Eyak =sh-gahX 'would that...!',
 prob. < earlier *=sh-gwahX, perhaps < *=sh-gwaR-X, which is remarkably similar to Tlingit ..gu7a=yáX.
 Tlingit gu7a`=l(-gwshe), with optative/prohibitive 'would that...!'
 Tlingit 7i=gu7a`=yáX=x`wán (exhortation to do one's best, words of encouragement)
- (61) PAET ~*ga(its) 'post' (unless borrowed)
 Eyak ga'ts 'ladder, stairway'
 Tlingit gá:s 'post'
- (62) PAET ~*gV(')(-)q' 'throat'
 Eyak -(dE-)ga'q'-l 'throat, larynx'
 Tlingit -giG-l'án ~ -k'IG-l'án 'hard palate', perhaps < *throat-margin'
 Compare -waG-l'an-da 'around the edges of the eye', perhaps < *eye-margin-around'; these are the only two instances of Tlingit l'án ~ l'an-, whose meaning remains therefore problematic.

2.2.3. PAET *k > PAE *k > PA *ky, Eyak k, Tlingit k

- (63) PAET ~*-kV:R 'tail' (rhyme correspondences extremely problematic)
 PA *-kye 'tail', compounding form *-kye:-
 Eyak -gu-ka' 'tail' and -gu-ka:- (class prefix for filament-like objects)
 Tlingit -ku`wú: 'tail', compounding form -ku-
- (64) PAET ~*-ka:ɲw 'belly'
 PA *-kya:n 'belly'
 Eyak -kEmah 'belly' (prefixal form -ku:lE- ~ -ku:N-)
 where -kEmah is evidently from earlier *-kEm-nah, a reduced form of 'belly' compounded with *-nah > -lah 'around'
 Tlingit -ká 'surface; on'
 alternating with -ka`- before syllabic postpositions
 du=ká-d ýád 7á: 'she is pregnant' lit. 'child is sitting on her'
- (65a) PAET ~*-ki(:)l(-k'), a kin term apparently referring to a younger male
 PA *-kyEl-e: ~ *-kyÊt'e: 'younger brother'
 where *-kyÊt'e: appears to be a contraction of *-kyEl-7e: < Pre-PA *-ki-l-k'-e:
 PA *-kyi:l-e: 'younger male parallel cousin' and *kyi:l ~ *kyi:l-e: 'boy'
 Tlingit -ké:l-k' (male's) sister's child, cross-nephew or -niece', voc. kélk'
 Note also Tlingit -ká:l-k'w (female's) brother's son, cross-nephew or -niece',
 voc. kálk'w

This kin term has given rise to a diminutive suffix attested only in Alaskan and Oregonian Athabascan, where the reduced stem vowel is lost—presumably via devoicing—and the erstwhile stem onset is spirantized from *ky to *xy:

- (65b) PA (Alaska) *=xyt'e: 'small' (< *-kyÊt'e:) alongside
 PA (Oregonian) *=xyt'e: (< *kyEl7e:), a diminutive enclitic:
 Ahtna =stl'e
 Dena'ina =shtl'a
 Deg Hit'an =stl'E
 Tututni, Tolowa =shl7e

- (66) PAET ~*ku:(n)tsh' 'to fart noiselessly' (unless borrowed)
 Eyak ku:Ntsh' 'to fart noiselessly': ku:Ntsh'-iNh 'is farting noiselessly'
 Tlingit 7a-ku'tsh~ 'to fart noiselessly': 7akú:tsh' 'is farting noiselessly'
 Tlingit 7a-ku'tl'~ 'to fart noiselessly': 7akú:tl' 'is farting noiselessly'
- (67) PAET ~*O-kaRl 'to bark, yelp at O'
 ~*7yE-kaRl 'to bark, yelp', with *7yE- indef. obj.
 PA *yE-kyEl (gh-act) 'to bark, yelp'
 Koyukon yE-kEl (gh-act): yEkEl '(dog) is barking, yelping'
 Eyak O-kahl 'to bark at O': kahl '(dog) is barking at it'
 7i-kahl 'to bark': 7ikahl '(dog) is barking'
 Tlingit ke`dl 'dog', possibly from *kaRl-l 'barker', where *l > dl.

It is conceivable that this was originally somehow related with (30), which likewise has a transitive theme paired with an intransitive theme formed with the PAET indeterminate object *7yE- > PA *yE-, Tlingit 7a-

2.2.4. PAET *k' > PAE *k' > PA *k'y, Eyak k', Tlingit x' or k'

- (68) PAET ~*k'u(')t' 'sinew, tendon'
 PA *-k'yÊt'(-e) 'sinew, tendon, nerve'; D-k'yÊt' (state) 'to be tough, strong'
 Eyak k'u't' 'thread, sinew, tendon, nerve, blood vessel'
 Tlingit sh-D-x'u't'~ (act) 'to have a contest of strength by linking index fingers and pulling until the loser's finger gives out': has=7ishx'út'd 'they are having a finger-pull'; (Tongass) x'út'a` 'index finger'
- (69) PAET ~*k'o(')t' 'to glide, swoop'
 Eyak dE-l-k'a't' (motion) 'to fly (of one bird)'
 Tlingit ýa-x'u't'~ (motion) 'to glide, swoop'
- (70) possibly PAET ~*k'a't' 'island' (unless borrowed)
 Tlingit x'á't' 'island'
 Eyak k'a't' 'island'
- (71) PAET ~*...k'utl' ~ 'to be(come) rippled, wavy, uneven'
 Ahtna dE-l-D-k'yu:l/k'yotl' (motion) 'to become crushed, dented, bent out of shape, wrinkled, bumpy'
 Tlingit du-x'u'Y'~ (event) 'for a riptide to occur': wuduwx'ú'Y' 'there is a riptide'

2.3. PAET rounded velars

In this section we will look at a few examples of PAET rounded velars, first described in Krauss 1964. These have the same reflex as unrounded velars in Tlingit and Eyak (although rounded velars are still attested in early word lists and in the Yakutat dialect of Eyak). In Proto-Athabascan, on the other hand, we find retroflex obstruents, which come from Pre-PA rounded velars. In general, then, without evidence from Athabascan it is often impossible to determine without question whether a velar was rounded in PAET. Sometimes indirect evidence can help decide the question, as in the case of Eyak -k'ahsh 'foot, lower leg, paw' alongside its prefixal form k'ush-dE-, which implies that Eyak -k'ahsh comes from earlier *-k'wahsh.

TABLE 9. PAET rounded velars

PAET	Tlingit	PAE	Eyak	PA
*xw	*xw	*shr~zhr	xw > x	x(w)
*gw	*gw	*dzhr	gw > g	g(w)
*kw	*kw	*tshr	kw > k	k(w)
*k'w	*k'w	*tshr'	k'w > k'	x'(w), k'(w)

2.3.1. PAET *gw > PAE *gw > PA dzhr, Eyak g(w), Tlingit g(w)

(72a) PAET ~*gwe:n ~'day(light)'

PAE *gwe:n 'day'

PA *dzhre:n 'day'

Eyak g(w)ah 'day'; ge:lE-7a:g 'noon' ('day-middle')

Tlingit gá:n 'outside'

(72b) PAET ~*...gwe:n 'to be bright'

PA *l-(D-)dzhre:n (s-state, state) 'to be light, bright'

Carrier (i-)l-D-dzin (?state): ildzin 'it is moonlight'

Hupa l-dzhe:n (state): nildzhij 'it is bright; it shines, glitters'

Tlingit ka-D-gan (state) 'to be bright, shining': kadigán 'it is bright'; ka-gán 'light'

(73) PAET ~*gwV(R)()g(w) 'bunch, cluster'

PA *dzhrâ:gy or *dzhrâ:dzhr (s-state) 'to lie in a bunch/pile (of small objects)'

PA *O- dzhrâ:gy or *O-dzhrâ:dzhr (motion) 'to handle O (small objects, in a bunch/pile)'

Tlingit ka-D-ge:gw (state): kadigé:gw '(fish roe) is loose'

(74) PAET, PAE ~*gwa:d 'leg'

PA -dzhra:d-e' 'leg'

Eyak gudE- 'buttocks'

Tlingit gu'd~ (motion) 'for one to go on foot, walk'

(possibly a denominal verb by origin)

If Tlingit gu'd~ 'one goes' is related to PAE ~*gwa:d 'leg', we have an apparent case where PAET *a in a rounded environment is assimilated to Tlingit u.

(75) PAET ~*7wi:gw (event) 'to cook'

PA *we:dzhr (s-act) 'to cook': *sEwe:dzhr 'it cooked'

Tlingit 7u'gw~ (event) 'to boil': 7uwa7úgw 'it came to a boil'

Causative:

PAET ~*O-s-7wi:gw (act) 'to cook O'

PA *O-l-we:dzhr (s-act) 'to cook O': *yElwe:dzhr 'is cooking O'

Tlingit O-s-7u'gw~ (act) 'to boil O': 7as7úgwX 'is boiling O'

2.3.2. PAET *kw > PAE *kw > PA *tshr, Eyak k(w), Tlingit k(w)

(76) PAET ~*kwa:xy 'plant with edible root'

PA tshra:s 'hedysarum alpinum, Indian potato'

Tlingit kú:xw 'Kamchatka lily; rice'

(77) PAET ~l-kVRl 'to be(come) wet, soaked'

PA *tshrEl 'wetness, moisture, dampness'

PA *l-tshrEl (s-state or state) 'to be wet, moist, damp'

Koyukon l-tsEl (s-state): 7EttsEl 'it is wet, very moist'

Carrier l-tsEl (s-state): sEltsEl 'it is wet'

Hupa l-tshwil (state): niłtshwil 'it is wet'

Tututni l-shrEl (state): lshrEl 'it is wet'

Tlingit ka-l-ke' l~ (event): kawlikél 'it is soaked';

caus. O-ka-l-ke' l~ (act): 7akawlikél 'soaked it'; 7aklakéls, 7aklakéłX 'is soaking it'

2.3.3. PAET *k'w > PAE *k'w > PA *tshr', Eyak k', Tlingit x'(w) or k'(w)

(78) PAET ~*O-k'win't' (act) 'to scratch O'

PA O-tshr'Ét' (gh-act/semel) 'to scratch O'

Eyak O-k'in't' (act) 'to scratch O'

Tlingit O-ka-x'u't'~ (act) 'to scratch O with a sharp pointed object': 7akax'ú:t' 'is scratching it'

(79) PAET ~*k'waRsh ~'leg, thigh'

Eyak -k'ahsh 'foot, lower leg, paw'; prefixed form k'ush-dE- 'id.'

Tlingit -x'a'sh 'cheek of buttock'

2.4. PAET ~*k(w) (?) > Tlingit sh;

(a) PAE *k > PA *ky, Eyak k, and

(b) PAE *kw > PA *tshr, Eyak k (found in only one important but phonologically problematic extended cognate set)

(80) a. PAE full vowel

PAE ~*O-l-ku:n'd 'to seize, grab O'

Eyak O-l-ku:N'd (event) 'to seize, grab O': sElku:N'd-iNh 'seized it'

PA *O-î-l-kyû:d (î-active) 'to seize, grab O': *yî:lkyû:d 'seized it'

b. PAE reduced vowel

PAE ~*kwEnd (motion) 'to move the hand suddenly, quickly'

Eyak kiNhd (motion) 'to make a quick motion with the hand'

PA *tshrEd (motion) 'to move the hand suddenly, quickly'

Tlingit O-sha'd~ (motion) 'to handle O with a sudden or quick motion of the hand(s); to seize, grab O': gashá'd 'grab it!'

Tlingit O-l-sha'd~ (Ga-event) 'to catch O (e.g. something thrown); to catch, capture O': Gałshá'd 'catch it!'

Tlingit O-l-sha'd~ (position) 'to hold O': 7ałshád 'is holding it'

This seems to be the only case where the Tlingit onset is palatalized, as if from PAET *ky, whereas Athabaskan-Eyak has the reflex of *k in the full-vowel stem and of *kw in the reduced-vowel stem. The Tlingit palatalized onset is all the more mysterious in that neither Tlingit nor Athabaskan-Eyak shows any trace of a front vowel that might have triggered the palatalization of the onset in Tlingit.

3.0. CONCLUSION

With this paper we take a stride into the realm where the question of Na-Dene as a genetic grouping is settled in favor of AET, and it becomes possible to posit actual reconstructed forms in PAET, however tentative and/or inexact these reconstructions may be. The discovery of the AET palatal series gives us a secure frame for the obstruents. However, other important processes in the history of AET remain to be described. I will briefly outline these here.

I have already published a description of the development of nasal codas in Athabaskan-Eyak (Leer 2008a). A couple of examples (81, 82) will suffice to illustrate these developments. After a reduced vowel, sonorant codas become devoiced in Eyak, evolving to aspiration after the vowel, which is usually nasalized if the PAE coda was a nasal sonorant. In Athabaskan, on the other hand, nasals were simply deleted after a reduced vowel and before an occlusive coda.

(81) PAE *lEnd 'smoke' > Pre-Eyak *lanhd > Eyak lanhd 'smoke'
Pre-PA *lEnd > PA *lEd 'smoke'

(82) PAE *linq'-iy 'one' > Pre-Eyak *linhq'-iyh > Eyak linhg-ih 'one'
Pre-PA *lEnq'-iy > PA *lAq'-Ey 'one'

Note that when a coda sonorant gives rise to an aspirated vowel before an originally glottalized obstruent in Eyak, the latter loses its glottalization; Eyak does not allow glottalized codas after aspirated vowels within the root. This constraint thus explains why *q' > Eyak G in example (82) and similar examples.

Since the discovery of the stigmatic system of Tongass Tlingit (Leer 1978) (short V, long V; glottalized V', and fading V') and its evolution into tone systems elsewhere, the similarity of the Eyak stigmatic system (reduced V, aspirated Vh, glottalized V', long V; long glottalized V:') immediately raised the question of correlation between the Eyak aspirated vowels Vh and the Tongass Tlingit fading vowel V'. Failing to find statistically relevant correlations, however, the question has languished until the discovery that the Eyak aspirated vowel by and large reflects a pre-Eyak sonorant following the vowel. We will probably find a similar source for the Tongass fading stigma. The main point is that although similar, these stigmata develop independently in Eyak and Tlingit. Independent evolution of similar structures is a recurring theme in AET. We have noted the independent evolution of *dl*, *tl*, and *dz*; a similar example is the late secondary evolution of rounded consonants in Tlingit as opposed to AE, which retained the original rounded consonants.

Another important area of AET phonology concerns *w and the rounded obstruents. In Tlingit, as noted earlier and illustrated in cognate sets (50) and (75), the vowel *u* may arise by assimilation of the original vowel to a rounded onset or coda. In AE, on the other hand, we find that original PAET *i: > *e: after the rounded onset. These and other AET phonological developments involving rounding deserve fuller treatment elsewhere.

Many other interesting puzzles remain to be explored: the split between glottalized stops and glottalized fricatives in Tlingit; affective feature alternation in Tlingit, Eyak, and Athabascan; the evolution of the classifier in AET; and classifier plus stem onset contractions in Tlingit, to name but a few. Some of these topics are presented in draft form in Leer 2008b. My hope is that the groundwork laid here will provide a secure basis for further exploration of AET phonology and morphology.

ACKNOWLEDGMENTS

This paper is the first fruits of the distillation of some 33 years of research on Athabascan-Eyak-Tlingit (AET). I wish here to thank some of the people who have helped me most along the way. First is Dr. Walter Soboleff, who inspired my boyish love of the Tlingit language with his Saturday night summaries of the week's news in Tlingit on the local radio station in the 1950s. He also accompanied me to the defense of my dissertation at the University of Chicago in 1990, and along the way has given freely of his time in the cause of documenting the Tlingit language. Profound thanks are also due to the late Nelly Willard, my first Tlingit teacher, and to the recently departed John Marks and to Richard and Nora Dauenhauer and their entire family, who have so abundantly enriched the documentation of the Tlingit language and culture, and to countless other Tlingit mentors, especially the late Mrs. Elizabeth Nyman of Atlin. To my perennial friend, mentor, and debate partner, Michael E. Krauss, who found me in Anchorage, enticed me to Fairbanks, and took on the role of nurturing and supporting my work on comparative Athabascan and AET, I say thanks; it has been a wonderful ride all the way. Thanks also to my other perennial friends: James Kari, especially for his patience and encouragement with this project, John Ritter, and Sharon Hargus, whose diligent proofreading and helpful feedback have proven invaluable. I wish also to express also my gratitude to my friend and mentor, Eric Hamp, for the inspiration he has provided over the years, and his insistence on the importance of rigorous accounting for comparative data down to the minutest details.

Special thanks are due to my friend Ed Vajda, who provided the inspiration for this paper. Some years ago at an Athabascan conference at Moricetown, B.C., Ed laid out his Dene-Yeniseian hypothesis and asked if I thought it was worth pursuing. I thought it was, and I still do. In 2006 Ed Vajda and Bernard Comrie organized the first Na-Dene Workshop in Leipzig at the Max Planck Institute for Evolutionary Anthropology. I then decided that it was time to write up the most important of my findings on AET. In order to test any long-range hypothesis of linguistic relationship, especially one as promising as Dene-Yeniseian, it is vital to provide researchers access to reliable data and a description of the oldest reconstructable form of Na-Dene, namely AET. Since time was short, I just threw everything and the

kitchen sink into a rough draft called "Recent Advances in AET Comparison" (Leer 2008a). Kari subsequently organized the February 2008 symposium concerning the DY hypothesis, where I summarized my Leipzig presentation. When Kari asked me to contribute to this volume, I first demurred, since this paper deals strictly with AET and has nothing to say about the DY hypothesis, and for this reason would normally be published elsewhere. But out of respect for Vajda and the other conference participants, I relented and agreed to publish a truncated version of the earlier paper focused on one key finding: the AET palatal series.

To make a long story short, Dr. Vajda is the main reason this paper with these first reconstructions of AET is seeing the light of day here. I am deeply gratified that some of my findings have been useful for his progress in expanding and sharpening his vision of the DY hypothesis. This is precisely the desired result—the sort of serendipitous matching and meshing that makes the hypothesis more and more interesting. Yet I must admit to having reservations about the hypothesis. Fundamental hurdles such as the apparent mismatch between Yeniseian and AET first and second person pronominals give me pause. For the time being, then, I consider it my task first and foremost to publish my findings on AET, and will leave it to others to gauge the viability of Dene-Yeniseian.

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THE CONCEPT OF GEOLINGUISTIC CONSERVATISM IN NA-DENE PREHISTORY

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1.0. INTRODUCTION¹

These papers are the first forum on the implications of the Dene-Yeniseian language stock, and in this article I attempt to engage scholars and intellectuals of varying backgrounds and in several disciplines. I have had the privilege of working with many of the foremost Alaska Athabascan intellectuals for over 35 years. On many occasions I have heard elders state that Athabascan people have lived in Alaska for more than 10,000 years. Perhaps few of these Athabascan elders would be able to parse the technical articles in this collection, but we are certain that many of their descendents will be among the first readers of these articles. At the February 2008 Dene-Yeniseic Symposium the implications of the geography of the proposed Dene-Yeniseian language stock were one topic of discussion. Johanna Nichols commented that the amount of evidence for Dene-Yeniseian is too large to have the antiquity of more than 10,000 years that is implied for an eastward land-based movement of the Na-Dene branch through Beringia. Nichols added that perhaps unless it can be shown that the Na-Dene and Yeniseian languages have changed at a much slower rate than most languages do.

In this paper I assess the geography, relationships, and estimates of time depth for the tightly-knit Athabascan language family vs. the Eyak and Tlingit branches of Na-Dene. I offer two proposals. I present in section 2 the Athabascan Geolinguistic Conservatism Hypothesis (AGCH) that integrates several concepts in support of the antiquity of common Dene-Yeniseian (at 14,000 years ago or older). I suggest that linguistic closeness within Athabascan languages derives from a combination of typological and morphological properties of the Athabascan verb, as well as a multifaceted Athabascan territorial ethos that is embedded in the core elements of Athabascan geographic naming. Strong congruencies in numerous rare and highly marked Athabascan grammatical traits that are in distant languages of the family certainly demand further attention for their implications for theories of language change. Also interconnected is the Athabascan territorial ethos that has promoted functional travel, networking with other Athabascans, and strategic land use. Thus, I suggest that the Athabascan family is a very interesting example of a cohesive and homogenous language family that tends to resist change. In section 3 I offer a model of eight stages of Na-Dene moves and expansions within North America that span a time frame of 12,000 to 13,000 years. In section 4 I offer a range of support for both proposals from linguistic, archaeological, ethnological, and human biological sources. I am suggesting that the interval for Proto-Na-Dene was fairly short; that Eyak and Tlingit branched from Proto-Athabascan at early dates (prior to 10,000 to 8000 BP); and there has been long-term presence of Athabascan peoples in the Northwest portion of the extended Northern Athabascan language area. The

¹ I would like to thank several persons who have made comments on earlier drafts of this paper: Adeline Kari, Johanna Nichols, Siri Tuttle, Ben Potter, Michael Fortescue, Edward Vajda, William Workman, Sharon Hargus, and Willem de Reuse.

strong signal that is being assembled for an ancient Dene-Yeniseian language stock is due to a combination of reasons: linguistic, environmental, resource procurement, and population movements.

2.0. THE ATHABASCAN GEOLINGUISTIC CONSERVATISM HYPOTHESIS

Refer back to Map D, the reference map for the North American distributions of the Na-Dene languages and the surrounding unrelated languages Haida, Tsimshianic, Eskimo-Aleut, and Algonkian. The Athabascan language family, with an estimated collective territory at the times of early historic contact at over 1,500,000 square miles, is the largest area of occupation for an indigenous language family in North America. Map D lists 53 named Athabascan languages. There were even two incipient Athabascan language groups during the 15th to 18th centuries in the Northern Plains and in Northern Mexico (see footnote 6). Some named groups can be treated as dialects of an adjacent group, especially in Pacific Coast Athabascan. A key question in formulating hypotheses about earlier common Dene-Yeniseian is how the divergent Eyak and Tlingit languages, as binary branches of the Na-Dene language stock, are related to the Athabascan languages, which are closely knit, homogeneous but geographically so very widespread.

Three striking themes about the Na-Dene language stock are: (1) the unique typological profile of the languages, which feature elaborate verb complexes with strings of rigidly ordered prefixes before a verb root that is also followed by a set of suffixes; (2) the sheer size of the Athabascan language area, with most languages having shared boundaries with other members; and (3) the homogeneity within Athabascan. Fortescue (1998:214) generalizes about the large Athabascan family: "It has often been said that Athabascan languages are exceptionally conservative, spreading their influence wherever they have come in contact with other languages but not being affected much in turn by them (although their speakers have been highly adaptable culturally . . .). The family is certainly highly distinctive and more homogenous than say Salishan." This latter theme—Athabascan linguistic homogeneity and how it can be characterized and evaluated—offers many avenues for future research into the prehistory that is prompted by Dene-Yeniseian. A concept of geolinguistic conservatism (or perhaps geolinguistic endurance) should be part of the discussion on Dene-Yeniseian.²

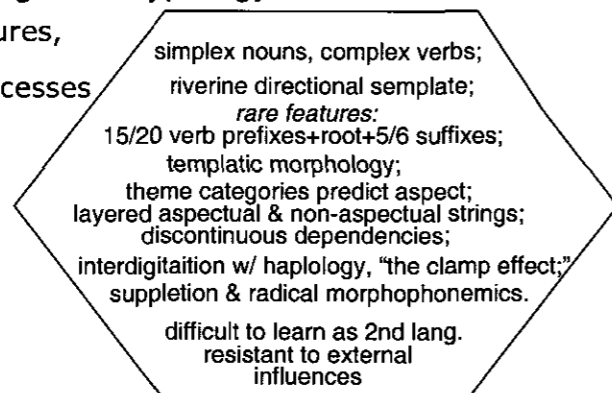
I have researched and assembled place names in 10 of the 11 Alaska Athabascan languages. Since I first documented place names in the early 1970s with Dena'ina speakers Shem Pete and Peter Kalifornsky, I have been making many of the same generalizations about recurrent patterns in Athabascan geographic names. I have noted the patterning of multilingual Athabascan place naming: across language boundaries the same place names are used for mutually known features. Athabascan place names are analyzable and functional and facilitate foot or boat travel. Athabascan speakers use names with considerable care. The place names in the oldest historic sources are usually known by expert speakers. Elaborate riverine directional terms pervade both the naming and the use of the landscape (Kari 1989a, Kari and Fall 2003, Kari 2008, Kari 2010). Among all documented Athabascan languages, the geographic particularism that is reflected in sets of place names is fascinating and obviously has played a central role in how Athabascan came to be the largest Native language family in territory in North America.

In Figure 1 a synopsis of the Athabascan Geolinguistic Conservatism Hypothesis is presented in flowchart format. The AGCH suggests that linguistic closeness within Athabascan languages derives from the rare morphological properties of the Athabascan verb as well as the multifaceted Athabascan territorial ethos that is embedded in the core elements of geographic naming. These geographic elements have promoted

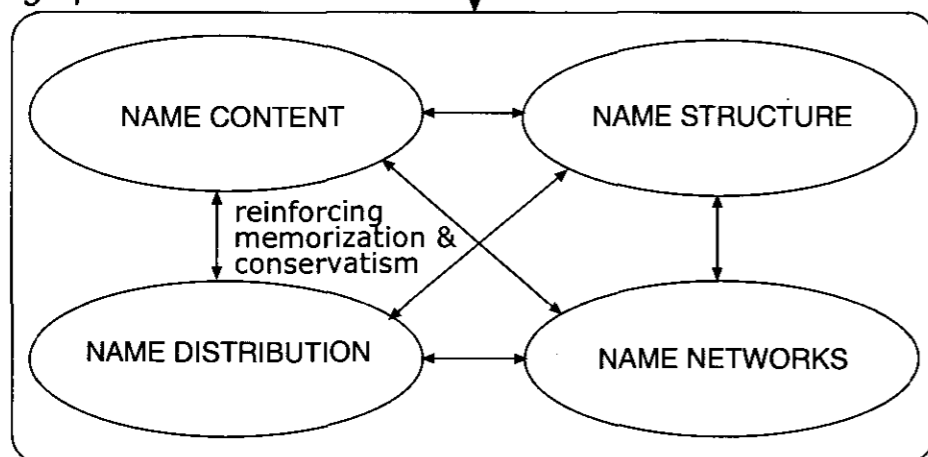
² The term *geolinguistic* seems to convey the generalizations I convey with this hypothesis—that both the language structure and a territorial ethos have contributed to the conservatism—the retention of lexemes, grammatical affixes, and highly complex word formation processes. As far as I know, "geolinguistic" has not been employed in historical-comparative linguistic terminology. I use "geolinguistic" in a distinctly different way than the term "geolinguistics" as defined in glossaries of linguistic terms, which appears to be a cover term for various subfields of dialectology. "We call geolinguistics the study of all the variation linked to the social and geographical roots of language users" (Ducrot and Todorov 1979:57).

**Level 1.
Athabascan Linguistic Typology**

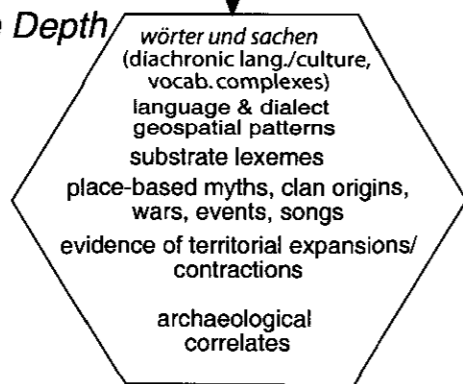
homogenous features,
high cognation of
morphemes & processes
in all Ath. langs.



**Level 2.
Geographic Elements**



**Level 3.
Indicators of Time Depth**



functional travel, strategic land use, networking, multilingualism, and high levels of intelligibility with other Athabascans. As was noted by Sapir (1921:209), "The Athabaskan languages of America are spoken by peoples that have astonishingly varied cultural contacts, yet nowhere do we find that an Athabaskan dialect has borrowed at all freely from a neighboring language." No Athabaskan language has been impacted by convergence with a neighboring language. It is highly unusual for an Athabaskan language to have an inflectable verb that has been borrowed.³ Many dimensions of Athabaskan linguistic homogeneity can be identified, however, most of these features remain unstudied in the comparative Athabaskan literature.

As I developed and analyzed several geographic name corpora in several languages: Dena'ina (Kari and Fall 2003), Upper Tanana (Kari 1997) and most extensively Ahtna (Kari 2008, 2010), I noted four conspicuous elements—shown in Level 2 of Figure 1—that can explain a great deal about the structure, the content, the distribution, and the transmission of Ahtna geography. The interconnected arrows indicate that these elements are self-reinforcing: *name content*, *name structure*, *name distribution*, and *name networks*. These geographic elements promote the strong similarities and the memorization of place names in distant Athabaskan languages. *Level 1* represents various unique linguistic features of the typological profile of Athabaskan languages that seem to have an overarching contribution to linguistic conservatism within the family. Shown in *Level 3* with a graphic of a scale are what I call *Indicators of Time Depth*.

The AGCH prompts a reevaluation of the positions of Tlingit, Eyak, and Athabaskan. An early entry into North America by Na-Dene is quite plausible if not probable (Potter, this volume). The assumption that the Athabaskan language family based on linguistic evidence has shallow time depth or is a young family has not been well argued and is fraught with contradictions; see section 4.1. The well-researched sites in the Tanana River Valley are about 13,800 cal BP (section 4.6; Potter, this volume). In a core area of Central Alaska, Athabaskan bands have been well established for at least 6000 years and it is possible they were there 11,000 to 14,000 years ago. The earliest Athabascans may not be directly ancestral to speakers of contemporary languages such as Upper Tanana and Gwich'in, but it seems likely that there was an early Athabaskan presence in much of Central Alaska.

2.1. Level 1: Athabascan linguistic typology

The Athabaskan languages have a grammatical dichotomy between simplex nouns and postpositions and complex verbs. Athabaskan geographic names contain a mixture of these elements. There is extensive use of basic nouns and postpositions, many of which are monosyllabic and are not subject to much derivation and modification. In sharp contrast, Athabaskan verb structure consists of 15 or more rigidly ordered prefix positions or zones of similar prefixes before a root, followed by sets of suffixes. Athabaskan is often cited as being among the most elaborate prefixing languages in the world. Keren Rice's (2000) impressive survey of morpheme order in the Athabaskan verb complex is the most complete source on similarities and variations in the verb complexes in various Athabaskan languages.

The processes whereby words are formed in Athabaskan languages have received some study but the most complete accounts have attracted little discussion. I have outlined a multidimensional stacking templatic model of Athabaskan verb formation (Kari 1989b, 1990:38-59, 1992) that can account for complex layerings of discontinuous dependencies, while recognizing both the well-motivated and arbitrary areas of the linear template of the verb complex. Fortescue (1992) has offered a similar model of word formation in Koyukon from a functional perspective. My most extensive discussions of the Athabaskan verb and of word formation have drawn upon Ahtna examples (Kari 1979, 1989b, 1992). Some key concepts are:

- (a) The lexicon integrates all roots, all grammatical morphemes, and loan words. Derivational strings are also treated as lexical units.
- (b) The verb complex must be fully specified for the affix inventory and prefix and suffix ordering. Affix positions and zones of sub-positions can be specified. Dialects of Athabaskan languages can have distinct verb complexes.

³ A rare exception is Upper Tanana *lisüü* 'money' (from French *l'argent*), becoming an inflectable verb: *hoksüü* 'I am a spendthrift, throwing money around'.

FIGURE 1. Athabascan geolinguistic conservation hypothesis

(c) Verb themes and verb theme categories play a key role. Theme categories are diagnostic of the simplest (zero) derivations and the primary aspects. Extended derivation can be partially accounted for by identifying theme formation strings.

Verb themes can have hundreds of derived forms that are altered by layered, interdigitated derivations. The derivations usually are in "strings," most of which involve discontinuous dependent morphemes. These derivations apply in layers and affect predicate formation (transitivity, valence), and can also alter the path and ground of verbs ('into water', 'upward'). There is widespread haplology and numerous radical morphophonemic alternations with special internal boundary conditions.

Kari (1992) is the most complete presentation of this model of *stacking templatic word formation*. In a conservative language like Ahtna, there are prodigious verb paradigms for inflection and virtually every prefix, suffix and layered derivation in verbs can be discerned. To make this model work in a fully mechanical way, the inventory and order for all affixes in Ahtna and Koyukon must be specified. For Ahtna this is 27 ordered sub-positions in 11 prefix positions or zones and 4 suffix positions after the verb root (Kari 1990:41-42, 1992). The Koyukon verb complex is treated with 31 ordered subpositions in 11 positions or zones and 5 suffix positions after the verb root (Jetté and Jones 2000:758-759). There is a large battery of aspects and super-aspects (momentaneous, conclusive, customary, semelfactive, and many others), and inflection (tense and negativity). Aspects are marked by arrays of stem suffixes and verb stem sets. Koyukon has the richest array of aspects with 16 aspects and 5 super-aspects (Jetté and Jones 2000).

This model of word formation has been applied to several Athabascan lexicons (Ahtna, Koyukon, Dena'ina, Lower Tanana). The model can handle the various levels of abstraction, from the specification of forms for underlying verb derivatives, to the most productive sets of derivatives for a theme, to the array of verb themes that may be associated with one root. The batteries of discontinuous strings have status as lexical entries, and these can be specified for their "look ahead" features as in Ahtna (Kari 1990:635-649) and Koyukon (Jetté and Jones 2000:767-776). Furthermore, and a point of emphasis for the AGCH, the main features of verb derivation and the processes of word formation are quite homogenous, as we can see in the best-researched Athabascan languages such as Carrier, Navajo, Slave, Ahtna, and Koyukon.

The Athabascan languages are strikingly homogenous in the degree to which there is retention of many of the most highly marked features of Athabascan grammar. Some features that are highly similar are:

- (a) Strong similarities in the verb prefix complexes, in prefix ordering and prefix/suffix inventories. Rice (2000) is an excellent demonstration of the details of verb prefix complexes in all of the better documented languages.
- (b) The most common ones, strings of 3, 4, and 5 prefixes plus sets of 4 suffixes, are ubiquitous; i.e., are in all of the languages. See Table 3 and discussion. Comparisons of batteries of aspectual derivational strings in various languages have not been researched extensively.
- (c) The core of the aspect system when properly investigated, is retained in all the languages. Navajo has an average aspect system, whereas Koyukon has elaborated the system considerably.
- (d) There is strong retention of the most common verb themes, the identical underlying forms with classifier, thematic prefixes, and theme categorization. This can be seen in dictionaries of Ahtna (Kari 1990), Koyukon (Jetté and Jones 2000), and Navajo (Young and Morgan 1992).
- (e) For whatever reasons, many of the most suppletive sets of verb stems are retained in virtually all Athabascan languages that have been well documented. Krauss and Leer (1981:143) note that Koyukon, Gwich'in, Navajo, Chipewyan, and Hupa have retained the highly suppletive array of verb stems with the commonly used proverbs, transitive 'do so to O, affect O' and intransitive, 'occur, happen'. The facts surrounding this suppletive set are discussed by Leer (1987:128 and Young and Morgan 1992:682. Consider in Table 1 these two verb themes in Ahtna and Navajo Kari

1990:426-427, Young and Morgan 1992:682).⁴

TABLE 1. Extreme verb stem suppletion in Ahtna and Navajo

Ahtna					
	<i>imperfective</i>	<i>perfective</i>	<i>inceptive</i>	<i>future</i>	<i>customary</i>
'do to O' O+O+laak	laex	laak	le'	liiŋ	ɬ'iis
'occur, happen' O/D+yaak	naex	dyaak	ne'	niiŋ	t'iis

Navajo					
	<i>imperfective</i>	<i>perfective</i>	<i>inceptive</i>	<i>future</i>	<i>customary</i>
'do to O' á#O+O+laa	lééh	laa	le'	liíŋ	ɬ'ijh
'occur, happen' O/D+dzaa	nééh	dzaa	ne'	nííŋ	t'ijh

How can these languages manage to retain such a disparate set of stem alternations? Why has no Athabascan language managed to level out and simply these alternations? (Furthermore, two cognate roots in Eyak *leh* and Tlingit *nii* do not participate in suppletive stem sets; Jeff Leer, p.c.)

The Athabascan *riverine directional system* is the organizational intersection between the geography, the lexicon, and the grammar. The directionals consist of nine roots, have a prefix-root+suffix structure (like the verb complex in miniature) and typically occur in over 60 forms (Leer 1989, Kari 1990:633, 2008:22-24, 2010:129-40). The directionals are highly congruent throughout the contiguous Northern Athabascan languages and are also in Pacific Coast Athabascan (Leer 1989). The riverine directionals in Athabascan languages are what Levinson (2003:90) terms an "intermediate absolute landmark" frame of reference. Most Athabascan language groups (other than Apachean) are oriented to the major rivers, and these rivers can have totally different geographic axes, such as the Copper River (which flows in an arc north to south) vs. the Tanana River (which flows east to west). The riverine element in Ahtna and Northern Athabascan is so pervasive that it constitutes an organizing "semplate" or semantic template in terms of the semantic theory of Levinson and Burenhult (2009). Riverine elements in Northern Athabascan are found in lexical sets in several form classes such as the outer (disjunct) verb prefixes, the noun lexicon (e.g. parts of houses, or boats and especially place names), and postpositions. Directionals are used in indoor and outdoor settings. In narratives about travel the cross-cutting riverine semplate is intricately orchestrated in directionals, many nouns, place names, verbal derivations for space and path, and so forth. The overriding influence of the directionals is researchable through the study of texts as well as through studies of gesture and body language. See Kari 2010 for discussion of Ahtna directionals and their use in narratives about foot travel.

There are also striking sociolinguistic patterns among Athabascans. Since Athabascan is very difficult to learn as a second language, there has been asymmetrical bilingualism between Athabascans and non-

⁴ In the Ahtna practical orthography *c* :: *k*, *c* ' :: *k'*, and *g* :: *gg* are the front vs. back velar series. As in most other Athabascan practical orthographies, Ahtna plain stops are written as *d*, *dl*, *dz*, *g*, *gg*, but when in word-final position these are written as *t*, *tl*, *ts*, *c*, *k*. Underlyingly these remain *d*, *dl*, *dz*, *g*, *gg*. The *e*- is the schwa vowel which has the quality of [ɛ] epsilon. Other symbols, for glottalized consonants and affricates are typical of other Athabascan practical orthographies such as Navajo; see Appendix A. Other conventions are + affix boundary and # for disjunct boundary. The symbol ° is for a sonorant closed root that zeroes out the perfective suffix *n* (Kari 1979).

Athabaskan neighbors (such as Eskimo groups in Alaska and Canada, and Puebloan groups in the Southwest). As Sapir noted (1921:209) Athabaskan languages tend not to borrow from other languages either in vocabulary or grammar, nor do they influence neighboring languages much. Recently Campbell and Poser (2008:322) cited Navajo and Apache as examples of languages that have resided in an area (in this region, say, for 500 to 700 years) with little affects of contact from neighbors. Since it has been nearly 90 years since Sapir's generalization and there are several very well-documented Athabaskan languages, this Athabaskan propensity to resist borrowings and not be significantly influenced by neighboring languages is even more noteworthy.

Thus Level 1 in Figure 1 makes reference to a suite of factors: the Athabaskan verb has a rare and complicated structure, elaborate patterns of word formation, and many of the more complex features are retained throughout the family. Various sociolinguistic patterns seem to be interconnected as well. Also, as I discuss in section 4.3, it appears that while many specific elements of the verb complexes of Eyak and Tlingit are cognate with Athabaskan, several of the most elaborate and distinctive processes in the Athabaskan verb are not shared with Eyak or Tlingit.

2.2. Level 2: Introduction to geographic elements

Athabaskan speakers or academics who have basic knowledge of vocabulary and grammar for one Athabaskan language often remark about similarities in place names in other Athabaskan languages. I have long pondered whether these tendencies to name geographic features in similar ways in different environmental settings may signal important trends in the prehistory of the Athabaskan language family.

The initial idea for the AGCH was Level 2 of Figure 1: arrows are drawn between the components—(1) name content, (2) name structure, (3) name distribution, and (4) name networks—to emphasize that these are mutually reinforcing elements that tend to be similar in neighboring as well as distant Athabaskan languages. Functionality, redundancy and the memorization of geographic knowledge are paramount, especially as we examine specific features of these four elements. I refer here to Kari (2008), a drainage-based place names corpus of 2208 Ahtna place names. The Ahtna language in Southcentral Alaska is an area of about 35,000 square miles. The core elements of Ahtna geographic knowledge are summarized in the introduction to Kari 2008. While we cannot delve into the details, we typically find very similar place names in other Athabaskan languages even when in very different environmental settings such as Hupa in Northern California or Navajo in the Southwest. Often we find that place names from those languages can be adjusted to have Ahtna pronunciations and are then meaningful or plausible as Ahtna place names.

2.2.1. Name content

Athabaskan place names serve as signs. Name content is nearly always analyzable and informative. For the Ahtna place names it is striking that 89% of the names are fully analyzable and 98% are partially to fully analyzable. Kari 2008:13–14 has details on these calculations. This degree of purity is typical of Athabaskan languages and is a dramatic demonstration of the Athabaskan territorial ethos. The place names in Ahtna and in the better documented Athabaskan languages use high frequency simplex nouns (e.g. water, rock, soil, colors, common flora) and common postpositions such as 'among', 'under', 'upon', 'within', etc. Several extension verb themes that have virtually identical underlying structures in distinct languages are very common in Ahtna place name lists. Generally speaking, the content of the place names refers to natural history or to traditional activities. In Ahtna the names that are opaque and unanalyzable still conform to canonical structure. There are very few non-Athabaskan elements in large corpora of place names other than a few loan word place names. This strong aversion to using other languages or preexisting place names is indicative of a very robust territorial ethos. Johanna Nichols (p.c.) has suggested that on a worldwide basis this degree of purity in Athabaskan onomastics is highly unusual.

2.2.2. Name structure

There is regular structure to Athabaskan place names. The more common patterns are binomials: (a) noun or verb+generic term; (b) noun plus postposition, and (c) nominalized verbs that feature a group of common extension verb themes such as 'current flows', 'linear object extends', or the common stative-classificatory verbs. Also there is a clear *generative geography capacity* to the Ahtna geographic system (Kari 2008:24–26). A specific noun or verb can combine with one or two basic generic nouns to form bi- or trinomial place names. Ahtna employs 22 generic terms for various water, land, and cultural features, and these recurrent terms provide a highly informative classification to the landscape. These sets or clusters of names can be easily memorized. The riverine directional system also promotes memorization and the generative capacity of Northern Athabaskan geography. The directionals are flexible and three-dimensional and can be applied at any level of scale. When we state that the structure in Athabaskan geographical names is similar, we mean that it is *similar in all of its complexity*.

It is instructive to illustrate the derivational potential of the Ahtna verb with some place names that contain the same root grouped into verb themes. Table 2 has three groups of Ahtna place names with the root 'aa⁰ glossed as 'linear extends', a root that is common in all of the Athabaskan languages and that is prevalent in place names. As noted earlier in section 2.1, the analysis of verb themes is the key organizing principle in Athabaskan lexicography. We detect the distinct structures of the verb themes by their commonalities and differences (grouped here in a, b, and c). Table 1 illustrates many recurrent themes in word formation and name content and structure that make geographic names in Athabaskan so fascinating. Every underlying prefix and suffix can be isolated and shown in underlying form. Strong speakers of Ahtna can offer fine-grained translations for batches of place names, such as in Table 2.⁵

TABLE 2. Some Ahtna place names with 'aa⁰ 'linear extends'

N= noun, # = disjunct boundary, + affix boundary, ñ = perfect = underlying sonorant; G = gender (noun classification), M/A = mode-aspect, CL classifier

place name	morphological analysis	meaning
(a) G+O+'aa ⁰ 'linear feature extends' (Kari 1990:75)		
Tsic Beni'aayi	tsic b+e#n+ñ+0+'aa ⁰ +yi N 3s-against-M/A-ROOT-NOM	'the one caribou fence extends against'
Ndez'aay Bene'	n#d+z+0+'aa ⁰ +yi ben+e' DIST-G-M/A-CL-ROOT-NOM N-POSS	'lake of one that is jagged'
Nay'dini'aa Na'	na#c'+d+n+ñ+0+'aa ⁰ na' across-INDF-G-M/A-CL-ROOT N	'stream of the one that extends across (log bridge)'
Nic'akuni'aa Na'	ni+c'a#ko+n+ñ+0+'aa ⁰ na' from shore-AREA-M/A-CL-ROOT N	'stream of area extending out from shore'
Ts'abaeli Nic'ani'aa	ts'abaeli ni+c'a#n+ñ+0+'aa ⁰ N from shore-AREA-M/A-CL-ROOT	'spruce extends out from shore'
Tahwghi'aayi	ta#ko+gh+ñ+0+'aa ⁰ +yi into water-AREA-M/A-CL-ROOT-NOM	'area that extends into water'
Ts'inahwnet'aaden	ts'i+na#ko+n+e+D+'aa ⁰ +den from-back-AREA-G-M/A-CL-ROOT-NOM	'place of area-object extends back out'

Table 2 continued on following page

⁵ As far as I know, Ahtna is the only Athabaskan language that has a verb theme that corresponds to: ð+'aa⁰ 'water moves, flows slowly'. It is common and seems to contrast in force with the ubiquitous Athabaskan verb theme 0+*len* 'current flows'. Dena'ina or Koyukon have many place names that are similar or exactly like those in a and b, but none like those in c.

Table 2 continued

(b) inc#G+0+'aa° 'incorporate extends' (Kari 1990:76)

Ketsitne'aay	ko+e+tsi#d+n+e+0+'aa°+yi AREA-against-head-G-M/A-CL-ROOT-NOM	'head that is against a place'
Tats'esghi'aaden	ta+ts'es#gh+ñ+0+'aa°+den into water-rock-M/A-CL-ROOT-NOM	'place of rock extending into water'
Tats'abaelghi'aaden	ta+ts'abael#gh+ñ+0+'aa°+den into water-spruce-M/A-CL-ROOT-NOM	'place of spruce extending into water'
Nay'dliisdini'aaden	na+c'edliis#d+n+ñ+0+'aa°+den across-song-G-M/A-CL-ROOT-NOM	'place where song extends across'
Natsede'aayi	na+tse#d+e+0+'aa°+yi across-head-G-M/A-CL-ROOT-NOM	'rock that extends across'

(c) l+'aa° 'water moves, flows slowly' (Kari 1990:77)

Deyighil'aaden	de+yii#gh+ñ+l+'aa°+den inside-M/A-CL-ROOT-NOM	'place current flows inside'
Tak'a's Naghil'aa Na'	tak'a's na#gh+ñ+l+'aa° na' s.w. down-M/A-CL-ROOT NOM	'stream where spring water flows down'
Tak'a's Kaghil'aade	tak'a's ka#gh+ñ+l+'aa°+den s.w. up-M/A-CL-ROOT-NOM	'place where spring water flows up'
Natu' Kaghil'aaden	natu' ka#gh+ñ+l+'aa°+den salt w. up-M/A-CL-ROOT-NOM	'place where salt water flows up'
Nilt'anta'il'aaden	nilt+t'a+ta#n+ñ+l+'aa°+den backforth-water-M/A-CL-ROOT-NOM	'place where water sloshes back and forth'
Unatadil'aayi	b+na+ta#i+l+'aa°+yi 3rd-back-water-M/A-CL-ROOT-NOM	'one that water moves up to it'
Unatade'l'aade	b+na+ta#d+z+l+'aa°+den 3rd-back-water-M/A-CL-ROOT-NOM	'place that water flows back to it'

In Ahtna geographic names nominalized verbs often have suffixes (y)i 'the one that' or den 'at specific place'. Multiple string-like derivations apply that give the verbs paths such as 'into the water', 'off from shore', 'downward'. The Ahtna derivational strings, such as *na# n neu.* 'across' or as *ta# gh neu.* 'into water' are each sets of three prefixes and a group of four possible suffixes. Five or six types of inflectional patterns for tense/mode/negativity occur in the CV(C) syllable that precedes the final stem syllable. These TAM inflectional patterns in Ahtna and other Athabascan languages also are discontinuous strings that are realized with many radical morphophonemic alternations in the pre-stem syllable and in the final stem. When these various strings apply to a verb theme, they interdigitate between or merge with (via morphological hapology) preceding layers of morphemes.

Distinct Athabascan languages may differ in details of affix inventory and affix ordering (i.e. have different variations of a verb complex template). They have different degrees of elaboration for inflection and aspect, and they have different batteries of predicates. Nevertheless, the similarities and overall homogeneity of both the abstract verb themes and the processes that generate derived verbs in distant languages are very striking. We repeatedly find elaborate features that are similar in Athabascan distant languages such as suppletive alternations in the pre-stem syllables, suppletive ablaut in verb stems, and "look ahead" strings with three, four, and more morphemes.

Stacking templatic word formation can track both the horizontal dimension of the morpheme inventory of the verb complex and the vertical dimension of the layered derivations. For the most derivationally complex place name in Table 2, *Nilt'anta'il'aaden* 'place where water flows back and forth', we can specify

nine levels from the abstract root 'aa° to the surface verb form. The derivation assumes there is the fully specified template of all Ahtna affix positions. We can distinguish the separate layered derivations although ordering among some of these still is uncertain. In Table 3 we can look at a couple of the mid-level layered derivations for this one verb.

TABLE 3. Partial stacking templatic derivation for *Nilt'anta'il'aaden*

	input	output (bold italics = added material)
1	ta 'water' + theme l+'aa° →	ta#l+'aa°
2	nilt+t'a+ta#n+ñ+D+(stem)+suffixes 'back & forth' →	<i>nilt+t'a+ta#n+ñ+D+l+'aa°+n</i>
3	n 'distributive' →	nilt+t'a+ta#n+ñ+D+l+'aa°+n

The most striking event is a six-part *aspectual derivational string* that means 'back and forth': *nilt+t'a#(n+ñ)+D+suffixes*. This string of prefixes and suffixes interdigitates with preceding the layers of morphemes. Such strings apply like multipronged clamps that grip several pieces of wood.

Significantly for the AGCH, many strings that apply to verb themes are often the same in other Athabascan languages. We have coined a Ahtna term for this process of clamping, as suggested by Markle Pete, *u'el tay'tesdedzi*, which is the Ahtna term for a 'clamp, vice', literally 'with it something is twisted closed' (Kari and Tuttle 2009). The "clamp-effect" is a key factor. If we can pinpoint just why it is that all Athabascan language have elaborate string-like derivations that are often identical or highly similar, we can offer *u'el tay'tesdedzi* or the "clamp-effect" as a key factor.

2.2.3. Name distribution

To date there have been no studies of the distributional properties of a large set of place names in any Athabascan language, and many interesting issues in Athabascan place name distribution remain unexplored. For expedience, in the GIS mapping of 2,208 Ahtna place names, all places have been treated as points. However, if the names are carefully plotted as points versus lines or as large and small polygons, we can show how remarkably comprehensive the naming system is for the Ahtna language area. For Ahtna there is thorough coverage of features along the main stem of the Copper River. There are about 450 named features along the main stem of the Copper River—streams, stream mouths, clearings and flats, and nearby bluffs and hills. Almost every sizable side stream of the Copper River has a documented Ahtna place name. All the larger tributaries have full nomenclature for their side streams. Streams have a single name for the whole drainage, while main features such as lakes usually group with the main name. The order of these tributaries is the key to the organization of the geography, and the riverine directionals provide have an overriding frame of reference. Also areas of hindrance that are difficult to access have fewer names, such as sections of the Copper River on the Wrangell Mountains side of the Copper River.

In Alaska Athabascan a principle of economy and memorizability works against the excessive proliferation of names. The Ahtna do not have high density, large-scale naming for rocks, sloughs, or specific eddies on the Copper River. Another issue in name density and distribution is the coarse-grained effect of the names whereby a name for a hill or ridge is an informal polygon of the outer contours of the feature. Also in Alaska we find combinations of riverine directionals with basic place names that result in pairs and triplets of named features, such as 'downriver swift current bluff' and 'upriver swift current bluff' that can be easily recognized. Also in Alaska several Athabascan languages can compound a stream name with the 'uplands' term (in Ahtna this is *ngge'*) which forms a name for an entire drainage system.

In the diverse environments of the extended Athabascan language area, there are various factors that impact name distribution, a topic that some day may receive in-depth research. The Pacific Coast

Athabaskan languages are 14 small language or dialect areas on a north-south axis (see Map D) that average only 650 square miles. The PCA languages or dialects maintained these small territories along sections of larger streams with shared boundaries perhaps on one or two borders with other Athabaskan languages (Baumhoff 1958). In contrast, the seven Apachean languages are in a general north-south axis in the high desert and plains of the Southwest averaging over 22,000 square miles.⁶

Note that the riverine directional organizing basis found in Northern and Pacific Coast Athabaskan is absent in Apachean. Instead Apachean appears to have an oronymic organizing principle, whereby intervisible mountains are paramount. Both the Pacific Coast and Apachean migrations were of a magnitude and significance that remain underappreciated in North American ethnography and are important for understanding Na-Dene as well as Dene-Yeniseian prehistory.

2.2.4. Name networks

Northern Athabaskan geography has been a web of interconnected place names networks. The Athabaskan territorial ethos is best seen through what I call the *networking effect*. Athabascans have maintained boundaries with neighbors who also speak Athabaskan languages. Even though only several Northern Athabaskan place name inventories are documented in fairly full detail, the larger regional network patterns can be inferred for many aboriginal Athabaskan territories. With these shared Athabaskan language boundaries came bi- and multilingualism and intermarriage between Athabaskan speakers. Generally we can refer to overlap in Athabaskan band territories and land use, ties of kinship and clan, and fairly amicable histories. The able-bodied Athabaskan men would serve as emissaries between settlement areas, and would know two and three band territories. In the first half of the 20th century the most-well-traveled Ahtna speakers ranged into six other language areas where they would know some of the geographic names: Dena'ina, Lower Tanana, Middle Tanana, Tanacross, and Upper Tanana as well as Eyak (Kari 2008:5-6).

There are numerous concrete indications that extensive regional networking and travel prowess are reflected in features of Athabaskan geographic names:

- (a) The same set of place names extends across Northern Athabaskan language boundaries (with only rare but interesting exceptions). Speakers who are not acquainted share the same name for mutually known features. This is constantly reinforced by the place name corpora; i.e., names with similar structural, semantic and distributional properties are interlinked from language area to language area across huge and continuous bioregions (Kari 1989).
- (b) There are numerous ways we can demonstrate that Athabaskan trail systems in Interior Alaska are ancient and that interregional travel was routine throughout Athabaskan prehistory. The redundancy in the use of Ahtna place names in narratives, field notes, early historic maps, and Ahtna-drawn sketch maps is demonstrated throughout Kari 2010. The reiteration of sequences of place names strongly confirms specific trails and routes and the overt functionality of the memorized names. Various early historic maps offer insights into Athabaskan territoriality and travel abilities. The Wrangell map of 1839 (eastern portion, discussed in Kari and Fall 2003:85-87) has about 20 recognizable place names and several northerly trail routes that emanate from Upper Cook Inlet for distances of 300 or more miles. This one map demonstrates the scale at which Athabaskan experts knew Southcentral Alaska in the early 19th century.
- (c) The most impressive demonstration of Athabaskan travel skills and geographic knowledge is in the genre that I refer to as "elite travel narratives" (Kari 1986, Kari 2004, Kari and Fall 2003, Kari 2010). In the most detailed travel narratives we see the orchestration of all of the spatial and orientational features of these languages. Numerous issues deserve further study: the ways in which salient places are selected and ordered; the use of riverine directionals before and after a place name to triangulate to locations in relation to the named place; and the use of features of

⁶ Some scholars have even suggested that as of the 15th century a continuous, thinly populated Southern Athabaskan territory could have been as large or larger than that of the historic Northern Athabascans (Forbes 1960:xii-xiii).

verbal morphology along with other spatial markers in relation to the place names.

- (d) There are several *region-marking traits* in the geographic names. Most notable are the seven mutually exclusive hydronyms in Northern Athabaskan, Figure 2 (from Kari 1996a).

The *hydronymic districts* are the most overt and salient pattern communicated by Northern Athabaskan geographic naming. For example, in eight western Alaska Athabaskan languages (including Ahtna) the term **na'* is used in streams, whereas in four eastern Alaska Athabaskan languages **niq'ə* (lit. 'on the upstream') is used. Several languages even have primary versus secondary hydronyms which have a "street vs. avenue" effect on stream names. In Lower Tanana and Tanacross we find that **na'* vs. **niq'ə* are used in reversed ways (Kari 1996a). In Gwich'in there is a primary hydronym, *njik*, and a secondary hydronym, *k'oo*. Although we need to expand upon the hydronymic data, this general distribution of Northern Athabaskan hydronyms is valid. Among Pacific Coast Athabaskan languages there are also indications of some alternations in hydronyms (Baumhoff 1958). The hydronymic districts predate language differentiation, they are overt markers of both the structure and conservatism of the place names. It is plausible and arguable that many names descend from the initial phases of Athabaskan radiations and expansions. Patterned hydronyms are just one of several signs of the dynamic of Athabaskan territoriality that has reinforced linguistic conservatism. Both Vajda and Nichols (p.c.) have remarked that this patterning in the Northern Athabaskan hydronyms is unusual and significant.

An important research project would be to lay out in detail the recurrent patterns in the toponymic systems of Yeniseian, Tlingit, Eyak, and Athabaskan. Werner (2002:35-67) is a compilation of the Yeniseian place names corpus. Vajda notes (p.c.) that there is little or no verbal derivation in Yeniseian place names. Also Vajda (this volume) has proposed that Athabaskan **de's̄r* (-*de'ž'e*) 'river, sandbar', the dominant stream term in six east Canadian languages, may be cognate with the reconstructed Yeniseian hydronym **jē:s* 'river'. This implies that **de's̄r* served as a vanguard hydronym when Athabaskan people first occupied the Canadian Shield.

- (e) In addition to the striking patterns for 'stream', other patterns in Athabaskan toponymic generic terms deserve closer examination. There is a conspicuous patterning in generic terms for 'mountain' in Central and Southcentral Alaska (Kari 1996b). The Ahtna term *dghelaayi* 'mountain' is shared with Dena'ina, Upper Kuskokwim, and Deg Hit'an. This has been innovated to mean 'mountain' from the Tanana Valley Athabaskan place name for 'Alaska Range'. Proto-Athabaskan **yas* 'ridge' vs. **dzəl* 'mountain' also may have significant patterning in some Northern Athabaskan languages. Also in Northern Athabaskan there is a marked contrast in the use of PA 'water' when it appears in hydronyms. In five western Canadian languages (such as Southern Tutchone and Kaska) **-tu* means 'river', but in six Canadian languages east of the Mackenzie River (such as Hare, Slave, Dogrib, and Chipewyan) **-tu* applies to large lakes. On the other hand, 21 other Northern Athabaskan languages use **wən* for 'lake'.
- (f) Comparison of inventories in Alaska Athabaskan place name networks indicate some other salient and recurrent features. Overt boundary-marking place names have been detected in Alaska (in Koyukon, Dena'ina, Ahtna, Lower Tanana, Tanacross). There are some ensembles of similar names for features, a topic that deserves more attention. Frequently we find several names that are related with a lithic, vegetation, or anatomical theme. Also there is some place name duplication that sometimes is overt and distinctive. For example, in the Ahtna language area Klutina Lake and Tazlina Lake are two large L-shaped glacial lakes with streams that drain from the west into the Copper River. It is salient and noticeable that the first sizable north-side bluffs on each river have the same name (*Ts'inahwnet'aaden* 'linear object that protrudes back out'), and that the two ridges at the south-side right-angled points on both lakes have the same name (*Tahwghi'aayi* 'one that extends into water') (Kari 2010:49).
- (g) The social ties between Athabaskan language groups can be traced through kinship systems, clan

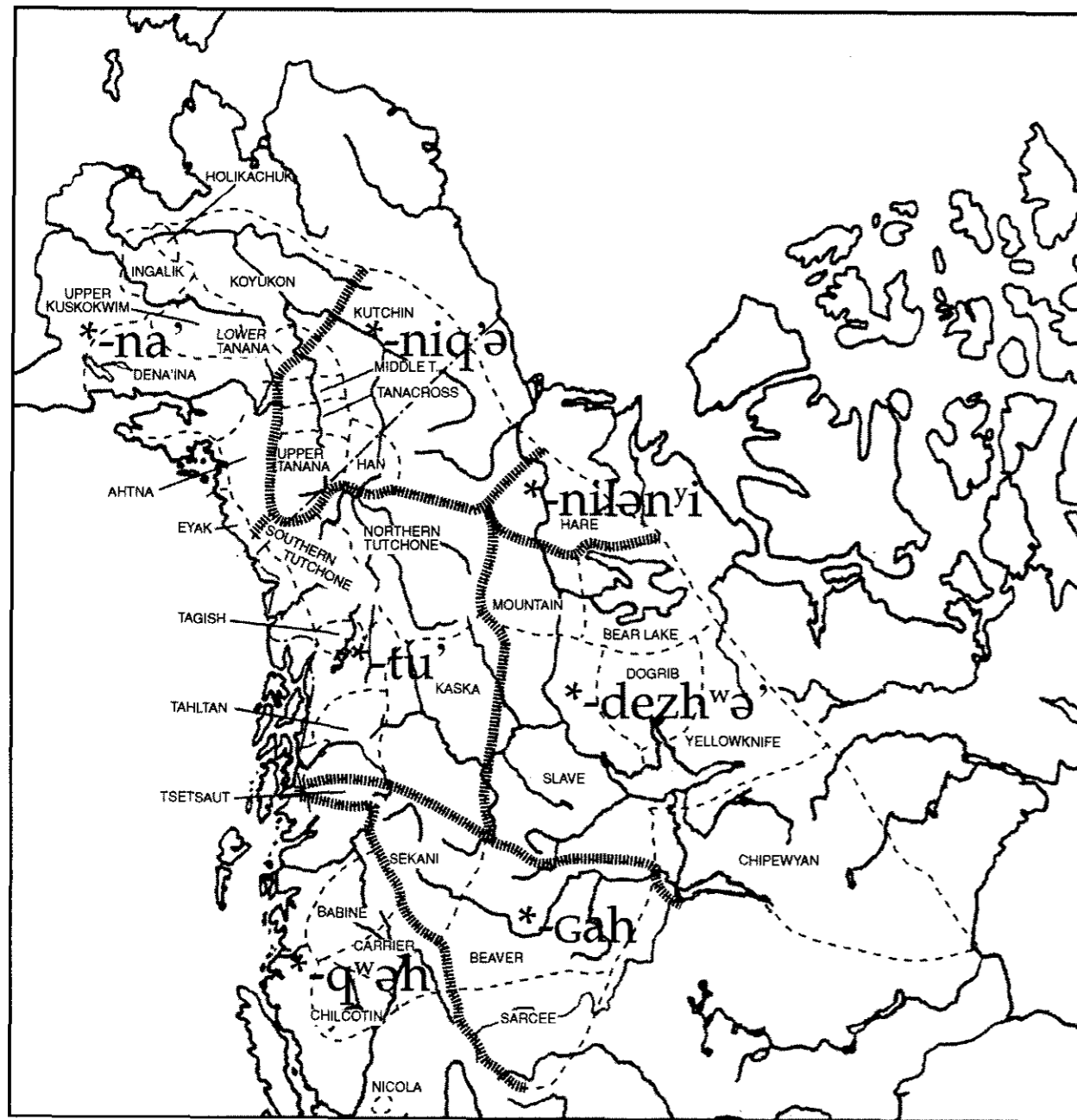


FIGURE 2. Northern Athabascan hydronymic districts (from Kari 1996a)

systems, as well as ethnonymy. Athabascan ethnonyms have served as a small-scale or macro-regional index system, and they depict a general awareness of distant Athabascan territories in aboriginal times. There is repetition among some ethnonyms as seen in glosses such as 'the dwellers of the lakes', 'the headwaters people,' 'the downriver people', 'the dwellers of the uplands', 'the mountain people.'

2.2.5 Level 3, Indicators of time-depth

In Figure 1 at Level 3 with an image of a scale are *Indicators of Time-Depth*. In the tradition of Sapir 1916, ("Time Perspective in Aboriginal American Culture: A Study in Method,") and Sapir 1936 (his classic demonstration of the northern origin of the Navajo), when there is extensive lexical, narrative, and

ethnographic documentation for a group of Athabascan languages, it is possible to compile pieces of evidence about a language's approximate time-depth of occupation in a general region. Diebold's 1987 article is a survey of numerous "linguistic ways to prehistory." His synopsis (ibid:34-38) of the venerable *Wörter-und-Sachen* ('words and things') methods developed by mainly German linguists in the 19th century reminds us of the potential of diachronic lexical semantics in hypotheses about linguistic prehistory. In the future for Na-Dene as well as Dene-Yeniesian *Wörter-und-Sachen* methods will be relevant; see sections 4.2 and 4.7.

The methods set forth by Sapir (ibid.) and by Diebold (ibid.) are perfectly valid in the 21st century. However, these methods require large amounts of in-depth language-based information. The assembly of factual information can include: (a) dialect differentiation; (b) well-researched lexicons; vocabulary complexes can be analyzed for areal patterns for seriation in meanings for material culture, biota, or social structure; (c) the presence of *isolated archaisms*, words apparently in no other Athabascan languages; (d) the prevalence of words that may be a substrate from one or more extinct languages; (e) geographic loci of clan-origin narratives or accounts of altercations or battles; or (f) religious or sacred associations with the landscape. The evaluation of such sources may indicate that a language group has annexed or taken over territory from other peoples or has expanded and/or contracted over time. It is also possible to engage in discussions about the archaeological records for regions of Athabascan territory. The archaeological research fostered by Jack Ives (2003) is opening up multifaceted lines of evidence about the phases and the likely locations of Athabascan emigration from the Northern Plains to the Southwest.

For some language areas, like Dena'ina or Ahtna, for which there is good coverage on Athabascan vocabulary and a large body of narratives, strong inferences can be drawn about relative time-depth, directionality of movement, or of non-movement. It is possible to model a sequence of movements of the Dena'ina into the Cook Inlet Basin from west of the southern Alaska Range (Kari 1988, 1996b; Kari and Fall 2003:10-14, 144-48; Boraas 2007). Cook Inlet Basin is likely the only part of Alaska where Athabascans have expanded into lands that were previously occupied by non-Athabascans. However, for the Copper River Basin and the Ahtna language area a strong case can be made for long-term occupation without the presence of any other non-Athabascans (Kari and Tuttle 2005).

To recapitulate, with the Athabascan Geolinguistic Conservatism Hypothesis I suggest that a distinctive Athabascan territorial ethos is reflected in the similar, functional, and memorable place names networks that we find in diverse parts of the large Athabascan language area. The more extensive lists of Athabascan place names are striking for their analyzability and purity. A common set of geographic names extends across language boundaries. Hydronym patterns indicate that geographic names have been used to mark large regions. There are many ideological similarities among Athabascans such as an aversion to using place names from other languages. These geographical traits are intertwined with some rare and highly marked features of Athabascan language structure that have contributed a strong "drift" (Sapir 1921) toward the retention of many fine details of the Athabascan verb complex and processes of word formation. The root and affix inventories in the well-documented languages are quite similar. *U'el tay'tesdedzi* (the clamp-effect), indeed may be a key factor in the promotion of homogeneity in Athabascan verbal grammar. Many multimorphemic discontinuous strings are shared throughout the family. Interconnected as well are Athabascan sociolinguistic phenomena such as asymmetrical bilingualism and the lack of convergence impacts of neighboring languages. The recognition that the Athabascan languages are extraordinarily homogenous and have had long-term occupancy in large portions of Northern Athabascan are prerequisite for interpreting the strong signal that is being assembled for an ancient Dene-Yeniseian language stock.

3.0. A MODEL OF NA-DENE MOVES AND EXPANSIONS IN NORTH AMERICA

In this section I offer some new proposals about the branchings and expansions of Na-Dene in North America, the main point being that the clear-cut binary branchings within Na-Dene, that of Eyak and Tlingit, occurred closer to 10,000 years ago rather than frequently cited but unsubstantiated estimated dates of 3500 to 4500 years.

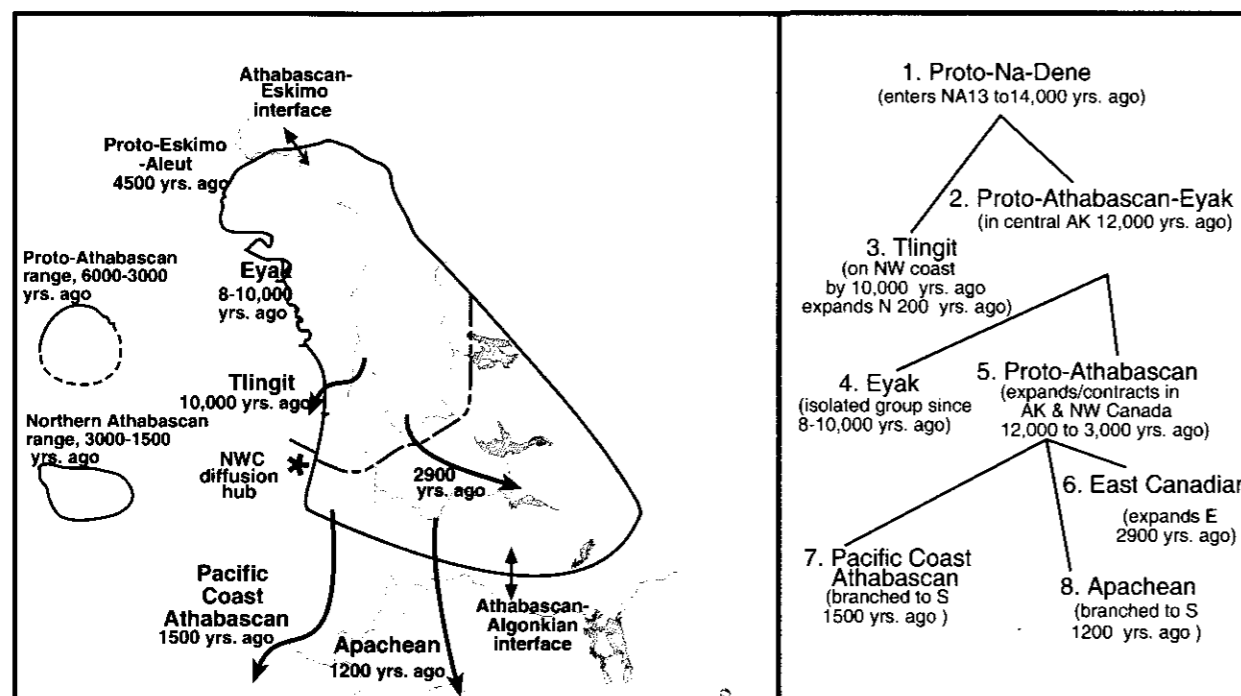


FIGURE 3. A model of Na-Dene moves and expansions

The 1998 book by Michael Fortescue, *Language Relations across Bering Strait: Reappraising the Archaeological and Linguistic Evidence*, was a major influence on Edward Vajda's work on the Dene-Yeniseian hypothesis. As noted in Kari and Potter (this volume), in a brief aside Fortescue (ibid.:214-217) assembled a concise summary of similarities between Ket and Na-Dene, but he did not present Ket or Na-Dene data, nor does he claim there is an historical relationship. Fortescue also presents several maps that model early Eurasian and Beringian language movements and distributions. He places pre-Na-Dene in western Beringia at 13,000 years ago and in Central Alaska at 11,000 years ago (ibid.:253 and Map 2). With the evidence being assembled for the Dene-Yeniseian language stock, the time frame presented in Fortescue 1998 for the entry of Na-Dene into Beringia and Alaska seems plausible and has served as input for Figure 3.

Figure 3 postulates the North American moves, branchings and expansions of Tlingit, Eyak, and Athabaskan in a chronology of eight stages that spans 13,000 or more years. The first event is hedged at 13,000 to 14,000 BP: the position and earliest entry for Proto-Na-Dene, although it is not possible to be very precise about this time or location. At this early time interval numerous other language groups would also be entering the New World. The routes and dates of the last two branchings—(7) Pacific Coast Athabaskan and (8) Apachean—are known fairly certainly. The sixth stage, an eastward expansion toward Hudson Bay of Canadian Athabaskan languages such as Chipewyan and Dogrib, is reflected archaeologically in the Taltleilei Tradition and is datable at about 2900 cal BP (Gordon 1996; Potter, this volume).

I am suggesting that the period for Proto-Na-Dene at Level 1 was brief; perhaps for a millennium or so. The distinctions between Levels 2, 3, and 4 are uncontroversial as a relative chronology, given the degree of linguistic separation between Athabaskan, Eyak, and Tlingit, and I am not making associations with these early levels and specific archaeological traditions. I suggest that by 12,000 years ago at Level 2 there was an established early Athabaskan presence in Central Alaska that also included the Eyak. This stage in writings by Krauss and Leer has been called PAE, or Proto-Athabaskan-Eyak, which is represented by a larger core of reconstructable vocabulary and grammatical features than there is for PND. This model postulates that Tlingit had a relatively brief period of association with common Na-Dene. Perhaps early Tlingit was never in Central Alaska. Tlingit has long been part of the ancient multilingual diffusion corridor (symbolized as *) along the Northwest Coast, first being based to the south of its contemporary language area in a rainy coastal

estuary environment. As for the Eyak, at Level 4 I suggest that a small Eyak band became separated from the rest of Athabascans at an early date. It is possible that Eyak's separation had something to do with one of the breaching of glacial Lake Ahtna. Recently, the first major breaching of Lake Ahtna has been dated "at 10,740 cal BP date at Canyon Lake on the upper Gulkana River, a major event that led to significant lowering of Lake Ahtna (if not complete recession from the Copper Basin" (Shimer p.c., 2009; Jangala 2004).

At Level 5 in Figure 3 with a red solid/dashed perimeter, I suggest beginning 12,000 years ago and continuing until through 3000 years ago there was a large and continuous Proto-Athabaskan occupation from Northwest Alaska to portions of western Canada. By 6000 years Proto-Athabaskan becomes identifiable in the Northern Archaic Tradition. Prior to the arrival of Eskimo populations about 4500 years ago, the extended Proto-Athabaskan language area had many cycles of centrifugal and centripetal expansion and contraction and with small band populations and little or no competition for resources from non-Athabascans. As of about 4500 years ago there has been a slow upstream territorial expansion by Eskimo groups in western Alaska. In terms of the AGCH from Proto-Athabaskan through to the huge Northern Athabaskan language area (32 languages with 1,400,000 square miles of territory at contact) reflects very-long-term range expansion in the Subarctic of Northwest North America.

Figure 3 encompasses additional information:

- the most likely area of the onset of gene-transmission between Na-Dene and Eskimo peoples (Scott and O'Rourke, this volume) since about 4500 years ago.
- The area where Proto-Eskimo-Aleut is posited to have been located at about 4500 years (Dumond and Bland 1995; Potter, this volume).
- The Northwest Coast diffusion hub where some unknown and extinct languages were present. The area of Southeast Alaska and British Columbia) seems to be the interface of Athabascans and Northwest Coast groups reflected in what Turner calls the Greater Northwest Coast dentition pattern (see section 4.4; Turner 1985; Scott and Turner 2008).
- The interface area between Northern Athabaskan and Algonkian must be a long-term point of contact due to the spread of the Albumin-Naskapi blood allele (see section 4.5; Scott and Turner 2008; Scott and O'Rourke, this volume; and Berezkin, this volume).

4.0. NA-DENE PREHISTORY IN VIEW OF DENE-YENISEIAN

In this section I review a few sources that offer support for both the AGCH and the model of Na-Dene expansion that I have outlined. There are some rather unique and perhaps unprecedented reasons that such strong signals of this transcontinental Dene-Yeniseian language stock have survived.

The coastal Na-Dene languages Eyak and Tlingit are at the north end of the Northwest Coast linguistic area. The major hub for diffusions in this linguistic area has been at the interface of Tlingit, Haida, and the Tsimshianic languages. Sherzer (1976) and Campbell (1997:335-37) have summaries of the Northwest Coast linguistic area. Krauss and Leer (1981:155-166) present some of the phonological and lexical convergences for Tlingit, Haida, and Tsimshianic that took place around this hub. Haida is now abundantly well documented (Enrico 2005). And in spite of Enrico's 2004 extensive presentation of possible cognates or diffusions between Haida and Tlingit-Eyak-Athabaskan, Vajda and others still find no evidence that connects Haida genetically with Dene-Yeniseian.

I suggest that Tlingit and Eyak are old binary branchings from Proto-Na-Dene. Perhaps both branchings took place by 10,000 BP. Whenever and however Tlingit first reached the hub area at the British Columbia/Alaska border, it must have been a participant in what archaeologists Ames and Maschner (1999:67) refer to as the Paleomarine Tradition or Northwest Coast Archaic Period (12,500-6400 BP). Contributing prehistoric themes along the Northwest Coast diffusion corridor are social stratification, boat travel between population centers, very limited foot travel, warfare, and enslavement.

Leer (1991) has offered insights into the linguistically complex history of Tlingit contacts with unknown

extinct languages, and with surrounding Athabascans, and within Tlingit dialects. However, the homogeneity within modern Tlingit dialects does not translate into support for Leer's highly improbable estimated dates for the consolidation of Tlingit on the Northwest Coast, at only 500-1000 years BP (Leer 1991:83).

The contiguous Northern Athabaskan language area is over 1.4 million square miles with 32 languages in the early historic period, 25 of which are north of 60 degrees latitude. All but one share boundaries in several directions with one or more Athabaskan languages. In terms of the AGCH and my suggested model of ND prehistory, Northern Athabaskan has continuously occupied large portions of this area. In support of this I have offered several ethnogeographic, linguistic, archaeological, sociolinguistic, and human biological arguments.

4.1. Some consequences of the Na-Dene "short chronology model"

The often cited estimated "dates of divergence for Na-Dene languages" are 2400 ±500 years for Athabaskan, and 3400 ±500 years between Athabaskan and Eyak and about 4500 years for Tlingit (Krauss 1973:950, 1980:11-13). Krauss has stated that such dates were based both on the Swadesh lexico-statistical formula and on comparisons with other datable but unspecified historical language splits. Concerning lexicostatistics and Na-Dene, Krauss 1973:950-953 is a thorough review of the sources from the 1950s and 1960s. Krauss (1973:50) states, "Eyak is in fact lexico-statistically equidistant to all Athapaskan, e.g. both Navajo and Ahtna (the closest Athapaskan neighbor to Eyak) show virtually the same percentage, 33%, with Eyak on the Swadesh-Hoijer 100-word list." Note that Kaufman and Golla (2000) have estimated (without any explanation) a time depth for Na-Dene at 3500 years, a 23% reduction in the time frame!

The most often cited statement on a location for proto-Na-Dene is, "It seems most likely that the Proto-Athapaskan homeland was in eastern interior Alaska, the upper drainage of the Yukon River, and northern British Columbia, or some part of this area," (Krauss and Golla 1981:68). In over 40 years no specific ancillary support (linguistic or otherwise) has been offered for this Proto-Na-Dene homeland area other than this area is (sort of) near the area of great divergence in the branches. Frequently this chronology has been invoked by some archaeologists and linguists to deny any associations between contemporary Athabaskan peoples and archaeological sites or traditions.⁷ The short Na-Dene chronology and the claim that Athabascans had some sudden emergence and expansion in the past 2500 years implies that unknown language groups were present for over 10,000 years in the archaeological records for Northwest North America. Potter (this volume) notes that for the general area of eastern Alaska-Yukon-northern British Columbia between 4500 and 1000 years ago there is no archaeological evidence of population expansion or replacement.

Lacking support beyond relativistic comparisons, the model of the rapid expansion of Proto-Athabaskan from a small district into the large Northern Athabaskan language area is chimerical. The degrees of separation between both grammar and lexicon within Na-Dene have never been discussed or evaluated. There is much greater time depth for the separations of the two branches Eyak and Tlingit from Athabaskan. The Dene-Yeniseian language stock renders the short Na-Dene chronology obsolete.

4.2. Lexical research and Dene-Yeniseian

In recent papers my colleague at the Alaska Native Language Center, Jeff Leer (2008, this volume), cites an important source for the study of Na-Dene and Athabaskan prehistory, his Comparative Athabaskan Lexicon (CAL, Leer 1996). The CAL has developed for over 20 years as a handwritten draft of over 3000 pages. The CAL is organized alphabetically by Athabaskan roots and morphemes, it cites comparative data, and it has some reconstructions. Previously Leer published Athabaskan reconstructions in an appendix in Young and Morgan 1987:264-301 and *in passim* in Young and Morgan 1992. The individual CAL entries are very

⁷ Popular publications abound with statements such as one in a 1990 photo essay in *National Geographic* by Reynolds and Doll (1990:44): "Athapaskan Indians like Ellen have trapped, fished and hunted in north-central Alaska for at least 2,500 years." The implication is that it is not possible nor prudent for a scholar to trace Athabaskan languages and peoples any further back in time.

interesting and invite further inquiry. We anticipate that the field of Athabaskan and Na-Dene prehistory will benefit greatly once there is a readership for Leer's CAL.

At this time figures on the cognate relationships within Na-Dene cannot be readily calculated. In general, when we leaf through Leer's CAL, for a given root or morpheme there often is an array of lexical cognates within Athabaskan and only a few matches for Eyak or Tlingit. The CAL does not track other cognation patterns for stems that are only in Eyak or are only in Tlingit or that are only between Eyak-Tlingit. We can also cite the lexical purity of the better documented Northern Athabaskan languages (see also section 4.4). In contrast, both Tlingit and Eyak have large amounts of non-sourced lexicon. However, these noncognate morphemes have not been part of Leer's CAL project. The non-sourced lexical strata reflect and confirm long periods of time that Eyak and Tlingit have spent on the Northwest Coast diffusion corridor. With the demonstration of Dene-Yeniseian these non-cognate potential substrata roots and morphemes for both Eyak and Tlingit take on added importance.

Proto-Athabaskan was a remarkably uniform proto-language and will be reflected in perhaps 1,300 to 1,500 cognate roots and morphemes and many reconstructable lexemes. Many pairs of Alaska Athabaskan languages share 80-90% of their root-morpheme inventories (e.g. Koyukon and Lower Tanana or Ahtna and Dena'ina). In 1965 Krauss estimated that about 40% of the Eyak noun and verb stems had Athabaskan cognates. Krauss's unpublished 1981 Eyak Morpheme List contains 1189 morphemes. My rough count turned up 397 Eyak morphemes with Athabaskan cognates or 33% of the total. However, percentage estimates based on matches of roots and morpheme headwords can exaggerate the degree of closeness between Eyak and Athabaskan. There are intriguing items in Eyak that are not in Athabaskan or Tlingit (for instance, 45 of 75 Eyak broken stems listed in Krauss and Leer 1981:93-97). When I researched fish lexicon scattered throughout the Eyak Dictionary (Krauss 1970), I listed over 80 terms for fish, shellfish, and fish anatomy. The bulk of the Eyak fish lexicon is marine oriented, and most of those fish and shellfish are not found in any Athabaskan language other than Dena'ina. Also, the exact meanings of many of the Eyak fish and shellfish terms cannot be determined. Three fish anatomical terms are cognate between Athabaskan and Eyak: 'fish meat', 'roe', and 'scales.' There are about nine shared species with nearby Ahtna or with other Athabaskan languages (Kari 2002). Although numerous Eyak fish terms employ roots and morphemes that are cognate with items in Athabaskan, beyond the three mentioned anatomical terms I found no other cognate fish terms between Eyak and other Athabaskan languages.

Semantic reconstructions within Na-Dene remain at a nascent stage. Proto meanings for PA, PAE, or Na-Dene have never been critically evaluated. With the advent of Dene-Yeniseian, biogeographical issues will be an important subject for future research. Among the signature cognates for Dene-Yeniseian, two that are telling us something about the DY paleo-environment are the term for 'birch, birchbark'. Ket *quj* and Athabaskan **q'əx*; and Ket *tii* 'canoe' PY *tix* 'canoe, vessel' PA *tš'i-x'* 'birchbark canoe'. For peoples of the circum-Subarctic birch is the most economically important tree. Birch is not a prominent tree in the coastal Eyak and Tlingit language areas, and this term, **q'əx*, is not present in Eyak or Tlingit. A key point summarized by Vajda (this volume) is that of the more than 90 DY cognates assembled so far, much of the shared lexicon is between Yeniseian and Northern Athabaskan and reflects the subarctic boreal forest (or taiga) environment: biota, technology, and skill sets. (Note that such discussions of diachronic lexical semantics of trees, implements, and environments are 19th-century *Wörter-und-Sachen* techniques, Diebold 1987.)

4.3. Some grammatical questions for Dene-Yeniseian

Edward Vajda's current reconstruction of the proto-Yeniseian verb and his first thoughts about a common Dene-Yeniseian verb serve as fodder for cross-linguistic discussions about the historical development of prefixing verb complexes and templatic morphologies. Considering what Vajda has put together so far, the pieces of the Yeniseian verb that match most closely with Na-Dene are the inner verb prefixes: three qualifier prefixes, six TAM prefixes and suffixes, and three or four pronominal prefixes. The valence-changing and predicate forming classifier system is not in Yeniseian, though there are elements that may be precursors

to the ND system. Vajda's suggestion that the common DY instrumental suffix, **ł*, was the precursor to the *ł* classifier that forms causative and transitive predicates is promising. Also the Yeniseian verb has very few suffixes, but there are two Yeniseian prefixes that Vajda suggests may have become ND verb suffixes. One of the most spectacular shared archaisms in Dene-Yeniseian, found in only two languages, Kott and Eyak, is the 'action nominal derivation' (described in section 2.3, Vajda, this volume). This derivation is an intricate formula: **s+verb root+n*. This must reflect a long-standing Dene-Yeniseian propensity to employ discontinuous strings in the verb complex.

One basic question is whether the verb in Proto-Yeniseian was more like Proto-Na-Dene or more like Proto-Athabaskan-(Eyak). For the Ket verb complex, Vajda (2001, 2004) are the most extensive statements. If Tlingit separated very early and has had a long-term presence on the Northwest Coast, and if Eyak became separated from Athabaskan perhaps due to the breeching of Lake Ahtna, we can expect to find some major disjunctions in the linguistic evolution between the three branches of Na-Dene.

For future discussions for Na-Dene, we need to have explicit demonstrations of how Eyak and Tlingit verbal word formation and extended derivation compare and contrast with those of Athabaskan. While I do not have command of the subtleties of Eyak and Tlingit word formation, it appears that numerous Athabaskan grammatical and word formation processes are very distinct from those of in Eyak and Tlingit or from those of Ket. Outlined here are some elaborate processes that are highly complex and very uniform within the Athabaskan family, but that are absent or weakly present in Eyak or Tlingit. These disjunctions are further evidence of the long-term separation of Eyak and Tlingit from Athabaskan.

- (a) Athabaskan verb theme categories can be defined based upon the aspects found in their simplest derived forms (Kari 1979). The basic telic/non-telic dichotomy between the *s-* and *gh-* perfectives is robustly cognate in all Athabaskan languages. For example, the basic aspectual contrasts in the perfective forms of 'kill sg.' versus 'kill pl.', 'make sg.' versus 'make pl.', or in 'freeze' (with *s-*conclusive) vs. 'eat' (with *gh-*durative) are always maintained in Athabaskan languages. The most common telic and nontelic verb themes are everywhere among Athabaskan. Just how is telic/nontelic expressed in Yeniseian, Eyak, and Tlingit? Are there any cognate telic/non-telic pairs of verb themes for DY?
- (b) The elaborate classificatory verb system is highly similar in all Athabaskan languages. Typically there are four sets of about nine or ten verb themes: neuter intransitives 'be in position', active transitives 'handle type of object', active intransitives 'object drops, moves', and active transitives 'throw object'. These sets of classificatory verbs remain intact very consistently in all of the well-documented Athabaskan languages—another mark of conservatism within Athabaskan. This is another mark of conservatism within Athabaskan. On the other hand, Ket, Eyak, and Tlingit do not have sets of classificatory verbs, although they each have some verb roots that are cognate with those of Athabaskan. How did this robust set of classificatory verbs develop for Athabaskan, and what are the vestigial elements of this system in Tlingit, Eyak, and Yeniseian?
- (c) For comparative Dene-Yeniseian, it will be interesting to see how a copious model of word formation might apply across the four branches of the language stock. The left-most disjunct prefix section to the Athabaskan verb complex is lacking in Eyak and Tlingit. The disjunct prefixes play a major role in the derivational capacity and the "look ahead" choice of TAM prefixes in Athabaskan verbs. Eyak and Tlingit do not make as extensive use of affix strings with discontinuous dependencies as do the Athabaskan languages. Only the Athabaskan languages have elaborate aspectual distinctions based upon stem suffixation formulae. Also few two or three-part strings have been shown to be cognate among Tlingit, Eyak, and Athabaskan. One example of a cognate string is the two-part progressive string: Eyak *G +stem+ł* and the Athabaskan *gh+stem+ł*. This string is not used in Tlingit. When we assemble sizable lists of derivational strings, for example between Navajo, Ahtna and Koyukon, it is very noticeable that many of the more common three-, four-, and five-part strings are identical. They share perhaps a disjunct prefix, sometimes

a qualifier prefix plus an option of four sets of tense-mode prefixes, a set of verb suffixes that indicate aspect and the same meaning. This is perhaps the most striking measure of Athabaskan linguistic conservatism. How can a battery of such highly marked aspectual derivations strings, be so similar in distant members of the family? We have suggested that this extreme degree of conservatism has something to do with the most highly marked "event" in the derivational history of Athabaskan verbs, that we term *u'el tay'tesdedzi* "the clamp effect" (Kari and Tuttle 2009). This orchestration of layered discontinuous derivations is one of the most striking indicators of homogeneity with Athabaskan.

While numerous pieces of the verbs in Yeniseian and Na-Dene clearly are cognate, over a great span of time distinct verbal templates and word formation processes have evolved for all branches. Also for the hypothesis that Yeniseian represents a westward back-migration from Beringia or Alaska (Fortescue, this volume), the reconstructed Yeniseian verb would have devolved to have lost verb suffixes or the elaborate Na-Dene classifiers. However, it is more likely that the Proto-Yeniseian verb was a precursor to the Na-Dene verb.

4.4. Sociolinguistic issues within Na-Dene

For the Proto-Athabascans, the Subarctic of North America appears to have been a large "mega-patch" and cul-de-sac which the Northern Athabascans pioneered, expanded into, and retained with little competition for resources from non-Athabascans. We must recognize that Athabaskan society (both ancient and modern) has been very egalitarian. There are many indications of long-term Athabaskan isolation with widely dispersed bands of very small populations. There were no intensive contacts and convergences with other languages. There is evidence of levels of substrata vocabulary in only a few of the well-documented Northern Athabaskan languages (see footnote 9). If there were prior occupations by other languages in the Northern Subarctic, they must have been very early and transitory. The extended Northern Athabaskan territory may be one of the world's most impressive examples of a large array of languages sustaining long-term equilibrium (*sensu* Dixon 1996) as pedestrian foragers that kept expanding and contracting its extended range and without showing major effects of diffusion from neighbors.

These long-term shared language boundaries among the Northern Athabaskan languages resulted in regional kin networks, multilingualism, and a chain of dialect complexes with extensive cross-cutting wave-like diffusions of phonological features and lexicon. Many of the recognized Athabaskan language boundaries are arbitrary and oversimplify the patterns of intelligibility and diffusion (see Krauss 1973:943.) Recently Krauss (2005:118) wrote, "Athabaskan 'languages,' I repeat, are really parts of a dynamic complex of more or less constant interaction and influences." Population changes and range expansions and contractions have also contributed to homogeneity. There are no obvious clear-cut branched sub-groupings among Northern Athabaskan. The networking effect that is reflected in the Athabaskan geographic names is one measure of inter-Athabaskan diffusions and linguistic homogeneity.

Athabaskan linguistic homogeneity is best viewed as a byproduct of long-term equilibrium of Northern Athabaskan in the North American Subarctic. Therefore I suggest rather strongly that the region cannot be treated as a "spread zone" as if it were analogous to Central Eurasia. Thus I disagree with Nichols (1997:379): "Na-Dene, the northernmost stock save Eskimo-Aleut, has been interpreted as the next-to-last entrant to the Americas, but on the evidence of linguistic geography, Na-Dene is not the latest pre- Eskimo entrant but merely the most recent subarctic spread. In any event, a shallow family like Athabaskan with a wide range in a spread zone can be assumed to have replaced earlier languages." Nichols must have been assuming that with an estimated short chronology for Na-Dene of about 4500 years, Na-Dene would have had a late entry into the New World (say at 5000 to 6000 years ago).

The circum-Pacific Rim was a route for ancient colonizations in both coastal Asia and coastal North and South America. The primacy of the coastal route of entry in North America has been promoted by Nichols (1990, 1997, 1998) through her tracking of historical markers (linguistic features that are of low frequency

worldwide, that are persistent in families where they are found, and that are not readily diffused). Nichols's emphasis on the coastal route has independent corroboration in the archaeological summaries by Dixon (2001) and Goebel et al. (2008). The model of Na-Dene moves that I propose points to the dramatic contrasts in the historical linguistic profiles between the Northwest Coast and the Interior Subarctic: (a) there have been very few diffusions or convergences in the Interior Subarctic; and (b) there are widespread and long-term convergences and diffusions on the Northwest Coast where the Na-Dene branches Tlingit and Eyak have been situated among some early and unknown language groups. Furthermore on the Aleutian Islands, there was a major language amalgamation of an unknown prior population with Aleut. As much as 40% of the Aleut vocabulary is *not* correlatable with Eskimo vocabulary (Steven Jacobson, Michael Fortescue, p.c., 1998:217).⁸

Thus the Athabascan occupation of the North American Subarctic is unusual for its small populations, very large language areas, great foot travel prowess, egalitarianism, and degree of sociolinguistic isolation. This is reflected in asymmetrical bilingualism at boundary areas due to the complexity of learning an Athabascan language. There are very few traces of prior populations, and the languages have been unaffected by earlier occupations or by convergence with non-Athabascan neighbors, even though (as indicated in Figure 3) there had to have been intermarriage and gene-flow at several points on the perimeter of Northern Athabascan. In contiguous Northern Athabascan I am aware of only a few regional pockets with evidence of extinct substratal languages.⁹

4.5. Human biology and the early distribution of Northern Athabascan

Physical anthropology provides further evidence for the early range of Proto-Athabascan, as in Figure 3, Level 5. Three sub-regions of contiguous Northern Athabascan, symbolized as \Leftrightarrow in Figure 3, appear to be areas of long-term contact and gene flow between neighboring peoples. Scott and O'Rourke (this volume) explain how dentition, blood group, and genetics of Na-Dene and Eskimo-Aleut groups are closer to one another than either is to other North and South American native populations. The general region of western and northwestern Alaska was the earliest interface of Athabascan-Eskimo gene flow.

Scott and Turner (2008) summarize the physical anthropological intermediacy of Na-Dene with what they term the Greater Northwest Coast Indians. Turner (1985), Greenberg et al. (1986), and Scott and Turner (1997), using dentition analysis from dozens of populations and thousands of individuals, describe the intermediacy in dentition between interior Alaska Athabascans and what they term Greater Northwest Coast populations. Scott and Turner (1997:278) place special importance on the incidence of three-rooted lower first molars in Northwest North America.

Scott and Turner in a recent paper (2008:62–63) summarize distribution of the blood mutation called the Albumin-Naskapi allele. The highest frequencies of this well-researched blood allele are between Northern and Southern Athabascans and Algonkians. But Albumin-Naskapi is *virtually absent* in a large sample of Tlingit and Haida, and it is rare or absent in Eskimo and Aleut groups. This allele developed and spread as a mutation long ago ("more than 6,000 years ago," Richard Scott, p.c.). This blood group distribution also gives strong support for the early separation of Tlingit from the rest of Athabascan.

While I cannot absorb the details of the more ancient scenarios for human population movements

⁸ Fortescue (1998:217) writes: "Aleut would seem to represent an example—rare in language families that lack any great depth of historical documentation—of how languages may develop via abrupt 'saccades' or cascades of linked adjustments between periods of relatively slow change." Yuri Berezkin recently (2009) has discerned exotic substrata myth motifs shared between Aleut and Kodiak Island Alutiiq that must predate Eskimo occupations of Southwest Alaska.

⁹ About two millennia ago Dena'ina annexed Cook Inlet Basin, and bearers of the Kachemak archaeological tradition became extinct on the Kenai Peninsula about 1,500 years ago (Boraas 2007). The only linguistic trace is a tiny set of words (no more than five, Kari 2007). Babine-Witsuwit'en on upper Skeena River has a very interesting early contact history, suggesting that they have been even farther west toward the coast and may have absorbed or had contact with unknown languages as well as with expanding Gitksan people (Hargus 2007, Rigsby and Kari 1987).

in Scott and Turner 1997, there is a confluence of evidence that points toward a large contiguous Proto-Athabascan area with disparate points of contact and gene-flow. As depicted in Figure 3, the *most recent contact* at about 4500 years is in the Northwest Arctic/Sub-arctic interface with Eskimo groups. Much earlier contacts took place in the Western Subarctic with Northwest Coast groups and in the Eastern Subarctic with early Algonkian groups.¹⁰ To reiterate, this happened without major convergence impacts and changes on the proximate Athabascan languages. Richard Scott (p.c.) writes, "Athabascans are more than willing to share their genes and culture with adjacent groups while retaining their linguistic distinctness."

4.6. Some archaeological issues

Over the past four decades there have been impressive developments in the archaeological literature for Central Alaska. There are two concentrated site districts in the Tanana River Basin; the Nenana River area sites (Dry Creek, Walker Road and others); and to the east, the Shaw Creek sites (Broken Mammoth, Mead, and Swan Point) and then the Gerstle River Quarry and Little John sites. Potter (2008a:181) summarizes: "The archaeology of central Alaska, defined here as the Tanana, Susitna and Copper River basins, encompasses an important record. This region is arguably the longest continuously inhabited area in the Western Hemisphere" (though not necessarily by the same people, Potter, p.c.). The Dyuktai lithic complex of Eastern Siberia, with its signature microblades, has been seen as highly similar to some early Alaska lithic complexes (Dikov 1979). A typical generalization via Goebel et al. (2008:1498) is that "artifacts at the earliest well-dated site in Alaska, Swan Point on the middle Tanana River, appear to document the dispersal of microblade producing humans from Siberia to Beringia during the late glacial." Furthermore, Potter (2008b:414) notes that "microblade technology is present throughout the entire span of human occupation in the study area until around 1000 years ago."

One significant point by Don Dumond during the Dene-Yeniseic Symposium discussion period (also Dumond 1969; Dumond and Bland 1995; Potter, this volume) is that whereas there was widespread eastward movement between Asia and Alaska from 14,000 to 11,000 years ago before the breaching of the Bering Land Bridge, there is no evidence of any major population moving into Alaska from Siberia during the interval of 10,000 to 5000 years ago. Most scholars, as summarized by Potter (this volume), connect the earliest bearers of the Arctic Small Tool tradition in Alaska, who date from 5400 to 1000 cal BP, to Paleo-Eskimo. Several millennia prior to this time (about 8000 years ago) there was a non-Eskimo population on the Aleutians that became amalgamated as Eskimo-Aleut, as suggested by Fortescue (1998:180, 217).

Before the influx of Eskimo population into Alaska, and identifiable at 6000 years ago there is widespread evidence of inland hunters subsumed in the "Northern Archaic" archaeological tradition (see esp. Potter, this volume, Figures 3 and 4). The Northern Archaic sites have no cultural influences from the Siberian Neolithic that can be traced to pre-Maritime early Eskimo-Aleut sites. Dumond (1969) suggested that Northern Archaic represented "non-coastal Na-Dene" [i.e., early Athabascan] population that ranged far south of Alaska 6000 or more years ago. Dumond's 1969 paper was cited by Turner (1985), who suggested that rare shared dental traits between Na-Dene and Northwest Coast groups derived from long-term associations. In recent years more archaeologists are associating the Northern Archaic Tradition with a large mobile Alaska Athabascan population, one that extended far into northwest and southwest Alaska. A recent set of articles in *Arctic Anthropology* (Vol. 45.2, 2008) draws together 30 years of information on Northern Archaic sites. Potter's (2008a, 2008b) intersite statistical summaries for 181 sites and 272 occupations in three large drainages (the Tanana, Copper, and Susitna Rivers) are especially authoritative. Potter (2008b:419, this volume) notes, "While there is some ambiguity, I suspect that the recent time frame of the transition between these cultural traditions [Northern Archaic and Athabascan] indicates a continuity of Athabascan populations from at least the beginning of the Northern Archaic Tradition [~6000 cal BP]." Furthermore, the dramatic contrasts between economic and technological resources of the

¹⁰ Further evidence for early Algonkian-Athabascan contacts derives from Yuri Berezkin's (2003, this volume) continuing studies of myth motifs on a worldwide basis. He notes that "late diffusion of ideas across the Subarctic does not seem plausible while a common substratum is."

Northwest Coast as compared with the Subarctic have been evidenced in the archaeological records for 6000 years or more.¹¹

There has been debate about the timing of the opening of the Ice-Free Corridor. Dixon (2001) states it was not available until 13,000 cal BP. Goebel et al. (2008) places these dates between 13,500 and 14,000 cal BP. Yesner (2001, Yesner et al. 2004) has suggested that the earliest levels on the Tanana River sites were a transient colonizing population, but that the second levels at about 12,000 cal BP were an established interconnected population. If, as my Na-Dene expansion model in Figure 3 suggests, by 12,000 years ago Athabascans were positioned at the northern end of the Ice-Free Corridor, then it seems likely that only during the first 1500 or so years prior to that time as this corridor first opened, that it would have been used by transient groups. Subsequent to the occupation of early Athabaskan bands on the Tanana River Valley, it seems likely that there would have been little use of the midcontinental corridor by non-Athabascans. As Potter notes (this volume), there may be various factors that have affected Athabaskan population shifts. I do not claim that the contemporary Athabaskan languages have stayed continuously in the areas of early archaeological districts. Thus, the North American Subarctic contrasted sharply with the Northeast Asia spread zone and the diverse language contacts that took place along the Northwest Coast of North America.

4.7. Some linguistic-archaeological-ethnographic correlations

The discovery of Dene-Yeniseian will bring the actual content of languages into discussions of northern prehistory. Various Na-Dene lexical sources are germane to hypotheses about DY economic activities, ecology, and settlement patterns. I often note that the rich older Athabaskan ethnological literature as well as more recent lexicographic sources are not being used in Northern prehistory syntheses.

Numerous vocabulary complexes that are similar among Northern Athabaskan reflect the many adaptive strategies and skills of ancient peoples. As noted in section 1, the best inventories of Athabaskan geographic names are truly spectacular for the regular features that promote orienteering. The Proto-Athabaskan vocabulary for flora and fauna match well with the faunal inventories in Interior Alaska sites. In Yesner 1996:264, with the exception of the extinct elk and bison, 21 of 23 faunal items have well-established terms in all of the Alaska Athabaskan languages. Even today some Alaska Athabascans have the foresight and the skill to save bones and hooves for broth. Among both ancient and modern Athabascans there has been extensive knowledge and use of lithics. There are various terms for usable stones (though we may have to guess at some referents). There are numerous place names that refer to lithic sources in the Alaska Athabaskan place name inventories. There are some tools, such as stone scrapers ("chithos" < PA *k'izəghi lit. 'something that scrapes'), with great antiquity in Alaska that continue to be used by Athabascans. Athabascans have great skills at butchering, and the anatomical lexicon is fine grained (see Kari 2007). Also, a very high percentage of anatomical terms is retained throughout Athabaskan languages. Bone and antler implements (needles, awls, spear heads, skin scrapers) were made until recent times. Studies of language and materials items in this vein use *Wörter-und-Sachen* techniques.¹²

In his classic material culture study of snowshoes and ski devices, D. S. Davidson (1937) concluded that the "highly perfected snowshoe" with two-piece frame and advanced traits had been invented at a single

¹¹ The process of range extension and contraction has been a normal part of Northern Archaic and Athabaskan prehistory. One striking example is the well-preserved complex of stone drive lines and tent rings at Aigik Lake in a treeless area in the southern Brooks Range summarized in Wilson and Rasic 2008. Fifty-five tent rings were being used during a 500- to 700-year period from 5600 to 4900 cal BP. Wilson and Rasic estimate that recurrent use of this site complex averaged one visit every 40 years. This would mean that experience about the site was transmitted into directions to the site over two to four generations. This is certainly in keeping with what we know about the band range and travel skills of Koyukon and Gwich'in bands.

¹² There is some irony that Diebold (1987) advocates the use of the 19th-century *Wörter-und-Sachen* techniques, which "made ethnographers and archaeologists out of researchers who might otherwise have remained dialectologists and lexicographers. . . . Some studies eerily adumbrate some of the contemporary concerns of ethnoarchaeology!"

point in time within the extended Northern Athabaskan language area. "All the advanced traits of the frame snowshoe seem to have originated in North America and of these the Athabascans probably contributed almost the entire list" (op. cit.:159). Among Davidson's profound generalizations: "The snowshoe, one of the most important aboriginal inventions in the northern hemisphere, has contributed directly or indirectly to the great expansion of northern peoples and has encouraged man to invade and reside permanently in many inland regions which had previously discouraged occupation" (op. cit.:157). Proto-Athabaskan has a rich complex of snowshoe vocabulary. For the Koyukon snowshoe (Jetté and Jones 2000:67-69) there are terms for the toe-hole area, broad (toe-hole) rectangular webbing, fine hexagonal webbing, foot harness, types of cross-braces and frames, and frame webbing holes. There are also special verb themes for installing rectangular vs. hexagonal webbing. The snowshoe has been a major factor in the long-term maintenance of the large Northern Athabaskan territories and thus is pertinent to the AGCH.¹³ The snowshoe should be regarded as *the* emblem of Athabaskan prehistory.

E. James Dixon (2001:284) made this observation about Interior Alaska obsidian and trade networks:

Trace element analysis indicates that obsidian from the Wrangell Mountains occurs in the lowest levels at Broken Mammoth and Walker Road sites. Obsidian from the Batza Tena [on the upper Koyukuk River] on the south side of the Brooks Range also occurs in Tanana Valley Nenana complex sites. These discoveries demonstrate that a widespread trade network was already in place in interior Alaska probably as early as ca. 11,700 BP.

With more than 11,000 Alaska Athabaskan place names now on record, we know that very comprehensive Athabaskan trail networks extended throughout western, central and eastern Alaska. The distances involved for the transport of upper Koyukuk River obsidian noted by Dixon are nearly 500 miles (to the middle Nenana River) and over 600 miles (to the upper Tanana River). By inference it seems to me that the advanced snowshoe had to be used in such travel feats. Also I think it is likely that some Athabaskan place names descend from the earliest times of Athabaskan occupation. Two such place names may be: Koyukon *Bæts'ə Tənə* 'obsidian trail,' the famous obsidian source on the Koyukuk River (Clark and Clark 1993); and the name for the Tanana River Valley in Lower Tanana, *Tənə Don'ə* 'trail upstream.'

The Northern Athabascans have had every means necessary to reside above 58° north, taking full advantage of winter travel, large game behavior, and food preservation in the cold Subarctic. The primary materials on Athabaskan ethnography and lexicon should be considered in hypothesis building about the early sites in Alaska and Siberia as well as for a wide range of questions about Dene-Yeniseian prehistory.

5.0. CONCLUSIONS

In this paper I have offered proposals that linguistic conservatism and delayed language change have contributed to the assembly of considerable numbers of cognate roots and morphemes for Dene-Yeniseian. Also I have cited a wide variety of sources to promote data integration and inter-disciplinary discussions. Here is a list of some of the major points:

- There is ample evidence to recognize Dene-Yeniseian as a proven language stock.
- Almost all movement into Alaska from Siberia was prior to the flooding of the Bering platform, prior to 10,000 years ago, and there was a hiatus in eastward movements into Alaska for the next 5000 years.
- The older sites on the Tanana Valley had settled populations by 12,000 years ago. The Northern Archaic archaeological tradition in Northwest North America has continuity with contemporary Athabaskan and spans more than 6000 years.

¹³ Vajda and I have contemplated the similarity between Ket 'skis' *asl* and Proto-Athabaskan 'a'x'y' 'snowshoes'. Evans (2010:124) has made note of this as well.

- Numerous Athabascan vocabulary complexes (anatomy, flora, birds, lithics, landscape) attest to long-term adaptation and intersect with much archaeological evidence in the areas that have some of the oldest sites in Alaska.
- There are well-researched human biological traits that imply early interaction at the northwest, southwest and southeast edges of the extended Proto-Athabascan language area.
- The large territory of the Athabascan languages in North America (over 1.5 million square miles) is reflected in features of Athabascan geographic names and spatial orientation. There are fine-grained similarities in place names content and structure in dispersed languages. The Northern Athabascan hydronymic districts that mark both place name structure and regional identity must be very ancient. The Northern and Pacific Coast languages have a pervasive riverine directional orientation system. These systems reflect a robust territoriality and travel prowess.
- Shared language boundaries throughout Northern Athabascan have promoted homogeneity within the extended language area. It is likely that large sub-areas were depopulated and then repopulated by small Athabascan bands. The sociolinguistic situation of the Athabascans in the isolation of the North American Subarctic contrasts sharply with that of the Northwest Coast where Tlingit and Eyak have been in a diffusion corridor with layers of coastal transients.
- Athabascan word formation evolved in several unique ways that appear to have promoted linguistic homogeneity and conservatism. Highly complex templatic word formation with the layering of conditionally dependent look-ahead strings is highly similar in all well documented Athabascan languages. We think that the clamp effect plays a role in preserving the content of look-ahead strings in distinct Athabascan languages. As shown in Table 1, even the details of the most suppletive verb stem variation are retained in the distant languages.
- A model of Na-Dene expansions, as suggested in Figure 3, with early North American branchings of Tlingit and Eyak is a plausible time frame that is supported by various strands of evidence.

Recognizing that the Athabascan languages as a language family in which language change has been on a unique and slower time table than most language families contributes to our understanding of how such a strong historical linguistic signal for Dene-Yeniseian is being assembled.

The best material culture study for any Athabascan language in over 50 years is the still unpublished MA thesis by Thomas O'Brien (1997, to appear), "Athabaskan Implements from the Skin House Days as Related by Reverend David Salmon." In August 2005, the distinguished Gwich'in elder David Salmon of Chalkytsik, then 96 years old and now deceased, commanded the attention of several hundred people assembled for the ground-breaking ceremony for the Morris Thompson Cultural Center in Fairbanks when he said something like, "The Athabascan people have had more than 10,000 years to learn how to live on this land." The Dene-Yeniseian language stock is in fact direct confirmation that a population much more ancient than 10,000 years is ancestral to Athabascan and to Na-Dene peoples. As Edward Vajda has written, the Dene-Yeniseian language connection "can wield a power vast enough to reunite entire continents." Due to Dene-Yeniseian we anticipate that there will be much greater interaction between the disciplines and subfields of linguistics, archaeology, ecology, and human biology. More significantly, the intellectual traditions that are embedded in these languages, such as the great knowledge base on tools that David Salmon shared throughout Alaska and in O'Brien's thesis, are going to attract much more attention and respect as ideas that have been passed down to us from very ancient times.

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DENE-YENISEIAN AND PROCESSES OF DEEP CHANGE IN KIN TERMINOLOGIES

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It is no wonder . . . [Dul'zon noted] . . . that this distinctive feature of the Ket kinship system is entirely foreign to the neighbouring Turkish and Samoyedic peoples . . . as these archaic traits are reminiscent of the Ganowánian-Turanian kinship system described in Morgan (1891: 366–383), which is characteristic of the Indian tribes of America and the Tamil . . . [and various other] peoples of India (cf. in particular the Athapascan kinship system in Hoijer 1956) (Werner 2006:88).

1.0. INTRODUCTION

This passage concerning Dul'zon and Werner's views on the classificatory nature of Ket kinship might remind students of anthropological history that the Dene-Yeniseian connection would have been of keen interest to one of the discipline's 19th-century giants, Lewis Henry Morgan. Morgan has justifiably been lauded as the inventor of kinship studies, which Trautmann (2001:268) construed as virtually the invention of anthropology itself. Morgan had a particular agenda in mind for his massive 1871 enterprise, *Systems of Consanguinity and Affinity of the Human Family* (hereafter, the *Systems*): he wished to show that his Turanian (Asian) and Ganowánian (New World) systems of kinship were historically connected. This proved to be an elusive goal, and as Trautmann has so ably shown, Morgan's enduring contribution is more commonly thought to lie in his recognition of a fundamental dichotomy in kin principles, as well as with the massive tabular summaries of kin schedules that he gathered on a global scale. In a number of instances, these kin schedules remain primary data even today.

Morgan's geographic "reach" through both travel and correspondence (to collect kin terminologies) was enormous, but the Dene¹ (i.e. Athapaskan) and Yeniseian worlds lay either at the edge of his capacity to gather data (Dene), or completely beyond (Yeniseian). One can only imagine that Morgan would have greeted news of the Dene-Yeniseian connection with more than passing curiosity. Minimally, it would have provided data for regions of significance to him; writ large, Dene-Yeniseian findings might have had a bearing on the hypothesis that motivated much of his influential work on kinship: the underlying semantic unity of Asian and New World kin systems.

Given the centrality of kinship as anthropological subject matter, examining Dene-Yeniseian from the

¹ Athapaskan, Athabascan, and other similar words derive from Cree terminology for the Peace-Athabasca Delta region, with a meaning conveying the idea of a "place where there is grass everywhere" (e.g. Harrington 1940). By a happenstance of mid-nineteenth century philology, this term came to be applied to the entire Athapaskan language family. While there is an established scholarly literature using such terms, we will here use the term "Dene" with synonymous reference to the Athapaskan language family. Although no single term can capture all the variation in the related terms for "people," the term "Dene" is far more congenial in this respect. As much as possible, we will provide clarification concerning this broader usage and reference specifically to Mackenzie Basin Dene. Some clarification will also be necessary with respect to scholarly usages such as "Proto-Eyak-Athapaskan."

perspective of kinship and social structure should be an early priority. At the most prosaic level, kinship is one of the lexical domains that is typically evaluated in language families: at some stage of enquiry, questions will be posed as to how kinship in the Dene world relates to kinship in Yeniseian contexts. It is logical to make an assessment of the relevant kin systems for this reason alone. More compellingly, kin terms have systematic relationships among themselves. While they are not simple reflections of social structure, they do touch upon and are influenced by changes in key features of a society. Thus, kinship is not just any semantic domain: certainly for Dene communities, we may say that kin terms provided an idiom in which key notions about the biological and socio-economic reproduction of society receive expression (Ives 1990, 1998). Precisely because kinship lends cultural form to the reproduction of societies in small-scale demographic settings, generation by generation, it becomes highly relevant to the larger interdisciplinary questions the Dene-Yeniseian relationship inevitably engenders. Finally, we have relatively little idea of just which forces produce change in kin terminological systems. Dene-Yeniseian provides one additional instance in which we can make a conscious effort to explore the deep processes through which kin terminologies may change.

Here, we make a preliminary assessment of the degree of relationship between Yeniseian kin terms on the one hand, and Dene, Eyak, and Tlingit kin terms on the other hand. Our treatment has two dimensions, on one level involving identification of cognate terms between these two regions, and on a second level, making a close examination of the semantic properties revealed by the kin terms in question. We begin by assessing kinship, principles of group formation, and developmental processes in Dene, Eyak, and Tlingit societies. After a consideration of Ket kinship in Yeniseian, we then identify cognate terms in Dene-Yeniseian to see what can be established about the semantic structure of earlier Yeniseian kin systems. We conclude by considering the historical processes affecting the configurations of Yeniseian and Dene kin systems.

We take this path because, as subsequent passages will show, the relationship between Dene and Yeniseian kinship is hardly straightforward. In our present state of knowledge, only a limited number of cognates can be identified between Ket and Dene terminologies (Ket providing the only reasonably complete data for Yeniseian). Nor can the Ket kin terminology be conveniently categorized in customary anthropological terms. Much that we will discuss concerning Dene, Eyak, and Tlingit kin terminologies has to do with distinctions between cross and parallel relatives lost in Ket. It will become equally clear that the current form of the Ket terminology is the consequence of complex developmental and historical processes. Yet, despite these complexities, Dul'zon and Werner were correct in asserting that the classificatory nature of the core Ket terminology is anomalous in its Siberian context. In fact, a significant number of Dene terminologies have terminological conventions not unlike those we see in Ket. Consequently, we will argue that our findings for Dene-Yeniseian kinship are not antithetical to the linguistic evidence for a connection between Dene and Yeniseian. We will suggest instead that the deep processes of change we articulate can explain the current form of both Dene and Yeniseian kin terminologies. Those same deep processes can have an integral role to play in broader interdisciplinary discussions concerning Dene-Yeniseian history.

2.0. SOME DEFINITIONS

This discussion first requires establishing a frame of reference for distinctions in kin terminology. Table 1 provides a listing of standard kin term abbreviations and symbols that appear here. For the benefit of readers who may not be familiar, we make an abbreviated discussion of several other general terms from the anthropological study of kin systems that will recur in our discussion. This discussion is not meant to be comprehensive, and can be supplemented by consulting sources such as Parkin (1997), Trautmann (1981) or Godelier et al. (1998).

One lasting value of Morgan's work was his recognition of two poles in the organization of kin terminologies. One of these we may term *descriptive* in that it tends to apply individual terms to each specific location on the genealogical grid of kin positions (so, for example, there might distinct terms for 'father', father's brother, 'mother's sister's husband,' and 'mother's brother' [where $F \neq FB \neq MZH \neq MB$]). The other of

TABLE 1. Kinship notation

Symbol	Referent	Symbol	Referent
Ch	Child	W	Wife
D	Daughter	B	Brother
F	Father	Z	Sister
GF	Grandfather	♀	Female, ♀ZS: sister's son, a woman speaking
GM	Grandmother	♂	Male; ♂ZS: sister's son, a man speaking
Gp	Grandparent	e	elder: MeB (mother's elder brother); e(MBS) = mother's brother's son, older than ego
H	Husband	y	younger, in the same convention as elder, above
M	Mother	G ²	Grandparent's generation
Pa	Parent	G ¹	Parent's or first ascending generation
S	Son	G ⁰	Ego's or own generation
Sb	Sibling	G ⁻¹	Children's or first descending generation
Sp	Spouse	G ⁻²	Grandchildren's generation

these we may term *classificatory*; toward this pole, kin terms tend to group locations on the genealogical grid categorically (so that a single term would be used in the previous example [where $FB=MB=FZH=MZH$]).

Although it remains common to see definitions from an earlier era concerning segments of kin systems (such as "bifurcate merging" for the siblings in parent's generation or "Iroquois" cousin terminologies), we wish to stress that such usages are insufficient and frequently misleading for comprehensive characterizations of the semantic domains connected with *entire* kin terminologies. Consequently, we will employ identifiers including "Dravidian," "Iroquois," "Crow," and "Omaha." These terms took their names from language families or societies in which they were first recognized. Not entirely without their own vagaries, these usages have the advantage of referring accurately to semantic patterns in the three medial generations (G¹, G⁰, and G⁻¹), for which associative combinations can be rendered in precise mathematical fashion (Tjon Sie Fat 1998).

Dravidian kin systems reflect an elementary structuring of the kin terminology in such a way that kin categories are defined by the logic that would follow from persistent bilateral cross cousin marriage. "Cross cousins" are the children of opposite sex siblings (e.g. MBD, FZS), while "parallel cousins" are the children of same sex siblings (e.g. FBS, MZD). An ideal representation (Figure 1) of bilateral cross cousin marriage shows that when a brother and a sister marry another brother and a sister in each generation, a series of "terminological equations" is built up, so that in ego's generation $MBD=FZD=W=BW$, while $MB=FZH=SpW$, for example. It can readily be shown that in a Dravidian semantic framework, a parallel relative is a consanguine or blood relative, while a cross relative is a real or potential affine or in-law (Trautmann 1981). In a more technical vein, associative rules for linking relatives also allow precision in the definition of Dravidian kin systems through more distant genealogical loci, such as second cross cousins (Godelier et al. 1998). Trautmann and Barnes (1998) have suggested that Dravidian systems may be referred to as having "Type A crossness," as a way of neutralizing the cultural and historical connections that the term "Dravidian" also has.

Lounsbury (1964) clarified the distinction between Dravidian and *Iroquoian* patterns of crossness. Iroquoian kin systems have identical patterning in cross/parallel distinctions for near consanguineal relatives. The equation of cross relatives with affines and parallel relatives with consanguines does *not*, however, occur in Iroquoian systems, where there is instead a separate affinal terminology. Thus, we find, for example, that $MB=FZH \neq SpF$. Second cousin terminology is another key diagnostic: half of all second

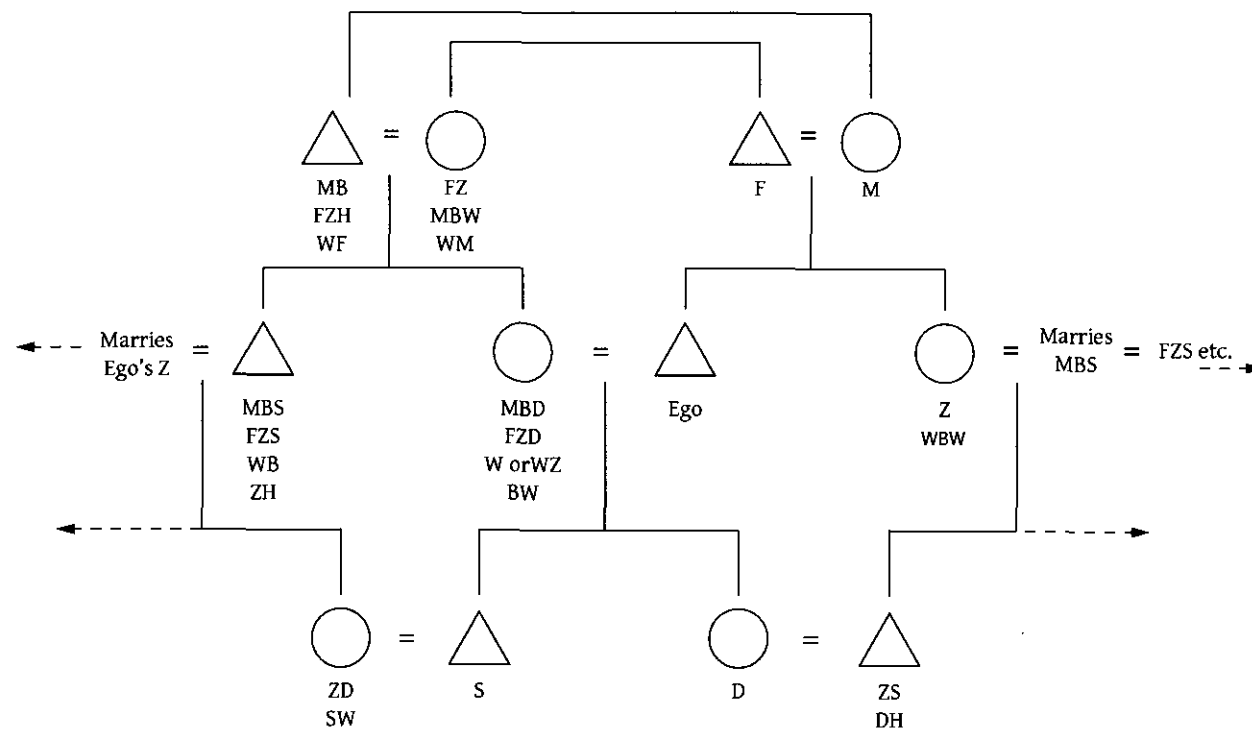


FIGURE 1. Terminological equations built up through symmetrical or bilateral cross cousin marriage, as these occur in Dravidian or Type A crossness.

cousins pattern for crossness in the same fashion for Dravidian and Iroquoian systems, whereas half pattern in the opposite fashion. Trautmann and Barnes (1998) proposed that Iroquoian systems be referred to as having "Type B crossness," again as a more neutral phraseology.

Morgan himself became aware of Dravidian versus Iroquois cross/parallel distinctions in the later stages of his work on the *Systems* (Trautmann and Barnes 1998). Yet, this discovery bedeviled him, and he tended to see the Dravidian pattern as somewhat of a blemish on what he regarded as the more perfect Iroquoian pattern (Trautmann and Barnes 1998:46). Because these distinctions came to prominence at a relatively late date in the anthropological study of kin systems, it is not uncommon to find kin systems with obvious Dravidian semantic properties classified as "Iroquoian" or as having "Iroquois" cousin terminologies. As we shall see, Dravidian cross/parallel distinctions have potent implications for marriage in the small-scale demographic settings typical of much of Dene-Yeniseian, or for that matter, many other hunter-gatherer societies. Esoteric though they may sound, distinctions between Iroquoian and Dravidian kin systems have profound historical and socioeconomic ramifications.

Crow and Omaha kin systems feature cross/parallel distinctions very much like those found in Iroquois terminologies, save for *intergenerational skewing* in which kin from different generations though one descent line are merged. Crow/Omaha systems are typically associated with unilineal descent, generally matrilineal for Crow, and patrilineal for Omaha. In a Crow kin system, FZ=FZD=FZDD in father's matriline, while the mirror image occurs in an Omaha kin system, where MB=MBS=MBSS in the mother's patriline. Precisely why this intergenerational skewing occurs in Crow/Omaha systems has been the subject of considerable theoretical debate in anthropology. It does appear to be connected with rendering a particular descent line unmarriageable, and therefore, may sometimes arise in connection with the dispersal of affinal alliances. Crow/Omaha systems are occasionally referred to as "semi-complex" (rather than elementary), inasmuch as they do not feature positive marriage prescriptions, but do have negative prescriptions against repetition of marriage between descent lines (cf. Parkin 1997).

Finally, we will make mention of kin systems with "generational" or "Hawaiian" and "Eskimoan" or "lineal/collateral" tendencies. *Hawaiian* kin terminologies merge lineal and collateral kin categories by generation, so that all loci in the parents' generation are mothers and fathers, all loci in ego's generation are siblings, and all loci in the first descending generation are children. Eskimoan terminologies (like English) distinguish relatives in collateral lines (uncle/aunt, cousin, nephew/niece) from lineal relatives (father/mother, sibling, son/daughter).

3.0. A SYNOPSIS OF HISTORICAL RECONSTRUCTIONS OF DENE, EYAK, AND TLINGIT KIN SYSTEMS

Dene kin systems are the best known from among the Dene-Yeniseian peoples and have been the subject of efforts toward reconstruction since the first half of the twentieth century (e.g., Opler 1936; Kroeber 1937). They provide a convenient starting point for the present discussion. Dyen and Aberle (1974) undertook the first substantive lexical reconstruction of the proto-Athapaskan kin system. Working from extensive kin term lists amassed by Hoijer (1956), they provided a reconstructed proto-Athapaskan kin system in which a cross/parallel distinction defined the three medial generations (parents', own, and children's). Dyen and Aberle next applied standard anthropological usages in characterizing the first ascending generation of the reconstruction as "bifurcate merging" (equating mother with mother's sister and father with father's brother), and referred to an "Iroquoian" pattern for the cousin terminology (a single term for male or female sibling and parallel cousin [B, Z, FBS or FBD, and MZS or MZD] and a single term for cross cousins [FZD, FZS, MBD, and MBS]), for example. Dyen and Aberle were particularly interested in inferring forms of social organization. They employed their reconstructed kin terminology in conjunction with statistical methods in assessing tendencies in a world ethnographic sample. Based on the strength of association between kin terminologies and social institutions such as lineality and postmarital residence, Dyen and Aberle concluded that the Proto-Athapaskan population was most likely matrilineal and matrilineal in its practices.

Nevertheless, Dyen and Aberle (1974:131-133) acknowledged that a significantly different alternative would apply equally well—Proto-Athapaskan society might also have been characterized by "normative bilateral cross cousin marriage" in the absence of formal unilineal descent groups. Shortly afterward, Krauss (n.d. [1977]) also reconstructed the proto-Eyak-Athapaskan kin system, using his superior knowledge of *comparative Athapaskan and Eyak to rework the rosters of kin terms for both proto-Athapaskan and proto-Eyak-Athapaskan* (see Ives 1990:206-209). Though very much the same semantic pattern emerged, Krauss was able to weed out considerable variability in reconstructed kin terms, clarifying Dyen and Aberle's results.

Rubel and Rosman (1983) were somewhat less concerned with the specifics of kin terminologies in making their assessment of emergent social complexity in northwestern North America, although they did make inferences concerning antecedent kin systems. Building upon data from ceremonial exchange, social structure and symbolism, they reviewed variation in social structure for Tlingit, Haida, and Tsimshian. Both Tlingit and Haida societies had matrilineal descent, avunculocal residence, Crow kin terminologies and exogamous moieties with internally ranked clans. Tlingit and Haida societies practiced patrilineal cross cousin marriage, which features alternating cycles of affinal exchange, as spouses flow between lineages in different directions in each generation. The Tsimshian, with four ranked phratries (also having internally ranked clans), practiced matrilineal cross cousin marriage. In this system of exchange, lineages remain in a constant relationship in receiving spouses.

Rubel and Rosman went on to argue that these different directions in social structure could most effectively be explained by divergence from an antecedent social structure characterized by some form of dual organization (perhaps moieties), a preferential rule for bilateral cross cousin marriage, and customs concerning funerals and ceremonies where guests would perform services for hosts, who recompensed the guests with gifts. Rubel and Rosman tested their hypothesis in the fashion suggested by Sapir (1916) and Levi-Strauss (1963), first examining an "inner ring" of societies surrounding the Tlingit, Haida, and

Tsimshian. The Eyak provided a close parallel for their proposed antecedent they concluded, although fur trade impacts had caused some shifts in the Carrier and Tahltan cases. These inner ring societies also featured dual organization with formal moieties (with cores of siblings forming the basis for opposing sides), matrilineal descent, matrilineal or avunculocal residence, and bilateral cross cousin marriage.

The "outer" ring examined by Rubel and Rosman concerned Mackenzie Basin Dene, such as the Hare and Slavey. These societies have no matrilineal descent groups, and dual organization is not so strongly cast. There are distinctions for cross and parallel relatives, involving Dravidian or Type A crossness, as we will see. Near relatives do not handle the dead, a task taken care of by distant relatives or those unrelated. Rubel and Rosman thought these third ring characteristics might reflect a yet deeper antecedent, or perhaps, a simplification of inner ring principles in stricter Subarctic environmental circumstances. Rubel and Rosman's proposal needs to be assessed against the actual historic backdrop for emergent social complexity during the last five thousand years in northwestern North America. Our review should also be tempered by the fact that neither Tsimshian nor Haida can be considered as instances that fit within the framework of Eggan's (1955) comparative method, since neither of the languages for these societies is related to Dene-Yeniseian. That said, Rubel and Rosman's notion that there existed a fundamental societal framework in northwestern North America—with dual organization, preferential bilateral cross cousin marriage, and compensatory ceremonial and funerary exchange practices—is a valuable insight to which we will return.

In the meantime, some of the significant strides in kinship studies noted in the prior section had already taken place, but were not accounted for by Dyen and Aberle, Krauss, or many other ethnographers. Both Asch (1980, 1988, 1998) and Ridington (1968, 1969) recorded South Slavey (Dehcho) and Beaver (Dunne-za) kinship in more comprehensive fashion. Asch recognized that both terminologies were characterized by Dravidian crossness. With insights revealed to him by an especially knowledgeable Dene elder, Asch came to the realization that this Dravidian semantic structuring played a pivotal role in Dene conceptions of society and its successful reproduction through the generations. Members of the Slavey community of Pe Ts'eh K'i (formerly Wrigley) conceived of themselves as composed of united sibling groups of one particular kind, namely, groups of brothers married to groups of sisters (same sex sibling cores). As Asch (1972, 1980, 1988) and Ives (1985, 1990, 1998) have discussed at greater length, Dravidian distinctions become paramount in determining marriage prospects for the next generation where this "unilocality" of parent sibling groups obtains. All of the children resulting from these sibling core arrangements are siblings, absolutely enjoining local group exogamy.

While the same underlying logical structure obtained for Dunne-za communities, Ridington (1968, 1969) found that kinship there operated with different principles of group formation. The preferred configuration of local groups was one in which groups of brothers and sisters were united with other brothers and sisters (unlike or opposite sex sibling cores). The immediate implication of these principles is that the children of the next generation are prospective marriage partners: they are cross cousins to each other. Consequently, Dunne-za groups are agamous or commonly, highly endogamous.

Ives (1985, 1990) went on to explore both the broader implications for lexical reconstruction and the socioeconomic consequences of these Dravidian semantic distinctions. The Dyen and Aberle and Krauss reconstructions required re-evaluation in light of Dravidian precepts. While more comprehensive data would certainly be welcome, both reconstructions had a number of concrete signs that Proto-Athapaskan and Proto-Eyak featured Dravidian or Type A crossness: these included affinal equations such as FB=MZH or FZ=MBW=SpM, the likely treatment of affines' affines as siblings, and the presence of a form of crossness in the Eyak grandparental generation sharing the same semantic properties of that in Kariëra section systems. From this perspective, it became clear that the historical processes resulting in the "unfolding" of Northern Athapaskan societies likely resulted from variations upon a basic theme of Dravidian crossness.

The socioeconomic consequences of identifying Dravidian crossness are not trivial in hunter-gatherer societies. In this simple phrasing of an elementary structure, the interaction of kin logic and principles of group formation results in an explicit mapping for the social and geographic locus of the incest taboo. Although conjugal pairs are often used as the basic unit of analysis in hunter-gatherer studies (e.g. Helm

1961; 1965), the empirical reality is that sibling sets are the elementary units, particularly in the eyes of the people involved. With Dravidian precepts in play, deliberate preferences for same sex sibling cores situate the social and geographic boundaries for incest *outside* the natal group. When time is introduced through elapsing generations, we see that the children of same sex sibling cores are themselves all siblings, and must marry exogamously. This is not so with unlike sex sibling cores, where potential (and frequently desirable) affines reside within the local group as cross cousins in the first descending generation. Here, the boundary for incest is managed *within* the natal group.

Ives (1990) worked through a series of Northern Athapaskan and Eyak case studies to show how the dynamic interaction between the structure of kin terminologies and principles of group formation triggered characteristic developmental processes with significant political and economic ramifications in Arctic Drainage (primarily Subarctic) and Pacific Drainage (Northwest Coast and Plateau) settings. This approach allowed for assessment of such varied circumstances as the active creation of a web of exogamous kin helpful for communities dealing with the exigencies of boreal forest or treeline caribou intercept economies, processes through which kin groups could "fix" access to rich fishing locations in alternation with use of upland caribou fences, or historic responses with larger "Big Man" aggregates to certain Fur Trade settings (where a large group with a dominant leader conveyed political advantages). This type of approach also provided insights for other language families such as Numic and Algonquian, where Dravidian kin principles also appear to have been at play in circumstances connected with yet other environmental settings (such as the Great Basin and Great Plains) (see Ives 1998).

Looking forward to Dene-Yeniseian, we have made considerable effort to outline this style of approach for an important reason. There is in these societies of small-to-moderate scale hunter-gatherer demographics a critical interplay of kin terminological structure, principles of group formation, and developmental processes. Where we can examine the semantic structure of a reconstructed kin terminology (or at least facets of it) or its daughter systems, we can also make reasonable inferences concerning processes of endogamy and exogamy, as well as specifying the economic and political potentials for societies we would expect to be organized along the lines of familiar hunter-gatherer demographic principles. With this last phrase, we refer to seasonally structured activities in which smaller hunter-gatherer local groups or bands met daily economic needs. These smaller groups nevertheless required recourse to larger regional groups or regional marriage isolates for critical social interactions, such as marriage.

These distinctions are also helpful in seeing why certain forms of kin terminology may arise. Spier (1925) noted a form of kin terminology which he termed "Mackenzie Basin," common among Dene speakers in that region of Canada, but widespread in the Americas in other language families. These kin terminologies feature crossness in the first ascending and descending generations, but not in ego's generation, where there are only terms for siblings. Subarctic environments have ecological features that place a premium on the capability of local groups to fall back on other local groups when they experience a failure in their own food resources or other calamities. There is no more effective way to build a web of kin relations as such a safeguard than to insist upon local group exogamy. While it is true that this can be achieved by the principle of unilocality (same sex sibling cores), it is clear that many Mackenzie Basin Dene communities will tolerate unlike sex sibling cores in forming local groups. When they do so, however, they apply a "Mackenzie Basin" terminology, which has the identical effect of enforcing local group exogamy—by making all co-resident children siblings to each other.

Again, thinking ahead to some inferences we will draw concerning Yeniseian, it is apparent that a strong predisposition toward local group exogamy can alter the property of crossness in some classificatory kin systems. In this particular case, we see that an entire generation can shift from cross/parallel distinctions to a "generational" or Hawaiian pattern, to use these common terms somewhat loosely, in which all members of that generation receive sibling terms.

4.0. ARE THERE OTHER SPECIES OF CROSSNESS IN DENE, EYAK, AND TLINGIT?

The Dene branch of Dene-Yeniseian has its own complex history spanning vast portions of western North America. While we feel that this history and distribution can be effectively seen as an unfolding from original Dravidian precepts, we stress that enormous time depths and historical complexity are involved. In this broader context, we note that Dravidian or Type A crossness is not the only attested variety of crossness to be found in the Athapaskan language family. It is important to enquire if a multiplicity of cross/parallel modes of reckoning might have characterized Dene, Eyak, and Tlingit kinship. If this were to be so, it might greatly complicate interpretive efforts.

4.1. Iroquois or type B crossness and Crow/Omaha skewing

Iroquois terminologies reflect an alternative method of reckoning crossness and have separate affinal terminologies, while Crow/Omaha terminologies result in systematic intergenerational skewing of kin terms. These patterns occur in Dene and Tlingit in ways that are informative for Dene-Yeniseian more broadly. A number of Apachean or Southern Dene groups are known to have Iroquoian or Type B crossness (Ives 1998, Trautmann and Barnes 1998:34). This is clearly evident in McAllister's (1955) Kiowa Apache kin terminology, for example. Donald and Tighe (1987) made a detailed formal analysis of Navajo, Western Apache, and Jicarilla kinship. They separated Navajo and Western Apache from Jicarilla and other (Lipan, Plains, Mescalero, and Chiracahua) kinship because a different structural pattern existed in Navajo and Western Apache. This involved a weak version of a skewing rule that they saw as lying behind intergenerational shifting in terms resembling (but not identical to) those found in Crow types of terminologies. Navajo and Western Apache also had entirely separate affinal terminologies, with no categorization of cross relatives as affines. The upshot of their Navajo and Western Apache analysis was that these terminologies had Iroquois properties, mildly skewed toward the intergenerational shifts seen in Crow kin systems. Jicarilla (and likely other Apachean) was notably different: intergenerational skewing did not occur, and some cross relatives were denoted by affinal terms, so that affinal terminology was not wholly separate.

Donald and Tighe (1987:71) enumerated three reasons why a pattern of weak skewing existed in Navajo and Western Apache but not elsewhere in Apachean. It could follow from a long history of skewing in Apachean or even larger Athapaskan culture, retained in these two instances of Apachean, but lost in other Apachean. Skewing precepts might also have been borrowed from Puebloan neighbors, or may have arisen through independent invention in Navajo and Western Apache communities. These authors saw the deeper historical explanation as most likely, noting that Dyen and Aberle's Canadian group of Athapaskans had Tahlitan, Kaska, and Southern Tutchone instances of intergenerational skewing. To this we might add Beaver or Dunne-za. Omaha-style intergenerational skewing occurred amongst some Pacific Coast Athapaskans as well.

As attractive as this conclusion might seem, Dyen and Aberle's (1974) reconstruction of the proto-Apachean kin terminology does not reflect intergenerational skewing, featuring only an innovation in the pairing of opposite and same-sex sibling terms to go with a cross/parallel structuring of ego's generation that remains Dravidian in character. Donald and Tighe's preferred conclusion also fails to account for two salient aspects of the Athapaskan distribution of kin terms. Large areas of the remaining Athapaskan language family lack this propensity for skewing. This becomes all the more suspicious when we ascertain that Athapaskan skewing occurs in regions where there is significant sedentism, higher population densities, and greater social complexity in the form of clans or lineages. Crow terminologies are well known for Tlingit and Haida communities in the Northwest Coast region, and the interior northern Athapaskans listed by Donald and Tighe lived in proximity to Tlingit peoples known to have had a significant influence upon them. Crow terminologies tend to be associated with matrilineal societies (typical of the northern Northwest Coast) as is the case for Tlingit society, which features two exogamous moieties (Wolf and Raven). There was a Tlingit preference for marriage between FZD and MBS (patrilateral cross cousin marriage), the Tlingit terms for FZD and MBD are terminologically distinct, and there is intergenerational skewing of Crow form (Rubel and Rosman 1983).

It is not inconsequential that Pacific Coast Athapaskans have skewing of the Omaha type, often associated with patrilineal societies, in settings where their neighbors were patrilineal in their social organization and also had Omaha skewing. In the northwestern North American and Pacific Coast Athapaskan cases, the skewing and unilineal biases present actually mirror those of neighboring societies, with whom there was significant interaction.

Apachean ancestors migrated from the Canadian Subarctic in the relatively recent past (Ives 2003). Linguistic and especially genetic studies show that these ancestral populations must have been of small-to-moderate size. Ives and Rice (2002) have gathered Apachean neologisms for unfamiliar species and objects that people migrating from the Subarctic would inevitably encounter, and for which they would require names. A large and dispersed ancestral Apachean population could be expected to yield notable variation in forming such terms, particularly where geographic barriers intervened. Instead, we find a pattern in which one term will commonly be applied, suggesting that the original Apachean population was relatively small and cohesive.

Several independent lines of genetic evidence (including sequence variation mtDNA haplotypes and y-chromosome data) reveal that the first Apachean populations went through a founder effect (Li et al. 1998, 2002; Holve et al. 2003; Malhi et al. 2003; Malhi et al. 2008). Yet, by historic times, the various Apachean populations had engaged in significant interaction or alliances with other southern societies and had grown dramatically (Brugge 1994). Apachean oral traditions and genetic data further reinforce the idea that many non-Athapaskan people joined the emergent, more westerly Apachean societies. Brugge (2003, 2006, 2008; see also Reichard 1928) has shown that Navajo clans were likely adopted from Puebloan societies, that many clan ancestresses were Puebloan women from specific Puebloan sites, and that early Navaho society was highly incorporative of others. This is very much being affirmed by genetic studies, where both mtDNA and y-chromosome data show that population admixture between Apachean and neighboring peoples was the norm (Malhi et al. 2003; Malhi et al. 2008).

These neighboring Southwestern societies (such as the Hopi) are known to have employed Iroquoian and Crow patterns of terminological crossness. Given the readily demonstrable penchant Athapaskan speakers everywhere have for emulating the ceremonial, social and material cultures of their neighbors, there seems little cause for doubt that the shifts in Apachean kin terminologies resulted from both contact with and incorporation of many individuals from other societies that used such principles of crossness. Consequently, we see Iroquoian crossness (along with tendencies toward Crow or Omaha intergenerational skewing) as a historical contingency following from the regional characteristics typical of established neighbors of Apachean speakers.

4.2. Yafar and more exotic forms of crossness?

To explore one final attribution, Godelier et al. (1998) returned to Morgan's *Systems* data in establishing a mathematical "thought model" for all logical varieties of crossness that can be defined for all human kinship involving cross/parallel distinctions. The "hypercube" they constructed had a series of 16 vertices, each corresponding to a set of equivalence and associativity rules capable of generating a unique kind of crossness. At this stage of investigation, Dravidian, Iroquoian, Kuman, Yafar (New Guinea) and Nagawbe (Central American) varieties of crossness had been attested in kin schedules throughout the world.

The fine details of this analysis need not detain us here, but one conclusion made by Godelier et al. (1998:24) must be corrected. The Yafar vertex Godelier et al. (1998) identified was also said to correspond to the pattern of crossness found in Morgan's *Systems* volume for the Red Knife (or Yellowknife; see Helm and Gillespie 1981, for oral history and archival information on the Red Knife) of Great Slave Lake, a finding that could have a bearing on how we view the larger prospects for Dene-Yeniseian. The Yafar/Red Knife vertex has Iroquois (Type B) crossness in the first ascending generation, but sibling terms in ego's generation and (mainly) son or daughter terms in the first descending generation.

Can Morgan's Red Knife information be taken at face value, on par with modern ethnographic knowledge of the New Guinea Yafar? To answer this question, it is important to understand that Morgan's

(1860, Morgan Papers, University of Rochester Library) Red Knife <Täl-sote'-e-na> kin schedule is one of those instances in which his original data has not been superseded, and that there are critical differences between his original data and the Red Knife data he presents in Table II of his *Systems*. Morgan relied upon a series of printed forms for soliciting logical possibilities for all such terms in each society; he worked extensively in eastern North America, encountering Dene kinship at the periphery of his horizon during trips into western Canada and the western United States. He collected two Dene terminologies in Canada but otherwise enlisted Hudson Bay Company clerks and factors like Bernard Ross, or naturalists such as Robert Kennicott, who traveled in Canada's Subarctic. Morgan's original schedules remain as part of his correspondence housed in the University of Rochester Library. He collected his Red Knife (<Täl-soté-e-na>) terminology in the Convent of St. Boniface, Fort Garry, Selkirk Settlement, from two Metis women of Red Knife descent, on August 6, 1861. Morgan (1959:146-147) described the interview as short (he was just about to leave), and flawed (he had difficulty collecting male and female speaking terms).

It would scarcely seem possible to collect information at the 218 loci on Morgan's 1860 terminological grid in the limited time and opportunity Morgan had; in fact, he did not elicit and record many Red Knife kin terms. Beginning at terms 65 through 86 of his 1860 printed schedule (the terms in Father's Brother's line running from FBS through FBDD), Morgan made written entries. For subsequent descent lines beginning with FZS, MZS, and MBS, Morgan simply wrote "Same as Above" (meaning that FB line of relatives) and drew a line through the remaining table cells. His 16 categories for the "Relationship of the Descendants of Brothers and Sisters to each other" at the end of the printed schedule, from which crucial diagnostic information about crossness could be evaluated, were also left blank. In his Pembina and Fort Garry journal entry for 1861, Morgan (1959:146-147) actually expressed doubt about the correctness of his own work, and resolved that "Kennicott will settle it," meaning that he would trust Kennicott's Athapaskan schedules rather than his own.

Trautmann and Barnes (1998:44) found that Morgan's published version of Table II in the *Systems* was far more comprehensive than the results for any of the schedules he received from correspondents. Table II entries "represent Morgan's best judgment of the nature of the vocabulary and the principles by which it classifies kin, and are not records of questions asked and answered in a mechanical fashion" (ibid.). By the fall of 1859, Morgan had become aware of the full ramifications, at more distant kin loci (like second cousins), of what today would be called an Iroquois or "Type B" terminological pattern for cross/parallel relatives. Not until 1862 did he receive detailed information about South Indian Tamil kin terminologies that fit the other major variant in such kin systems, the Dravidian or Type A pattern of crossness. By the time Morgan presented the 268 terms of his Table II in the *Systems* in 1871, there is Red Knife data for many of these loci (now, just 30 of 268 entries are blank), and terms for key categories like second cousins are represented. Morgan obviously *inferred* a pattern of Iroquois or Type B crossness for Red Knife, the only pattern of crossness he knew about in 1861.²

Very simply, there can be no comparison of Yafar and Red Knife data on crossness because most of Morgan's Red Knife entries are illusory for the key kin categories, and his elicited data contradicts

² This conclusion is reinforced when we look carefully at the data Morgan did record for male or female speaking for the FB line: FBSD, FBSS, FBSD, FBDS, and FBDD. If we apply the same exacting standards as Godelier et al. (1998), we see that every one of these individuals is rendered as a 'son' or 'daughter.' Even if Morgan had the difficulty he acknowledged with the male or female-speaking distinction, Tjon Sie Fat's (1998) three diagrams for the Iroquois-Generational Pattern (Variants 1 and 2, male egos, Figures 3-6 and 3-7) and Yafar (Variant 2, Figure 3-8, captioned to be for a female ego, although ego is drawn as a male), reveal that some of these terms should pattern as cross (nieces or nephews). Consequently, with women providing the Red Knife information, we expect (but do not find) nepotic terms for FBDD and FBDS if this really is the Yafar pattern as claimed. If we follow Morgan's "same as above" instructions, these inconsistencies in calculating Yafar cross/parallel distinctions would ramify logically in the lines other than FB's. Morgan's fragmentary observations do not square with Iroquois or Yafar generational patterns of crossness. Trautmann and Barnes (1998) noted that Morgan also imposed a Type B pattern of crossness in his Table III for Asian societies, making mistaken entries for Dravidian South Indian kin systems.

expectations for this vertex, with patterning favoring Dravidian crossness instead.³ Insofar as we know, crossness in Dene, Eyak and Tlingit kinship is confined to Dravidian (Type A), Iroquois (Type B), and Crow-Omaha forms of reckoning, with no need for other forms of crossness to complicate our analysis.

4.3. Semantic patterning and historical processes in Dene, Eyak, and Tlingit kinship

After a careful consideration of Morgan's data from the *Systems*, as well as other contemporary and later investigations, Trautmann and Barnes (1998) concluded that:

1. The "ground" from which unilineal Crow and Omaha systems was raised in North America was of Iroquois or Type B character;
2. The relation between Dravidian or Type A systems and unilineality was mediated by Iroquois or Type B;
3. Dravidian or Type A systems lie in the northern reaches of the continent while Iroquois or Type B crossness lie to the south, where they are associated with larger population aggregations;
4. Iroquois or Type B crossness is associated with the exogamy of cousins, such that it is associated with the opening out of affinal ties and larger agglomerations of people than we find with Type A (Trautmann and Barnes 1998:5455).

Ives (1998) reached broadly similar conclusions, although he remained agnostic on the relationship between Dravidian crossness and lineality, and preferred to take archaeological information into account. Some Dene and Algonquian kin systems have moieties or clans in the presence of attested Dravidian crossness. In the fullness of prehistoric time, it does not seem impossible that Dravidian precepts could lead to the expression of lineality without intervening Type B crossness, which could then develop

³ This should scarcely be taken to mean that there is nothing to be learned from Morgan's enterprise, for his work opened independent lines of enquiry. Kin schedules came from other correspondents, like Robert Kennicott, one of a band of enterprising naturalists connected with the Smithsonian Institution and the Audubon Club of Chicago (James 1942, Lindsay 1993). Part of the celebrated Megatherium Club, Kennicott cultivated the respect and interest of Hudson's Bay Company personnel. From 1859 to 1862 he was in Forts Liard, Simpson and Yukon, pursuing ethnological enquiry far beyond Morgan's own penetration of more settled western Canada.

There is a substantial difference in the level of effort that went into collection of the Fort Liard Slavey (recorded as A-cha'-o-tin-ne) terminology that Kennicott provided to Morgan through Professor W. W. Turner. In his correspondence to Turner of February 19, 1860, Kennicott is clearly concerned about the linguistic fidelity of his work, wants to interact with fur traders fluent in various Dene languages, knows that he has not grasped the complexity of Slavey grammar, assesses the experience of interpreters, is striving to locate older informants more likely to know earlier usages, and so forth. He concludes one passage saying "I have gone over the whole [terminology] many times and in fact have spent some 30 or 40 evenings on these short lists." When Kennicott tells us something he has learned about Dene kinship, we are obliged to take him seriously.

Morgan treated Kennicott's data in the very same fashion as his own Red Knife data, making direct entries only for the FB line running from terms 65-86. If we look directly at Kennicott's February 19, 1860, correspondence to Turner, from which Morgan must have transcribed to his circular, two things are apparent. Morgan's Table II in the *Systems* contains entries for kin loci that Kennicott did not record in his own listing, and, Kennicott made observations to which Morgan did not respond in his transcription. For instance, Kennicott registered terms for FFBS and FFBD, but not FFZD or MMBS. Those last two terms appear in Morgan's Table II in a form diagnostic of Iroquois crossness. Kennicott also recorded information for FFBS, FFBS, FFBS, and FFBD (all of these second cousins being called siblings). Morgan has only FFBS, but lists other second cousin terms Kennicott did not record directly.

Kennicott reports quite thoroughly on another important index of Dravidian crossness, the "affinal equations" that flow logically from repeated bilateral cross cousin marriages. He found many of these, including FB=MZH=FFBS, MZ=FBW, FZ=MBW=FFBD, MB=FZH. Particularly difficult to explain as anything other than the residue of Type A crossness are the equations B=WZH=HZH and Z=HBW=WBW, i.e. my spouse's sibling's spouse is my own sibling. The Kennicott correspondence confirms that Morgan enhanced data from others, just as he did his own. It also gives us snatches of independently elicited data that affirm traces of Dravidian crossness at other loci.

subsequently. Nevertheless, this is not to deny the association of Iroquois or Type B crossness with Crow-Omaha systems.

Ives (1998) felt the geographic patterning between Type A and B crossness lay not so much with a divide between northern and southern reaches of North America, but rather with those loci where sedentism, higher population densities, and greater social complexity developed (cf. Rubel and Rosman 1983). These include the northern Northwest Coast and associated interior societies (where intensive salmon fishing fueled highly productive economies), California (where salmon or acorn harvesting formed an economic base) as well as the Southwest and the Eastern Woodlands (with horticulture reliant on the Mesoamerican triumvirate of maize, beans and squash). All of these settings provided additional critical elements—sufficient residential stability to allow for increasingly complex and generational cycles of affinal exchange (such as matrilineal and patrilineal cross marriage), and a profound emphasis on sophisticated alliance building in competitive sociopolitical environments. The material traces of emergent social and economic complexity become visible in the archaeological records of these regions in time frames generally bounded by the interval from roughly 2500 to 5000 radiocarbon years before present. Ives (1998) saw these as the real historical settings in which Iroquois, Crow and Omaha precepts were likely to have emerged and persisted.

5.0. YENISEIAN KIN SYSTEMS

Information on Yeniseian kin systems and social structure has been (and likely ever will be) documented only in the case of the Ket, even though the closely related Yugh language survived into the early 1970s and a small remnant of Yugh still reside in the middle Yeniseian villages of Vorogovo and Yartsevo (Krivonogov 2003:179–182). Nothing specific is known about kinship among the southern Yeniseian groups (Kott, Assan, Arin, Pumpokol) beyond what can be inferred from individual kin terms that by chance were recorded from these languages by passing explorers and linguists in the 18th and 19th centuries (see Map C).

Studies of Ket social structure of direct relevance for the analysis of the Ket kin system began with the work of the indefatigable demographer, Boris Dolgikh, who participated in the 1926 Census in the Yenisei region and afterward produced a monograph describing Ket culture and society (Dolgikh 1934). The first English-language study of Ket social organization is a brief article by Shimkin (1939). Popov and Dolgikh (1964 [orig. 1956]) provided more information on the history of Ket social traditions. The famous monograph on Ket material and spiritual culture by anthropologist Evgenia Alekseenko (1967), based on years of fieldwork as well as valuable acquaintance with a variety of archival sources, contains many valuable observations about social organization.

All of these publications stress that the Ket retained features of an ancient dual organization, with two exogamous phratries, or moieties, organized to exchange marriage partners and perform other vital social functions. A number of smaller lineages were comprised within these two major groups, though their function and interrelationship remains unclear. The Ket term corresponding to the anthropological category of 'phratry' or 'moiety' is *hoyotpuul*, recently etymologized by Vajda and Werner (in preparation) as consisting of *hoy* 'same' + *a'd* 'bone' + *puul* 'group, accumulation', with the term *a'd* 'bone' traditionally used to refer to one's affinal kin, just as in Turkic and Mongol societies. The two primary lineages were named the Fire People (*bogdedeng*) and Large Ski-Pole Ring People (*Qentandeng*), the latter named for the size of the ring at the end of the ski-pole; the larger imprint of tracks left in the snow afforded an easy way of identifying the clan membership of any hunter passing by. Each moiety had its own legendary shamans, totemic birds, sacred spots, and hunting grounds. Burials were, by tradition, performed by members of the opposite moiety as a barrier against return of the dead to his clan. Members of each moiety sat separately during marriage ceremonies and at the important Bear Ceremony—social occasions where the two groups co-mingled. It was not permitted to give a member of the opposing moiety either fire or the dry-rotted wood shavings for use as absorbent material on the bottom of a baby's cradle.

This dual organization, which is reminiscent of that described by Rubel and Rosman (1983) as a cultural substrate in northwestern North America, survived among the Ket well into the 20th century, despite the

social dislocation that followed in the wake of the arrival of Russians and accompanying diseases, in the early 17th century. While the Yugh, who lived in an area near the Yenisei that put them in more direct contact with Russian fur tax collectors, were soon decimated by smallpox and presumably quickly lost much of their traditional social organization, the Ket, many of whom lived along the less-accessible tributaries of the Yenisei, maintained their societies essentially intact until the Soviet collectivization and sedentarization campaign of the 1930s. Since that time, Ket social structure, language use, and everyday culture began to undergo intensive Russification. Nevertheless, during fieldwork in August 2008, Edward Vajda found older Ket who still insisted on the importance of regulating marriages using the traditional phratry system. Most Ket marriages, however, no longer observe the old customs, with inter-ethnic matches becoming increasingly the norm (Krivonogov 2003).

Like that of neighboring peoples, Ket society is highly patriarchal,⁴ with strongly patrilocal residence. At the same time, occasional references in folktales seem to suggest the existence of an earlier matriarchate, with women controlling the residence of the newlyweds (Alekseenko 2001). Access to traditional hunting territories or trails is defined through the father's line, and women lose membership in their own kin group upon marriage. Popov and Dolgikh (1964) indicated that Ket clans retained territorial and economic unity in the 17th and 18th centuries, but have since been dispersed, with ties now to territorial neighbors. Shamanism was important in Ket society, and it is intriguing to note that the root referring to shamanistic magic appears to be cognate across all of the sub-branches of Dene-Yeniseian (Vajda, this volume). Ultimogeniture is the norm for inheritance, although Shimkin (1939:156) noted that shamanistic power is inherited through alternating sexes in succeeding generations.

The first publication dealing specifically with Ket kin systems is Dul'zon (1959), who provides a linguistic analysis of kin terms based on several years of fieldwork among speakers of the three remaining Ket dialects (Central Ket, Northern Ket, and Southern Ket) but based mainly on the northernmost Ket population of the Kureika River area, just north of the Arctic Circle. Dul'zon observed that the kin terms used by the Northern Ket included classificatory terms used for both sexes of siblings (*bisep*) and also for nephew/niece (*qaloq*). He also noted that all older male kin on the father's side were called by a single term (*qīp*). Descriptive terms based on gender are the norm for ascending and descending members of ego's immediate family: grandmother (*qima*) and grandfather (*qīp*), mother (*ā-m*) and father (*ō-p*), daughter (*hu'n*) and son (*hu'p*), as well as for husband (*tē-t*) and wife (*qīm*).

Yeniseian kinship is not well known in the literature, so we will cite the remaining material from two recent and larger studies involving Ket kin terms. The first is an unpublished dissertation on Ket kin terms by Kazantsev (2004), which represents the only full-length study of this topic. The second is Werner's (2006) treatment of the Ket system (cf. Table 2) in a chapter of a book devoted to interpreting the traditional Yeniseian worldview through analysis of the documented vocabulary. We have already seen that Morgan's seminal work on kin terminological systems resulted in his discovery of a fundamental polarity between classificatory and descriptive tendencies in the underlying structure of human kin systems. This broadest level of comparison is of interest with respect to Dene-Yeniseian because Dene, Eyak, and Tlingit kin systems are known to be classificatory in character. Werner (2006) noted two logical trends in the Ket terminology, one descriptive and one classificatory. Some Ket terms paralleled the periphrastic and reduplicative usages typical of their Siberian neighbors, with examples including *ap huub-da hu'p* 'my son's son', *ap hun-d hu'n* 'my daughter's daughter', *ob-da ō-p* 'father's father', *am-d ā-m* 'mother's mother', *ap bisép-t tet-da ā-m* 'my sister's husband's mother.' Werner saw this trend as an obvious and later innovation, existing alongside a traditional system of classification completely at odds with the descriptive kin systems of Ket neighbors. It is possible that Samoyedic influence is at play in this development, since the Ket during the past few centuries had intensive friendly contact with their reindeer-breeding Selkup neighbors to the west, with frequent exchange of marriage partners. The topic of Samoyedic influence on Ket kin terminology (and at older levels of Yeniseian) warrants further study.

⁴ Although Werner (p.c. to Edward Vajda) thinks they were originally matriarchal, for reasons including inheritance of the family's spirit images by the youngest son from the mother.

TABLE 2. Ket kin terms (based on Werner 2006: 78–88)

Term	Referent
<i>ōp</i>	F
<i>ā'm</i>	M
<i>tē't</i>	H
<i>qī'm</i>	W
<i>hu'p</i>	S
<i>hu'n</i>	D
<i>ap hubda hu'p</i>	SS
<i>ap hund hu'n</i>	DD
<i>obda ōp</i>	FF
<i>amd ā'm</i>	MM
<i>ap bisept tetda ā'm</i>	ZHM
<i>qī'p / qibat</i>	FF, MF, HFF, HMF, FFeB, FMeB, FMFeBS, FeBWF, FyBWF (older than F), MBWF, FeB, MeB, FeZH, MeZH, FZHZH, FFeBS, FFeBSS, HF, WF, eBWF, HMeB, HyZHF, HFB, HFZH, HFyBS
<i>qibat / qibbat baat</i>	WeB, WF, WFZH, ZH, eWBS, etc.
<i>qī'p</i> (pl. <i>qibat</i>)	GF
<i>qibbat</i> (pl. <i>qibbatan</i>)	SpF, SpB
<i>qima / qimam</i> (pl. <i>qimaman</i>)	HM, FFeBW, FFBW, MM, HBWM etc., FeZ, MeZ, eBWM, FBW, HFBW, HBWFW, SWMM, WMZ, HeZ, WeZ, HBWeZ etc.
<i>qimam / qimam baam</i>	WM, great-grandmother, WeZ, WMZ, WFZ, WeBW (older than ego or ego's wife), etc.
<i>qima</i> (pl. <i>qiman</i>)	GM, FeZ, MeZ, SpM
<i>qāl / qaləq</i> (pl. <i>qalun</i> , <i>qaləkun</i>)	SW, yWZH, WZS, WBW, WBD, WZD, WyZ etc.; HBS, DH, yZH, HyBW, HBSD, eBySW, HyBD; SS, DD, SD, DS
<i>bisep</i> (pl. <i>bisnimin</i> , <i>bistimden</i> , <i>bisnimden</i> , <i>bistimneen</i>)	Z, B, FyB, MyZ, HFB or HFZ (younger than ego's husband), eBS, eBD, eZS, eZD
<i>bistil / bistul</i> (pl. <i>bistulan</i> , <i>bistilgat</i>)	yB, yZ, WyB, WyZ, HyB, HyZ, HFyBS, MSpB, FSpB, nephews and nieces
<i>amd(i) bīs</i>	MZS, MZD
<i>qō'j</i> (pl. <i>qō'jan</i> , <i>qō'ján</i>)	MB, MZ, MZH, MBW, eMBS, eMBD, HMZ, HMB, MyB, MyZ
<i>èn</i> (pl. <i>ènn</i>)	DH, SW, yZH, yBW
<i>bē'p</i> (pl. <i>bebən</i>)	eBW, eZH, MBW, FBW, MZH, FZH, DH, eZ
<i>hūtet</i> (pl. <i>hūtatn</i>)	ZS, BS
<i>hūtam / hūyəm / hūxəm</i>	ZD, BD
<i>betat</i>	(husbands of two sisters)
<i>attam</i> (pl. <i>atnam</i> , <i>atum de'ŋ</i>)	HBW
<i>bōles</i> (pl. <i>bōlesn</i> , <i>bōlesən</i>)	SWF, DHF, DHZH, HZHZH, BZH, BDHF, SWB, etc.; also brother-in-law
<i>bōlesam</i> (pl. <i>bōlesamn</i>)	BW, SWM, DHM, yBWM, yBWMZ, FyBSWS, FyBeSWM
<i>dē'ŋ</i>	WeB, HyZH, HFeBS, yZH, HMeBS, HeBS, FyBW, WeBW, FyBSW

As noted previously by Dul'zon's (1959:95) pioneering treatment of Ket kin terms, Werner found that this underlying kin system was classificatory in nature and had terms that yielded common designations for groups of consanguines and affines. In some cases, such as that for the term *èn* (for DH, SW, yZH, and yBW), or *bē'p* (eBW, eZH, MBW, FBW, MZH, FZH) the category appears to be wholly affinal. In others, (e.g. *qī'p* or *qibat* for FF, MF, HFF, HMF, FFeB, FMeB, FMFeBS, MBWF, etc., as well as *bisēp* for FyB, FyZ, MyZ, HFB, HFZ, eBS, eBD, eZD, eZS), the categories lump kin loci that would be discriminated by cross/parallel distinctions or do include affines. At this most rudimentary level of comparison, then, we see that Yeniseian kin terminologies are anomalous for their region, providing a classificatory contrast with their primarily pastoralist Siberian neighbors, whose kinship systems are generally descriptive.

As might be expected in circumstances where very few kin terms are in play within each generation, age distinctions are important in the Ket terminology. In ego's parents' generation, siblings younger than mother or father are discriminated from older parental siblings by the term *bis'ep*, while older parental siblings receive the terms *qima* (eMZ or eFZ) or *qī'p* (eFB, eMB), these last terms also being applied in the grandparental generation (Kazantsev 2004: Figure 1, Table 1.10). With reference to ego's generation, one's younger siblings' children are equated with one's own grandchildren. Consequently, the Ket terminology is also marked by intergenerational skewing of these classificatory kin categories. Both the first ascending and descending generations have lineal/collateral distinctions in which parents are discriminated terminologically from uncles and aunts, and one's own children receive different terms from one's siblings' children. In ego's generation, however, all kin persons receive sibling terms, making for a "Hawaiian" or generational pattern.

5.1. Cognate forms shared by Dene and Yeniseian

There are three specific terms to which we draw attention with respect to potential cognacy. At the greatest level of generalization, there is the locus that caught Trombetti's (1923) attention, with Ket *de'ŋ*, Kott *čēŋ* 'people' seeming to parallel Athapaskan forms such as *diné* or *dené*. Vajda (this volume) concludes that codas originally consisting of a nasal followed by a glottal stop or other truncated element yielded a simple velar nasal in Proto-Yeniseian, supporting Trombetti's assertion that these forms are cognate with the various Dene terms for 'people'. While such terms have a rather general application, we do note that Alekseenko (1967:159) has identified the Ket vocative form *deŋó* as a singular form of address for any close affinal relative. Such usages can also occur in the Dene branch, where, for example, we see Gwichah Gwich'in, <*šidiŋdzi*> 'husband' (literally "my man") and <*šitr'ijdzó*> 'wife' ("my woman") (Ives, unpublished data; Sawyer, p.c.).

In his discussion of a rule that truncates anlaut **l* in historical Yeniseian before a front vowel, Vajda (this volume) provides the example of Proto-Athapaskan **-tən* 'brother-in-law' (WB, *ŝZH*), cognate with Southern Ket *èn*, a form used to mean 'son-in-law' as well as a variety of other affinal relatives by marriage (DH, SW, yZH, yBW). The Ket term *qāl* 'nephew, niece, grandchildren of a lineage other than your father's, and younger siblings of one's mother' might turn out to be cognate to Dene terms like **-k'ət'le* 'younger brother, male parallel cousin' in Proto-Athapaskan (Krauss n.d.; Leer, this volume #65a).

The small number of obvious cognates in kin terminology would seem to follow from the likelihood of extensive Samoyedic and possibly other neighboring influence on Ket kin systems, as well as the prospect that significant time depth separates Ket from Dene kin term uses.

5.2. Synopsis of Ket kinship

To summarize the salient facts, we can say that Ket kinship occurs in social settings with evidence of dual organization, strong patrilineality and patrilocality reflecting exogamous clans and lineages, and inheritance through ultimogeniture. The kinship terminology itself has a "layered" effect, with more recent periphrastic uses and even the prospect for borrowing of some Uralic kin terms, as well as a core or traditional terminology that Werner takes to be more ancient. That traditional terminology:

1. Has a strong predisposition to classificatory principles, standing in contradistinction

- to the descriptive kin systems of surrounding pastoral societies (Samoyedic, Turkic, Tungusic, Ugric);
2. Lacks cross/parallel distinctions, yet has some separate affinal terminological uses;
 3. Adopts a "generational" character in G^0 , such that all are siblings;
 4. Has G^1 and G^{-1} lineal/collateral distinctions;
 5. Has some intergenerational skewing most likely related to elder/younger sibling discriminations in adjacent generations;
 6. Appears at present to involve only three cognate terms, though Dene-Yeniseian linguistic comparison is still very much a work in progress. Such a small number of cognate forms are too few for any clear semantic patterning to emerge.

It should be patently obvious that the Ket kin terminology cannot be conveniently categorized in customary anthropological terms. Its current form is the consequence of complex developmental and historical processes, a supposition certainly warranted by the current cultural geography of the remaining Ket communities. We turn now to the question of whether any predictable processes might have the capacity to align what is known of Dene and Yeniseian kin systems.

6.0. PROCESSES IMPLICATED IN THE DEEP CHANGE OF DENE, EYAK, AND ATHAPASKAN KIN SYSTEMS

In conceptualizing long-term change in kin terminologies, one might think that processes of change should lead to various rates of "decay" among essentially independent terms in a kin vocabulary. This is not the case, however, because rosters of kin terms have systemic qualities, with integrated usages. Consequently, there are constraints and pathways likely to effect such change, since kin terms cannot freely vary without corresponding adjustments. It is helpful to make two distinctions in the particular case of Dene, Eyak, and Athapaskan kin systems. As we have seen already, some changes in these kin systems have followed pathways that involve shifts that may elaborate but nevertheless go "with" the inherent cross/parallel logic of the kin system, shifts that have been known for some time in the anthropological literature (toward Iroquoian and Crow/Omaha semantic structures). Other changes can be said to begin a process that seriously erodes or alters the underlying cross/parallel logic of the kin system.

In the Dene-Eyak-Tlingit case, there is a strong justification for arguing that the underlying rationale in the kin terminologies concerned cross/parallel distinctions. One upshot of the *Transformations in Kinship* volume was the recognition that categories for "crossness" were inevitably tinged with affinity (cf. Asch 1998; Viveiros de Castro 1998). The most immediate link occurs in Dravidian crossness, where kin categories flow directly from the logic of bilateral cross cousin marriage, replicated each generation (Figure 1). The other varieties of crossness are in all likelihood linked to long-term cycles of marital exchange between groups, taking a number of generations to elapse. In a certain sense, the different varieties of crossness are modalities that speakers can select with respect to broader affinal strategies. Much as Trautmann and Barnes (1998) have argued, then, there is a cross-cultural basis for thinking that Dravidian cross reckoning has a significant tendency to give way to an Iroquois mode of cross reckoning, in which separate affinal terms come to be applied. When these processes are carried further, they may yield Crow/Omaha distinctions, in which intergenerational skewing affects the terminology. In this stepwise trajectory, certain cross/parallel distinctions are modulated, but other cross/parallel distinctions persist.

6.1. Dene kin terminologies where cross reckoning is systematically diminished

Yet, some Dene kin terminologies exhibit no trace of crossness in some or all generations. These terminologies retain a preponderance of cognate kin terms (i.e. there is no doubt that they are Dene terminologies), but their semantic properties are governed by other principles, more in keeping with generational or lineal/collateral distinctions. There must be processes that transform prototypical kin

terminologies with cross/parallel distinctions into those that lack such distinctions. Mackenzie Basin terminological structures seem to provide a pivotal intermediate step in the processes of change likely to be involved. As noted earlier, Mackenzie Basin terminologies feature cross/parallel distinctions in G^1 and G^{-1} , but apply sibling terms across the entire kin spectrum in ego's generation. We have already noted that this kind of terminological structure does appear in conjunction with Iroquoian or Type B crossness (e.g. in the Athapaskan world, among Plains Apache, and in Algonquian, among Arapaho and Cheyenne). Among Mackenzie Basin Dene speakers, this terminological structure occurs in the presence of Dravidian or Type A crossness. Tjon Sie Fat's (1998) mathematical modeling of associative rules would suggest that the Mackenzie Basin form has stable and predictable properties.⁵

In its Mackenzie Basin appearance, this is not an abstract typological issue. Subarctic and treeline ecosystems present significant challenges to Dene speakers, who must deal with both periodic abundances and scarcities of resources. In such contexts, tactical uses of cross kin terms within local groups imply or result in situations where marriageable partners will exist among co-resident individuals. Inwardly focused marriage practices reduce the prospect for external alliances. While this certainly conveys advantages in forming larger groups suitable for communal hunting, or in adopting large group sizes suitable to middleman fur trade roles, for example, it does leave these groups prone to dislocations when more difficult conditions prevail—such groups forego external alliances that might otherwise be called upon in times of hardship (Ives 1990). Local groups that are strictly exogamous circulate individuals in a broader society, facilitating a web of external kin ties. Mackenzie Basin kin terminologies in these Dene communities thus concern something of great strategic moment. They allow for a high degree of flexibility surrounding the sibling cores at the heart of these communities, and retain cross/parallel principles through which both like and unlike sex sibling cores are regarded as acceptable. Yet, by rendering all children of these sibling cores as siblings themselves, they require subsequent local group exogamy. In that Mackenzie Basin variants are more common west of the continental divide, one must suspect that this external web of alliances is highly significant in providing a variety of economic and political options.

To codify this line of reasoning, we would say that:

1. Mackenzie Basin terminological systems readily accommodate a variety of marriage forms for sibling cores (like sex, unlike sex, and unrelated couples) that leave a "bifurcate merging" structure intact in the first ascending generation.
2. For any small-scale demographic setting formed from any of these sibling cores, the logic of zero generation Mackenzie Basin terminologies makes all co-resident children siblings, and thereby requires local group exogamy.
3. There is a strong correlation between this predisposition toward local group exogamy and social, economic and political environments that favor extensive external alliance building through marriages.
4. Consequently, there is considerable justification for adopting the position that strong forces promoting exogamy are one constant in small to moderate-size demographic settings where we find an absence of zero generation crossness, but where cross/parallel distinctions are retained in adjacent generations.

In this context, the gross terminological structure revealed by the Yafar pattern should catch our attention. It seems clear, given its widespread distribution in the Americas, that the Mackenzie Basin pattern is a stable formation. One must ask, nonetheless, if it is conceivable that the forces capable of eroding crossness in ego's generation might not be capable of affecting crossness in adjacent generations? Leaving aside the precise nature of the crossness rendered in Morgan's Red Knife terminology, the answer would certainly seem to be in the affirmative. In Table 3, we plot only those Red Knife kin terms actually elicited

⁵ Tjon Sie Fat (1998:92, note 14) focused on Iroquoian variants of zero generation terminologies that have only sibling terms, but indicated that an analogous range of Dravidian-generational structures could also be modeled.

TABLE 3. Morgan's Red Knife or Täl-sote'-e-na kin terminology

Term	Referent
G²:	
<set-see'a>	FF, FF _B
<set-sa'nä>	FM
G¹:	
<se-thá'>	F
<a-n ä'>	M
<ser'-a>	MB
<seth'-a>	HF, WF
<säk're'-a>	StM, MZ
<set'-so>	FZ, FBW, MBW, HM, WM
G⁰:	
<sü-nä'-gä>	eB, e(FBS)
<set-shi'-ya>	HB, ♀ZH, ♀FBDH
<sa'-o-gä>	♂FBDH, ♂ZH, WB
<set-de'n-na>	H
<set-chil'-e-ä-ze>	yB, y(FBS)
<set-dez'-a-ä-ze>	eZ, e(FBD)
<sä-kre'-a>	eZ
<set'so>	♂FBSW, WZ
<sa'-oga>	♀FBSW, WZ
<set-se-ä-na>	W
<sä'-re>	yZ, y(FBD)
<sä-kre'-a>	yZ
G⁻¹:	
<se-yä'-za>	S, ♂BS, ♀ZS, FBSS, FBDS, StS
<sa-le'-ä>	D, ♂BD, ♂ZD, FBSD, FBDD
<si'za>	♀S, ♂BS, ♂ZS
<set-thu'-yá>	♂BSW, ♂ZSW, SW
G⁻²:	
<se-yä-zet-tha-re>	SS, DS, BSS
<sa-le-zet'-thare>	DD, SD, BSD

by Morgan in the limited time he spent recording them at Fort Garry on August 6, 1861.⁶ This table requires several observations. First, it provides unique information that could not, after Morgan's time, be replicated ethnographically. Second, because the table concerns only elicited terms, these are presumably data not affected by Morgan's subsequent efforts to infer a pattern of crossness, thereby adding his own semantic interpretations (as he presented in Table II of the *Systems*) for terms he neither elicited nor actually wrote down. Finally, there is sufficient change in this terminology that we have elected not to present it in the

⁶ These are presumably data not affected, then, by Morgan's subsequent efforts to infer a pattern of crossness, whereby he added his own semantic interpretations for terms he neither elicited nor actually wrote down.

"Dravidian paradigm" or diagrammatic convention (see Trautmann 1981; Ives 1990).

Were we to have done so, however, the assembled terms would reveal a pattern in which there is no G⁰ or G⁻¹ reflection of cross/parallel distinctions. We find persuasive the notion that members of a parental generation could promote a strong ethic of exogamy by ensuring not simply that their children regarded each other as siblings, but that their children's children did so too. The residue of such an impetus would have the gross terminological structure Morgan recorded for the Red Knife: a "bifurcate merging" G¹ terminology, with generational or Hawaiian precepts cascading downward from G⁰ to G⁻¹ kin terms. Use of principles of group formation still favoring the uniting of sibling sets could allow the "bifurcate merging" parental terminology to persist for some time after cross reckoning had ceased to exist in descending generations, but the relative rarity of such terminological structures on a global scale may mean that they are transient phenomena⁷.

Finally, we might ask if these same processes were carried to a conclusion, what end product would exist for the terminological pattern? The precept of crossness in the parental generation could eventually be construed as having reduced application once it had disappeared in G⁰ and G⁻¹. If cross reckoning ceased to be operative among proximate relatives in this generation, the semantic dimension of crossness would be eliminated, resulting in a Hawaiian or generational cast to the entire terminology.

Very little thought has been devoted to the potential for these historical processes, but such terminologies absolutely do exist in the Dene world. Crossness has effectively vanished in the Tsuut'ina (Sarsi) kin terminology, as reported by Jenness (1938). Reaching the Plains from the headwaters of the Athabasca and North Saskatchewan Rivers toward the end of the seventeenth century, the Tsuut'ina entered a loose confederacy with the Blackfoot peoples at the turn of the 19th century. In the following century they assumed much of Blackfoot ceremonial life, and led an indistinguishable lifestyle. Jenness' Tsuut'ina kin terminology is one of the most simplified in the Dene world. Cross-reckoning is effectively gone in G⁰ and G⁻¹, where only elder and younger sibling as well as separate affinal terms are to be found in the former generation, and where own and sibling's children tend to be classed together in the latter generation. In G¹, FZ is distinguished, but note that FB and MB receive a single term, as do M and MZ, so that cross reckoning is not occurring, and there is a tendency more toward a generational than a lineal/collateral framework.

We note also that factors affecting cross reckoning can lead toward lineal/collateral distinctions in Dene terminologies. Ives (1990) explored this in kin terminologies from various Chipewyan (Dene Sųliné) communities. Some Dene Sųliné, such as at Cold Lake, have provided a Dravidian semantic framework, but other communities, such as Snow Drift and Mission, have not. Those latter terminologies, while again using a Dene kin vocabulary, made lineal/collateral distinctions in each of the three medial generations (e.g. distinguishing siblings from "cousins" [both cross and parallel]). These shifts toward an "Eskimoan" semantic framework are sometimes attributed to Fur Trade and missionary contact, but it is important to note that: (1) such historical forces scarcely had the same affect across the Dene world (when they ought to, to have explanatory force), and (2) Caribou Eater Chipewyan principles of group formation and local group development processes accorded rather precisely with a more dispersed pattern of exogamous alliance formation that would favor just such lineal/collateral distinctions.

A pattern with lineal/collateral distinctions occurs in some parts of the Southern Carrier world, too. This is particularly so for those Carrier communities in contact with the Bella Coola, who evince precisely the same terminological pattern as their coastal neighbors (again, see Ives 1990 for a summary). Lineal/collateral distinctions are explicitly reckoned in these circumstances, with marriage in the Nadleh Whut'en case being governed by the *Law of Four Sticks*, which stipulated that neither siblings nor first, second, and

⁷ Other aspects of this terminology are reminiscent of certain trends we saw in the Ket kin term schedule. For instance, there is intergenerational skewing for terms such as <set'so>, <set-shi'-ya> and <sä-kre'-a>, along with lineal/collateral distinctions for <sel-the'-ne> and <set'so>. We note that Red Knife or Yellowknife society underwent profound changes after the dominance of the Red Knife leader Akaitcho became significantly diminished early in the 19th century (see Helm and Gillespie 1981).

third cousins could marry (McQuary and Poser 1996).⁸

Finally, at yet another geographic locus, we note that Gwich'in kin terms are also marked by the severe erosion of crossness, in the presence of lineal collateral distinctions. This is evident in data from Morgan's era: in the University of Rochester Morgan Papers, the Tukuth Gwich'in schedule collected by McDonald in 1865 has no sign of crossness in all generations. Sapir's (1936) description of Gwichah Gwich'in also makes it clear that crossness has been extinguished in all generations. Ives (unpublished data; Sawyer, pers. comm.) has carefully traced modern Gwichyah Gwich'in kin terms (including all second cousins and a variety of other more distant genealogical loci) with a highly knowledgeable speaker: no cross reckoning whatsoever is present. Lineal/collateral distinctions obtain in the first ascending and descending generations, with mother and father distinguished from aunts and uncles and children distinguished from nieces and nephews. In ego's generation, the pattern is Hawaiian, with all siblings and cousins classed together in either elder or younger categories. The categorical treatment of kin classes is decidedly reminiscent of that seen in the Ket terminology.

6.2. Attritional processes in kin vocabulary change

Male zero generation kin usages in Dene terminologies exhibit semantic patterning difficult to explain without reference to some of the internal processes just noted (Ives et al. 2002). In fact, these points of tension in cross/parallel kin distinctions are informative with respect to attritional shifts that would have the capacity to create long-term change in kin terminologies. Intriguingly, the Ket term *en* (for DH, SW, yZH, or yBW), which we suggest is cognate with Proto-Athapaskan **-tʰən* for WZ and *σʰZH*, also occurs within this realm. Krauss (n.d. [1977] 42) further elaborated that **-tʰən* may be related to Proto-Athapaskan **-tʰag* or **-tʰax*, for WZH, HBW, WBW, or BWB, or SbSpSb more generally. This last semantic locus is of high diagnostic value with respect to cross/parallel distinctions: in Dravidian or Type A frameworks, with their underlying logic of bilateral cross marriage, SpSbSp is expected to be a sibling, classificatory or otherwise (see Z=WBW in Figure 1 and Figure 2). Any shift away from this logical framework severs this equation, with important systemic consequences.

In order to explore this variability, we have laid out a modest sampling of Na-Dene elder male kin terms for G⁰ in Table 4. This shows quite clearly that some of these terms have the capacity to travel across semantic boundaries one might otherwise think would be profound, and potentially impenetrable, while others do not move so widely. The most stable of the Dene terms features derivatives of the term used for elder male sibling or parallel cousin, which is **-unəyə* (the en-dash in this and following examples standing for the possessor prefix slot, as kin terms in Dene languages are obligatorily possessed).

By far the most "semantically mobile" of the G⁰ male terms are those that derive from Proto-Athapaskan **-tʰən* or **-tʰag* ~ **-tʰax*. Hedican (1986, following Kroeber 1937) explored one of these derived terms, *<sela>*, in some detail. In the Apachean world, *<sela>* can be part of a "double sibling classification" in which there are four sibling terms (marked by elder/younger and male/female distinctions) accompanied by a two-part terminology for "opposite-sex" and "same-sex" sibling. For some Apachean cases, the two-part sibling terminology is the only one in play, having completely supplanted the four-sibling term system. Hedican (1986) observed that the Athapaskan double sibling classification had parallels in Eyak, Tlingit, and Haida. He felt that a Na-Dene double sibling classification began to break down in Proto-Athapaskan, and continued to do so for Alaskan, Canadian, and Pacific Coast speakers. It received renewed expression in Apachean, at which time a new kin term, *<si'k'is>* (same sex sibling) emerged to accompany *<sela>* (opposite sex sibling).

Hedican's developmental sequence is feasible, but not entirely convincing. First, although Hedican argued that Proto-Athapaskan featured its own double sibling classification, it evidently possessed only a term for sibling of the opposite sex to counterbalance the eB, yB, eZ, yZ system, and nothing for same sex sibling. This lack of symmetry is somewhat puzzling. Krauss (n.d. [orig. 1977]) also suspected that the Eyak pattern might have arisen because of recent Tlingit influences, a fact that would limit the historical scope

⁸ Therefore making marriage possible only after four "removes" from ego's own line.

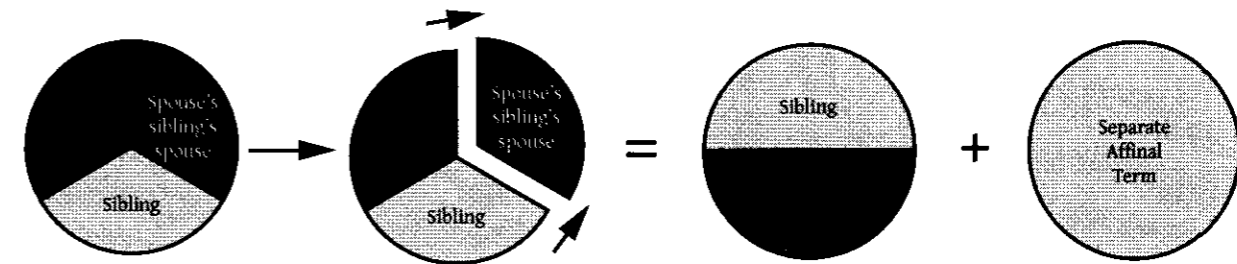


FIGURE 2. Component meanings of a kin term might be "detached" when Dravidian or Type A equations are ruptured. Where a single term had represented Z=MZD=FBD=WBW, for example, the affinal portion of the equation could lapse if Dravidian or Type A crossness were not retained. The term might persist for Z=MZD=FBD usages, with another term denoting WBW. Or, the original term might take on a purely affinal meaning, while another term subsumed the sibling/parallel cousins role.

of the antecedent pattern. Hedican focused on just a few instances of opposite sex sibling terms like *<sela>* (Tsuut'ina, Dena'ina, Tolowa) in reaching his conclusion. With the larger corpus of data as in Table 4, it is apparent that terms like *sela* can have meanings including "cousin," parallel cousin, cross cousin, spouse's sibling's spouse, and brother- or sister-in-law. Analysis of the term must reflect this diversity. Finally, in terms of parsimony, the sequence of events Hedican proposed is complex. The Na-Dene double sibling classification would need to break down in Proto-Athapaskan, and disappear for Alaskan, Pacific Coast, and Canadian speakers (with many of the latter Dene being closely related to Apachean speakers). The double sibling classification then reappeared in Apachean.

Nevertheless, the conundrum of "coming and going" that confounds Hedican's argument is a fruitful area for further thought. How is it that one kin term can move so readily across the entire spectrum of meanings available in ego's generation? Several patterns are evident in Table 4. Kaska, Hare, Wrigley Slavey, and Dene Suliné all reflect an essentially Dravidian crossness, in which eB, e(FBS), and e(MZS) each receive a single parallel term, while male cross cousin and brother-in-law are equated and receive a single cross term. Gwichah Gwich'in, Tsuut'ina, Dogrib, Bear Lake, and Chiracahua (where the same sex/opposite sex distinction has supplanted other sibling terms) and Kiowa Apache each capture siblings and cousins with a single term, discriminating only the brother-in-law. Ahtna and Navajo equate siblings and parallel cousins, but discriminate cross cousins from affines. Snowdrift Chipewyan segregates the sibling term from all cousins, while providing a separate term for brother-in-law; Babine-Witsuwit'en has a separate term for each locus. These final cases make lineal/collateral distinctions in ego's generation, as we saw previously. Some of these instances could result from borrowing, as is the case with Gwichah Gwich'in, where it seems to have been introduced from other Mackenzie Basin Dene⁹ (Sawyer, personal communication 2002). Even so, *<sela>* is integrated with the inherent logic of other kin terminologies, suggesting the need for a more systematic explanation.

In Figure 3, we construct a model in which the kin term patterns observed in Table 4 are represented simply by letters. The subscripted letters can be conceived of as components of meaning associated with a particular kin term, or as subsidiary kin terms. The barred vertical line represents the boundary denoting incest in different Dene societies. The appearance of a term like *<sela>* at any given locus could simply reflect its retention from the Proto-Athapaskan condition where, following Krauss, one would lean to meanings involving sibling/parallel cousin/spouse's sibling's spouse. We know, however, that G⁰ cross/

⁹ With respect to the shifting and splicing of kin terms we are about to consider, this could be another intriguing—some might even say likely—point of departure: a Dene term or kin term entering a Dene language from other Dene neighbours, then assuming particular semantic dimensions as it is integrated in kin usage. Sawyer specifically indicated that *sela* was used as a way of making other Mackenzie Basin Dene (Bear Lakers and Hare), related by marriage to Gwich'in families, more comfortable in referential usage.

TABLE 4. A Sampling of Na-Dene kin terms for zero generation males (Elder)

	Sibling	Parallel Cousin	Cross Cousin	Affine	
				ZH/WB/WB	SpSbSp
Eyak	♂-xəwəx ♀-ədkih	♂-xəwəx ♀-ədkih	-tʰlaʰ	-tʰaʰwɪʰih	-ləxeʰnah (WZH)
Proto-Athapaskan	*-unəyə	*-unəyə	♂*-udə ♀*-zædə	*-tʰən	*-ləG, *-ləx
Ahtna	-unghae	-unghae	-udae, -tlæn	♂-tlen ♀-ghae	-latsiin Friend, Partner
Gwichah Gwich'in	<-ōndé>	<-ōnde>	<-ōndé>	♂ <-la>, <sq> ♀ <-kai>	Periphrastic usages
Witsuwit'en (Bulkley Carrier)	-unyi	-ətsen	-undi	-yi	-ləx
Tolowa	<-onigi>, <-laʔe>	<-onigi>, <-laʔe>	<-onte>	<-ge>	<-la-sen> WZH
Ross River Kaska	-edayā	-edayā	-eslah	-lah	
Hare	<-oʰtie>	<-oʰtie>	<-la>	<-la>	
Sahtú Dene, (Bear Lake)	<-əde>	<-əde>	<-əde>	<-la>	
Tłichə (Dogrib)	<-iʰde>	<-iʰde>	<-iʰde>	<-ye>	
Pe Ts'éh Kí (Wrigley Slavey)	<-əinde>	<-əinde>	<-gheh>, <-lah>	<-gheh>, <-lah>	
Dene Sųliné (Cold Lake)	-unaye	-unaye	-ye	-ye	
Dene Sųliné (Snowdrift)	<-ounnare>	<-lla>	<-lla>	<-tchaye>, <-rre>	
Tsuut'ina (Sarsi)	-nóghà <-lâ>, <-lâ>†	-nóghà	-nóghà	♂-ndàlì ♀-óónijàní	
Navajo	-ínaaí, ♀-lah, ♂-k'is	-ínaaí, ♀-lah, ♂-k'is	♀-zeedi ♂-it naa'aash	bíyè nishlì bit ashhéhé	bit ashhéhé
Chiracahua Apache	♀ <-lâh>, ♂ <-k'is>	♀ <-lâh>, ♂ <-k'is>	♀ <-lâh>, ♂ <-k'is>	<-à'dyèhìs>, <-á'iyèhn>	
Plains (Kiowa) Apache	<-dâyá>, ♀ <-lâh>, ♂ <-t'sisé>	<-dâyá>, ♀ <-lâh>, ♂ <-t'sisé>	<-dâyá>, ♀ <-lâh>, ♂ <-t'sisé>	<-zéxdâ> ♀ ZH, HB <-bâxdâxnâ> ♂ ZH, WB	<t'sisé> WZH <-lâh> HZH

Note: Terms reproduced in original orthographies, but regularized as stems without the first person possessive prefix, as cited by the authors listed below. Sources: *Eyak*, and *Proto-Athapaskan* (Krauss n.d. [1977]); *Ahtna* (Kari 1990:699); *Gwichah Gwich'in* (Ives and Sawyer, unpublished data; but see also Sapir 1936:136-137); *Witsuwit'en* (Bulkley Carrier)

Notes for Table 4 continued on next page

Dene-Yeniseian and Processes of Deep Change in Kin Terminologies

Sibling	// Cousin	X Cousin	Affine	SpSbSp
Term D Losing Affinal Quality, Becoming Purely A Sibling Term				
A _[D]	A _[D]	B _[E]	B _[E]	A _[D]
A/D	A/D	A/D	B	B/D
D	D	D	B	B
Term D Becoming Purely Affinal				
A _[D]	A _[D]	B _[E]	B _[E]	A _[D]
A	A	A	B/E/D	B/E/D
A	A	A	B/D	B/D
A	A	A	D	D
Term B Losing Cousin Connotation and Becoming A Sibling Term				
A _[D]	B _[E]	B _[E]	C _[F]	C _[F]
A/D/B	A/D/B	C _[F]	C _[F]	F
B	B	C	C	F

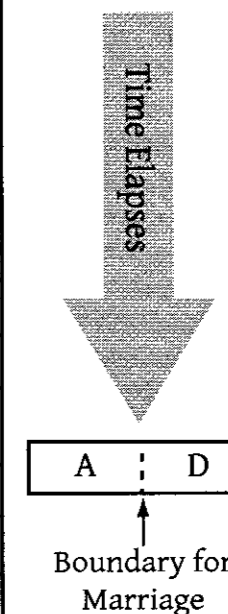


FIGURE 3. A diagram indicating how the component meanings of G⁰ kin terms, or subsidiary kin terms in a kin system (the subscripted letters), might shift in usage as the boundary at which acceptable marriages may occur expands or contracts.

parallel distinctions are a major field of play in Dene kin terminologies. Consider what happens when the logic of a kin system departs from Dravidian crossness by rendering cross cousins as siblings. For <selə>, it is difficult to maintain all the component meanings of eB=e(FBS)=e(MZS)=SpSbSp. Most vulnerable is the last term of the equation. The chain of connections makes it likely that the affine in question will be a complete stranger to ego, not a sibling or classificatory sibling. At a minimum, such a term begins to have ambiguous, potentially contradictory meanings. At a maximum, the term would need to be brought into alignment with the altered social circumstance. It might become an alternate sibling term, through time even gaining a favored status and losing any affinal quality (as in the first three rows of Figure 3).

Or, it might lose its sibling qualities, taking on a purely affinal nature (the middle three rows of Figure 3). If a term like <selə> started at a locus where it had cross or affinal content, as in Ahtna or Hare (where MBS=FZS=ZH=WB=HB), then a "Mackenzie Basin" shift (Ives 1998) would in all likelihood push the term to

Notes for Table 4 continued from previous page

(Jenness 1943:526-527 plus Hargus 2007); *Tolowa* (Dyen and Aberle 1974); *Ross River Kaska* (Kaska Tribal Council 1997); *K'sasho Go'tine* (Hare) (Hara 1980); *Sahtú Dene* (Bear Lake) (Rushforth 1984: 55-56); *Tłichə* (Dogrib) (Helm 1981:302); *Pe Ts'éh Kí* (Wrigley) Slavey (Asch 1972:47-60; 1988); *Dene Sųliné* (Snowdrift) (Van Stone 1965:70-71); *Dene Sųliné* (Cold Lake) (Elford and Elford 1981); *Tsuut'ina* (Sarsi) (Jenness 1938 and Starlight and Donovan 1996); *Navajo* (Shepardson and Hammond 1970 and Young and Morgan 1987); *Chiracahua Apache* (Opler 1955); *Plains* (Kiowa) *Apache* (McAllister 1955:104-106).

† As noted by Dyen and Aberle (1974:453), from Hoijer (1956), Sapir recorded this Tsuut'ina usage for B. Note that related parallel cousin usages occur in some Dene Sųliné, and that a cognate term comes into important or even exclusive male sibling use in Apachean.

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reflect only the affinal parts of the equation as the cross cousins become siblings. This movement to the right in the diagram can be contrasted with movements to the left. If our candidate term <selā> occupied a locus where MBS=FZS=MZS=FBS (Snowdrift Chipewyan), re-imposing Dravidian crossness precepts could cause a need to choose upon which side of the cross/parallel divide a term would lie. The term could be “captured” in the parallel realm as a subsidiary sibling term, ultimately expanding in use through time (the last three rows of Figure 3). Thus, we would say that manipulation of cross/parallel distinctions does provide a logical basis for these shifts; what we know of the underlying motivations for such shifts is consistent with fundamental social and economic choices affecting the societies in question.

If <selā> speaks to some ancient Dene kin usages, <si'k'is> (the same sex sibling form in Navajo, Western Apache, Chiracahua, and Mescalero, alongside Jicarilla <-k'isé>, Lipan <-k'isi>, and Kiowa Apache <-t'sisé>) has no such claim (Opler 1936; 1955; Donald and Tighe 1987; McAllister 1955). While this term becomes the logical counterpart to <selā>, it is an innovation in Athapaskan kinship, appearing only among Apachean societies (Dyen and Aberle 1974). Krauss (n.d. [1977]) offered meanings like Hupa -q'is, Chipewyan -k'ad, and Eyak -q'as for ‘mate, one of a pair’ as prospective sources¹⁰. Hoijer’s (1956) kin rosters also included Sapir’s finding for -k'is in Tsuut'ina, again “partner, mate.” Such words may have provided a straightforward inspiration leading to the kin term <si'k'is>. But this is likely not the whole story. Several factors suggest that Blackfoot and Apachean ancestors may once have occupied the northern Plains together. The PA root *-q'as, sporadically present throughout Dene languages, is surprisingly homophonous with a kin term of great significance in the Blackfoot world.

The relevant form in Blackfoot that may have inspired the Apachean innovation is the Blackfoot form <k'is> or <k'isa>, “thy or your elder brother” (Uhlenbeck 1913:32–35). The Blackfoot root for the word ‘brother’ is <-i's> (Frantz and Russell 1989:336). It is inalienably possessed. Hence, my elder brother is <n'is>, with <ni> being the Blackfoot first person singular possessive prefix. Note also <nisis> (‘my younger brother or sister,’ a woman speaking) (Hanks and Richardson 1945). The second person singular in Blackfoot is <k'>, leading to “your elder brother,” <k'is>, and <k'isis> (‘thy younger brother or sister,’ speaking to a woman) (Uhlenbeck 1913:32–35). Blackfoot ceremonial life is, in significant measure, comprised of rituals conducted by a series of age-graded societies, in which concepts of brother- and sisterhood (and other forms of both real and fictive kinship) are elaborated to a great degree. Many of these precepts receive equally heavy emphasis in Tsuut'ina ceremonial life (Jenness 1938). The emergence of key elements in Blackfoot ceremonial life is evident not only in Blackfoot oral traditions, but in the material traces (such as specific medicine wheel forms, Napi effigies, and iniskim or buffalo charming stones) accompanying the onset of the Old Women’s Phase ca. 1250 years ago on the northern Plains (Vickers and Peck 2009). If, as we argue elsewhere (Ives, this volume; 2003; Ives et al. 2002), Apachean ancestors lived in proximity to Blackfoot ancestors (not unlike Tsuut'ina people today and in the recent past) in that very time frame, we can be assured that Apachean speakers would have heard frequent, remonstrative repetition of the second person singular Blackfoot form, “your brother,” <k'is>, perhaps along with <k'isis>, in alliance building and ceremonial contexts. Blackfoot <k'is> is a bisyllabic word with stress on the initial syllable. To an Apachean ear, this stressed syllable might have triggered an association with the semantically compatible stem <-k'is>, to which would then be added the obligatory Athapaskan possessive morphology yielding <si'k'is> (my same sex sibling).

<Sela>, derived from Proto-Athapaskan usages such as *-tʰən or *-tʰag ~ *-tʰax, has a longer history, with the capacity to become a sibling term in some Dene languages, and an equally strong tendency to shift to cross cousin and sibling-in-law meanings in other Dene languages. In its Ket incarnation ɛn, it appears in a purely affinal mode, with G⁰ and G⁻¹ in-law usages. To foreshadow our larger conclusions, we have an abiding suspicion that such a categorization could very easily have arisen when splicing and shifting processes connected with extinguishing crossness in ego’s generation were altering the original cross/parallel distinctions in proto-Yeniseian kinship. Correlatively, the Apachean term <si'k'is> (my same-sex sibling)

shows how other processes can promote non-kin terms into prominent new roles, even for a semantic position as elementary as that for “sibling,” causing core kin vocabulary change.¹¹

6.3. Is the Ket terminology anomalous from a Dene perspective?

In the previous section, we attempted to show how prototypical Dene kin terminologies with a full complement of medial generation cross/parallel distinctions (very likely of Dravidian form) changed in ways such that those cross/parallel distinctions disappeared in a number of daughter systems. The distributional evidence strongly suggests that fully Dravidian Dene systems tend to shift toward a gross structure of Mackenzie Basin form (all zero generation kin are siblings) where principles of group formation favor local group exogamy. In yet other instances, both zero and first descending generation crossness can be eliminated, though it persists in the first ascending generation. Finally crossness can vanish in all medial generations, leaving a terminology of generational form. In an alternate pathway, crossness can similarly be eroded in all medial generations, but lineal/collateral distinctions are set up.

In cases like the Tsuut'ina or Southern Carrier, we suspect that complex historical forces were also at play. As we saw earlier, Navajo, Western Apache, and Pacific Coast Athapaskan kin systems align well with the properties of neighboring kin systems. In the Tsuut'ina case, uncle/aunt and nephew distinctions are also subsumed by elder/younger sibling terms (an intergenerational skew). The overall pattern is highly reminiscent of Blackfoot kinship—which itself could conceivably reflect the long-term breakdown of a Crow kin terminology in a Plains setting (Ives 1998; Hanks and Richardson 1945). Even if a Blackfoot model were to be the inspiration for the terminology, however, we note that the Tsuut'ina were exogamous in their marriage practices. For our present purposes, we need only say that Dene speakers in various settings can bring their kin terminologies into alignment with neighboring conceptual arrangements lacking crossness, that they can explore internal processes leading to the same result, or that both phenomena may work together. In the end, however, the outcome is the same: there is a progression toward terminologies with generational and lineal/collateral overtones in which large classificatory categories exist, although these categories no longer adhere to a cross/parallel logic.

From this perspective, we believe that the Ket system no longer appears so divergent in its semantic structure from what we know of Dene, Eyak, and Tlingit kinship. The periphrastic and potentially Uralic terms indicate accretional historical change overlaying what Werner suspected of being a core, traditional terminology. That core terminology could have semantic features also deriving from historical contacts, but in no way would it be mysterious to suggest that its semantic structure arose because one or more daughter Yeniseian systems made an exploration of predictable development processes. The core Ket terminology bears striking semantic resemblances to Gwich'in, Tsuut'ina, and various Carrier kin terminologies. At their conclusion, the developmental processes affecting Athapaskan societies destroyed the principle of crossness, leaving behind simplified, classificatory kin categories. We know that these shifts invariably involved settings in which co-residential or kin group exogamy was highly valued, or indeed, required. There is considerable justification for thinking that Yeniseian kin systems were affected by similar processes, thereby explaining their current form.

The processes we have discussed are also suggestive with respect to the limited number of cognate forms we can now detect between Dene and Yeniseian. It is reasonable to think that the break-up of the Tlingit, Eyak and Athapaskan speech community has been under way since roughly the mid-Holocene interval (ca. 4000–6000 years) (cf. Krauss and Golla 1981), injecting a significant temporal dimension for our consideration. More pertinently, Krauss (n.d. [orig. 1977]:32) noted that Proto-Athapaskan *-unəyə (eB, eFBS, eMZS) is the only one of the four Athapaskan sibling terms that is demonstrably cognate with an Eyak (♂ -xəwəx) and Tlingit sibling term (♂ -h'w'x^w), with the possible exception of Proto-Athapaskan *-ədæ (eZ) and Eyak -ədkih (♂ Z). We believe that zero generation elder male kin terms (including those for siblings) have cycled through

¹⁰ Kari (p.c. 2010) elaborates that Proto-Athapaskan *-q'as, *-q'azə has a numeral meaning ‘one of a pair, a mate’ like one shoe; as a postposition it means ‘along side P’. Some languages use the term as an animal’s mate. Only in Apachean does it assume a specific kin meaning.

¹¹ The restricted Dene distribution of this innovated same-sex sibling term is itself evidence for a small and coherent founding Apachean population that would subsequently grow and diversify.

related semantic frameworks that evidently have greater stability than their constituent kin terms.¹² Because so few sibling terms managed to persist among those three language groups situated near each other in North America, it is not surprising that there are no shared sibling cognates between the Yeniseian and Dene branches. This reasoning can be applied in each generation, where we would expect intense historical and developmental processes to take a similar toll, given equal or greater time depths. Kin terminology in Dene-Yeniseian societies may have been a somewhat more volatile area of the lexicon than ordinarily thought.

7.0. THINKING ABOUT AN ANTECEDENT DENE-YENISEIAN KIN SYSTEM

At this stage of our discussion we are in a position to evaluate some propositions concerning early Dene-Yeniseian kinship. Ideally, one would like to have access to a reconstruction of a proto-Dene-Yeniseian kin system. It should already be apparent, however, that various forces of change and attrition have left little in the way of cognate forms that would allow for meaningful reconstruction of a semantic pattern. Nor do we have a proto-Dene-Eyak-Tlingit kin reconstruction, from which the semantic properties of that early kin system could be evaluated. It is important to bear in mind some of the impediments that would exist for even this work. Regrettably, many North American ethnographers and linguists take little interest in more penetrating analyses of kin systems, with the result that diagnostic indices for discriminating patterns of crossness go unattended. Reconstructions based on currently available kinship data will inevitably be limited by this state of affairs, in turn setting limits over the extent of reconstruction possible. Of course, the deeper in time we probe, the more likely we are also to encounter shifts and changes in terminology, making comparisons for purposes of reconstruction more fragmentary in yet another, predictable way.

Acknowledging these challenges, there remain several sound and meaningful inferences to be made about expectations for a proto-Dene-Eyak-Tlingit kin system. It would no doubt have featured cross/parallel distinctions of some variety, since each of the daughter systems have manifest forms of crossness, whether this is of Dravidian (Type A), Iroquoian (Type B), or Crow (crossness affected by intergenerational skewing) varieties. We would therefore expect that prototypical system to have been classificatory in terms of the broad dichotomy Morgan elucidated for kin systems. Given our knowledge of proto-Eyak-Athapaskan, it also would not be highly speculative to propose that the deepest antecedent system could have featured the Dravidian variety of crossness.

Drawing Yeniseian into our consideration, an antecedent Dene-Yeniseian kin system might have had three conceivable starting points. First, it could be that proto-Dene-Yeniseian kin terms leaned more heavily toward Morgan's descriptive pole, with Yeniseian, Dene, Eyak and Tlingit following various pathways to their current forms. In the Yeniseian case, this would involve a significant degree of simplification, in which large kin categories would need to supersede descriptive terms in each generation. Dene, Eyak and Tlingit would each need to build up the cross/parallel equations associated with Dravidian, Iroquoian, or Crow/Omaha systems, with a Dravidian starting point seeming the most likely candidate for a point of origin in our current state of knowledge. Some such kin systems would survive through to the present, whereas others would shift to Iroquoian or Crow/Omaha patterns through processes of historical development or contact with other societies having these same frameworks. Yet other kin systems within the Dene branch of the family would see an original semantic framework for crossness dissolve in favor of Mackenzie Basin, generational, or lineal/collateral kin distinctions. This alternative seems highly unlikely to us: none of the descendant kin systems in Dene-Yeniseian could be construed as descriptive in character, a rather puzzling circumstance if this were to be the point of origin.

Somewhat more plausible would be the notion that antecedent Dene-Yeniseian started from a generational or Hawaiian framework, in which kin persons in each generation tended to be siblings. Core Yeniseian would then remain relatively unaltered in its semantic form, although extensive change in kin vocabulary would have occurred, and some lineal/collateral distinctions would need to be picked up. In

Dene, Eyak, and Tlingit, cross/parallel equations would have to build up, perhaps from a Dravidian basis, with subsequent shifts toward Iroquoian, Crow/Omaha, Mackenzie Basin, generational, and lineal/collateral in various daughter systems. The practical reality of precisely how a generational system might be partitioned into cross/parallel categories has not been treated in the literature, insofar as we know, and it is not readily apparent to us how it would proceed in this particular context. Of course, once this cross/parallel shift had occurred, it would have to be undone in many Dene circumstances, again straining plausibility.

The third and final option we discuss exhibits the greatest degree of parsimony and has reasonably well understood processes capable of creating predictable shifts in kin terminology. In this scenario, proto-Dene-Yeniseian would have featured some form of cross/parallel distinction, again most likely Dravidian in character. In the Dene, Eyak, and Tlingit branch, Dravidian crossness would persist in some cases, but morph into Iroquoian and Crow/Omaha distinctions in other cases, where some form of crossness was maintained, though now in the presence of significant social and economic complexity. In yet other instances, developmental processes would begin to dissolve cross/parallel distinctions, as happens in ego's generation with Mackenzie Basin terminologies. It would appear that this dissolution of crossness can eventually permeate the first ascending and descending generations, as we see in Tsuut'ina, Gwich'in, and other Dene examples. In this framework, the surviving (core) Ket kin terminology for Yeniseian would simply be an instance where there has been a long-term breakdown in cross/parallel distinctions, just as occurs in daughter Dene systems, with both generational and lineal/collateral shifts.

At this juncture, we have pressed the logical exploration of semantic transformations of kin systems to their limit, and would presumably be speaking of kin systems that existed in mid-Holocene through terminal Pleistocene time frames (see Potter, Kari, and Ives for various temporal perspectives, this volume). It is legitimate to ask if there are any other tangible forms of evidence for social structure (particularly with respect to the existence of cross/parallel distinctions and relative degrees of exogamy) in such a distant past. As might be expected, archaeological traces of this are far from abundant. Yet, as Levi-Strauss (1963, 1969) pointed out, some societies have a noteworthy tendency to map their social structure onto settlements (see also Means 2007). This is especially prevalent in societies with dual organization, where the two halves of a society are reflected in linear or circular arrangements of settlements with bilateral or concentric symmetry. Bilateral or symmetrical cross cousin marriage commonly accompanies such spatial organization of settlements; kin terminologies with cross/parallel distinctions are typical in these settings.

Late Palaeolithic sites in the Ukraine and on the central Russian Plain have just such settlement features, with both circular arrangements of circular structures and "long house-like" dwellings with rows of central hearths (see the plans in Klein 1973 and Soffer 1985). In some instances, these sites have produced split image art, which frequently accompanies dual organization (Levi-Strauss 1963).¹³ The Mal'ta-Afontova sites—the late Palaeolithic occupations that precede the Kitoi Phase in the Baikal region—are generally regarded as the easternmost extension of this phenomenon, featuring substantial semi-subterranean dwellings, figurines, and other mobiliary ivory art (Medvedev 1998). This vast Late Palaeolithic sphere has therefore produced important evidence of societies with sophisticated conceptions of social organization, very likely including corporate kin groups (clans or lineages of some type) (Soffer 1985).

As we proceed yet farther to the east, the archaeological record is generally silent with respect to social structure, although we do note that the small, semi-subterranean dwellings in the Ushki Component 7 layer tend to occur in pairs, as we might expect in some simple expressions of dual organization (see the plans in Dikov and Titov 1984:77). In northwestern North America, the Paul Mason site in the Kitselas Canyon is much later in time (2750–3230 radiocarbon years BP), but of interest with respect to Rubel and Rosman's (1983) ideas concerning antecedent social structures involving dual organization (Coupland 1985). Paul Mason is one of the earlier settled villages in northwestern North America; it has ten prepared house floors, with houses arranged in two rows facing each other. Coupland felt that relatively egalitarian corporate

¹³ The painted mammoth skull from Mezerich illustrated by Soffer (1985:78, Figure 2.73), for example, has a design that curves somewhat, but otherwise has nearly perfect symmetry: almost every design element to the left of the mid-line is mirrored to the right.

¹² One cannot help but think that Morgan might well have found such a finding felicitous, given his motivations for undertaking the *Systems*.

groups existed in the Paul Mason Phase.

With respect to relative degrees of exogamy, archaeologists and biological anthropologists have occasionally made well-informed inferences from ceramic studies or discrete osteological traits concerning endogamy and exogamy in past human populations. New genetic and isotopic techniques may make such inferences increasingly feasible. It is not known whether there is biological continuity in human populations from the Mal'ta-Afontova Late Palaeolithic to the Early Neolithic Kitoi sites noted above, but mtDNA studies of Kitoi phase cemeteries (ca. 7000–8000 cal BP) are of direct interest because of the high frequencies of relatively rare mtDNA haplogroup F, a trait shared with modern Ket and neighbouring Shor populations (Mooder et al. 2006). Following Kitoi, there is what is interpreted as a cultural and biological hiatus, succeeded by the Serovo-Glazkovo cultures (6000–3200 cal BP) of the Late Neolithic. Both the region and time frame are clearly germane to reasoning about Dene-Yeniseian. While much more will continue to be learned about the entire suite of Cis Baikal mortuary and residential contexts, Haverkort et al.'s (2008) strontium isotope study of the Bronze Age Khuzhir-Nuge XIV cemetery (ca. 4000–5000 calendar years BP) indicated roughly half of the Little Sea Glazkovo burial population grew up in localities other than the microregion in which they were buried. A variety of explanations for this are possible, but one prominent candidate would certainly be that relatively high rates of exogamy obtained in these prehistoric populations.

In no way would we claim that any of the foregoing archaeological information can provide a specific confirmation of our logical inferences concerning proto-Dene-Yeniseian kinship. By the same token, however, even this limited empirical evidence concerning the spatial organization of settlements, art, and extralocal origins of burial populations in some key geographic regions and time frames makes it highly plausible that we should be employing antecedent models with cross/parallel distinctions, accompanied by principles of group formation that could be inflected in one direction or another by varying rates of endogamy, agamy, and exogamy.

8.0. CONCLUSIONS

Dene-Yeniseian kinship might simply be approached by assessing the remaining kin term inventory of Ket for cognate forms in Dene, Eyak, and Tlingit—an exercise that should continue in even greater detail. The upshot of such an approach would, to this point, be a determination that three kin-related terms appear to meet historical linguistic standards of scrutiny. Given that the reconstructed proto-Athapaskan kin terminology features 35–40 kin terms, one might say that shared forms could be expected to lie in the range of roughly 5–10%, a comparatively low value. To take such an approach, however, fails to address the semantic structure of the kin terminologies involved. One difficulty with the more limited approach would therefore be a failure to recognize that the semantic structure of the Ket kin terminology is distinctly anomalous for its region, as Dul'zon and Werner saw. The second difficulty resides in the evidence reviewed here that it is the *semantic forms* of the kin terminologies that may actually have the greater degree of persistence. Even where there are transformations of these kin systems, the changing semantic forms have predictable causes in which kin-structured principles of group formation influence the demographic profiles of small-scale hunter-gatherer societies.

We hope to have provided useful information concerning Yeniseian kinship and social organization that has not been widely known in western literature. Beyond this, our review has attempted to place Yeniseian kinship in a broader Dene-Yeniseian context, with a specific emphasis on the semantic domain that lay at the heart of Morgan's enterprise. The modest evidence for cognate kin terms reinforces the connections evident elsewhere in vocabulary and grammar, while at the same time implying that considerable time has elapsed since Dene and Yeniseian separated. Dene, Eyak, and Tlingit kinship information is particularly helpful in establishing some reasonable suppositions about proto-Dene-Yeniseian kinship, and for clarifying the pathways and transformations capable of shifting the semantic framework of classificatory terminologies with cross/parallel distinctions. The periphrastic and Uralic usages speak to a historical overlay affecting the

Yeniseian terminology, while the intergenerational skewing, generational and lineal/collateral distinctions all suggest an emphasis on kin group or co-residential group exogamy.

Eggan (1980:188) remarked that "...there is a whole world of social structures 'underneath' Claude Lévi-Strauss' *Elementary Structures of Kinship*," a sentiment with which we are in emphatic agreement. In fact, we can generalize our understanding of cross/parallel distinctions in such a way that it is possible to develop some elementary anthropological theory concerning kinship and principles of group formation. Two of these elementary formulations can be abstracted as *Local Group Growth* and *Local Group Alliance* models in hunter-gatherer or band societies (Ives 1990, 1998). Agamous or endogamous Local Group Growth systems typically have developmental processes that promote the splitting of daughter groups from a parent group. Hunley et al. (2008) suggest, as have others, that small-scale population fissioning has had a fundamental role to play in much of human history. Such processes may very well explain the divergence in genetic frequencies that we see between Dene and Yeniseian populations (see Scott and O'Rourke as well as Ives, this volume). If this were to be the case, however, we would expect a strong retention of cross/parallel indices in the respective terminologies.

Instead, we find that developmental processes with a deepening focus on exogamy have been at work, offering transformative pathways that would go beyond simple fissioning. The persistent exogamic practices of Local Group Alliance systems would tend to "open out" earlier Dene-Yeniseian societies choosing this pathway, thereby promoting the impacts of external influences. This would be especially true in terms of material and ceremonial culture as well as human genetic signatures, and could be hastened where palaeogeographic or migratory events left some branches of Dene-Yeniseian surrounded by decidedly different cultures and languages.

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ARCHIVAL RECORDS

Morgan Papers, University of Rochester Library

Degrees of Relationship in the Language of the Mountaineer /Täl-sote'-e-na/Red Knife [Yellowknife] a circular compiled by Lewis Henry Morgan, Convent of St. Boniface, Fort Garry, Selkirk Settlement, August 6, 1860.

Correspondence from Robert Kennicott to William Wadden Turner, from Fort Liard, February 19, 1860, including Slavey kin terms.

Degrees of Relationship in the Language of the A-cha-o-tin-ne or Slave Lake Indians [South Slavey], taken by Robert Kennicott, Fort Liard, February 19, 1860, circular completed in Morgan's hand.

Degrees of Relationship in the Language of the Loucheux [Gwichah Gwich'in], circular completed by W. L. Hardisty, Fort Liard, May 1862.

Degrees of Relationship in the Language of the Tuküthe [Gwich'in], made by R. MacDonald, Peel River, one circular undated in MacDonald's hand, one 1865, in Morgan's hand.

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SELECTING SEPARATE EPISODES OF THE PEOPLING OF THE NEW WORLD: BERINGIAN–SUBARCTIC–EASTERN NORTH AMERICAN FOLKLORE LINKS

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1.0. THE ABSENCE OF EXCLUSIVE FOLKLORE LINKS BETWEEN THE KETS AND THE NA-DENE

This paper analyzes regional and global folklore patterns to identify relationships among modern populations, with a particular emphasis on the proposed Ket and Na-Dene linguistic connection. In addition, after reviewing various papers in this volume (e.g. Kari, Potter, Scott, and O'Rourke), I suggest a scenario for the ancient spread of Na-Dene in North America. Though, explaining the unity of Dene-Yeniseian remains a major challenge for those who study areal distributions of folklore motifs.

The Na-Dene folklore material is largely represented by the Athabaskan texts. Significant parts of Eyak folklore had been lost before ethnographic research on this group began. The Tlingit data are rich, but the territory occupied by the Tlingit (and, of course, by the Eyak) is relatively small. Generally speaking, the evidence suggests that groups settled inside a small territory adopt traits that are widespread in adjacent culture areas. The Tlingit mythology and folklore are not an exception and share most of the motifs with Haida, Tsimshian, and other Indians of the Northwest Coast (see Map D). The western Subarctic occupied by the Northern Athabaskans, however, forms a large region which is relatively uniform in its culture and in which mythology and folklore are both rich and highly specific.

Checking the Northern Athabaskan folklore-mythological tradition against American, Eurasian, and global data, we can detect links with traditions of the American Arctic, Eastern Subarctic, and the Northeast, Eastern South America, the Pacific borderlands of Asia, and Southern Siberia. However, there are no specific folklore parallels that would link the Kets with the Athabaskans or with other Na-Dene. The Circum-Yenisei area, where the Yenisei languages were registered in the 18th century and where the Kets live now, does demonstrate explicit and detailed folklore-mythological parallels in the New World, but these parallels are localized not in the western Subarctic but in the North American Northeast (Berezkin 2006a, 2008).

I see two possible explanations why the hypothesis of the Na-Dene-Yenisei linguistic unity finds no support in the folklore data. The first one is that original proto-Na-Dene group of migrants could have been too small. Thanks to historical chance, it preserved its language during the movement across Eastern Siberia and Alaska, and thanks to another chance, the offsprings of one of its daughter languages, i.e. the Proto-Athabaskan, spread across wide territories of North America. “The Athabaskan languages are so clearly and closely related” that such a spread could be as late as 2500 BP with even much later spread of Pacific and Southern groups (Golla 2007:71–72; Krauss 1973:953). Kari (this volume) suggests a much earlier date for the proto-Na-Dene splitting into its three sub-branches (Athabaskan, Eyak, and Tlingit) and one of the arguments in favor of this early dating is the lack of unambiguous archaeological confirmation for cultural change at about 2000–2500 BP. However, if there were no great cultural differences between the Athabaskan and pre-Athabaskan population of the Subarctic and if the process were not a mass migration but a slow infiltration of small groups, it would be difficult to pinpoint in time the formation of the known

ethno-linguistic map of Western Subarctic (Map D).

As mentioned above, small isolated groups involved in distant migrations are not able to preserve their folklore traditions for a long time but adopt the traditions that are widespread across their new homeland. The Kets and the Pacific Coast Athabaskans provide examples. They share most of the folklore-mythological motifs with traditions of the neighboring groups, i.e. the non-Yeniseian people of Western Siberia in the case of the Kets, and non-Athabaskan groups of Northern California and Oregon in the case of Athabaskans. Even the Southern Athabaskan folklore is 90 percent Southwestern and shares but a dozen specific tale-producing motifs with the Northern Athabaskans from which the Southern Athabaskans split 1000 BP if not later. If a small group of migrants moved from Siberia to America about 10,000 BP, it would be completely unrealistic to expect that the Na-Dene and the Kets could for so long a time preserve similar sets of folklore motifs. Such a proto-Na-Dene group had to adopt the set of motifs that was known to the inhabitants of Alaska-Yukon-British Columbia border area in time when the newcomers reached it. We do not also have many chances to discover archaeological traces of the proto-Na-Dene migration if it was brief and if the number of people involved in it were not numerous. Lack of genetic markers exclusively shared by the Kets and by the Na-Dene (Scott and O'Rourke, this volume) can also mean that the genetic pool of the Na-Dene ancestors was small and practically lost after movement into the New World.

Unlike this small-number hypothesis, another possible explanation offers some hope to discover folklore and archaeological correlations for the linguistic data. If the Kets and the Na-Dene demonstrate no exclusive folklore links, it could be because they are related not directly as the descendents of an ancestral unity that was localized not in the Yenisei Basin but was formerly located somewhere else. Unfortunately, such a hypothesis is not based on firm data. One of the problems is that the ancient folklore tradition of Eastern Siberia, especially of the Lena Basin, was very much transformed after the recent replacement of former populations by the Tungus and Yakuts. Because Western Siberia, Chukotka, and Lower Amur folklore traditions share a vast series of common tales (Berezkin 2006b), we can suggest that before AD 1000 the folklore traditions of all Siberia, from the Urals to the Pacific, had much in common. However, the pre-Yakut tradition of the Lena and Kolyma basins certainly possessed traits specific to these areas, and these traits have remained unknown to us. The Yukaghir folklore of the Siberian Northeast is also known inadequately, being partly lost at the time when it became the object of the research.

This gap in our knowledge of the Siberian folklore is especially regrettable because an obvious archaeological candidate for the proto-Na-Dene Asiatic origins is Dyuktai culture (Potter, this volume). The Dyuktai is the only archaeological tradition of Siberia that has counterparts to the east of the Bering Strait (Denali Complex and Paleoarctic Tradition in general) but not beyond the American Northwest, and therefore it could hardly be connected with the peopling of the major part of the New World. Unlike Ocean Bay and Anangula, both the Paleoarctic Tradition and Dyuktai occupy continental areas and are not related to marine adaptation. This corresponds well to the probable environmental and economic characteristics of the proto-Na-Dene. The only important argument against the Dyuktai origin of the proto-Na-Dene is the Terminal Pleistocene dating of Denali. In this case the separation between groups that were the ancestors of the Na-Dene and the Yenisei family must be well over 12,000 BP. That seems to be too long a period, given the degree of linguistic proximity between the two families that has been put forth by Ed Vajda.

But even if the Na-Dene descend from Denali and ultimately from Dyuktai (at the moment it is only a guess), it is very unlikely that all pre-Athabaskan and pre-Eskimo-Aleut peoples of Alaska spoke some Na-Dene or "para-Na-Dene" languages. The folklore data suggest that the cultural (and, by extension, linguistic) situation in prehistoric northwest North America was complex and that during the late stages of the peopling of the New World there could have been several separate entries of people from Siberia into North America, all of them, of course, through Alaska. To demonstrate this, we review some data on folklore and mythology for all of North America. Two sets of links that probably still remain unnoticed by researchers are revealed. The first one connects the Algonkian and the Northern Athabaskan traditions. The second connects traditions localized around the Bering Strait (mostly Eskimo and Paleoasiatic) with the Algonkian one and with the Amerindan traditions of western United States and British Columbia.

2.0. LINKS ACROSS NORTHERN NORTH AMERICA

The hypothesis of a Plateau homeland of the proto-Algonkians, based on controversial linguistic and archaeological evidence (Denny 1991, Dryer 1992; Golla 2007:73), finds confirmation in a vast series of specific and exclusive folklore-mythological links between Central and Eastern Algonkians (especially Menomini and Ojibwa) and Plateau-southern North Coast Indians (mostly Fraser River Salish and the neighboring groups of Coastal Salish). I discovered the corresponding data seven years ago (Berezkin 2003), and the new information obtained since that time ever more confirms the initial conclusions (Berezkin, in press). Among 15 tale-producing motifs shared by the Central and Eastern Algonkians and by the Indians of western North America—but unknown across intermediate territories (so that late West-East diffusion is unlikely)—11 are known to the Fraser River Salish (Thompson, Lillouet, and Shuswap), 5 to the central Coastal Salish, 5 to the Tsamosan Coastal Salish (Quinault, Chehalis, Cowlitz), 3 to the Bella Coola, 3 to the Inner Salish to the south of Fraser Basin, and 3 to the Tillamook. From the Algonkian side, 7 motifs are recorded among the Menomini; 7 among the Ojibwa; 4 among the Atlantic Algonkians; 3 among the Sauk, Fox, and Kikapoo; 2 among the Plains Cree; 2 among the Naskapi; 1 among the Blackfoot; and 1 among the Plains Ojibwa. No motifs of this list are found among the Cree (besides the Plains groups), Montagnais, and Potawatomi. The data on Potawatomi are relatively scarce, but negative results for the Cree (besides Sandy Lake Cree, who speak a Northern Ojibwa dialect and here are included into Ojibwa) probably indicate that northern and central Algonkians had different prehistories. The demonstrated distribution perfectly fits the hypothesis of the Fraser Basin homeland of Algonkian-Ritwan languages. Among the Ritwan only two motifs on the list are recorded, but these small groups certainly lost the greater part of their folklore heritage after their migration to California. Unlike Yurok and Wiyot migrations, the proto-Algonkian migration had to be rather massive, and the pre-Algonkian population of the Great Lakes region apparently small. We cannot exclude that the proto-Algonkians were pushed off their homeland by the Salish, who had been moving up Fraser River. Linguistic and archaeological evidence suggests that this process took place in the late 4th to early second millennia BC (Campbell 1997:117–118; Pokotylo and Mitchell 1998:84–85). An alternative explanation is that just the Fraser River Salish were in contact with the Algonkians, who inhabited some neighboring territories.

The late arrival of the proto-Algonkian to the Great Lakes area opens a question: who occupied the Eastern Subarctic and the adjacent territories of the Northeast before ca. 3500 BP? Could it be the same people as those who occupied at least part of the Western Subarctic before the spread of the Na-Dene, or could it be Athabaskan themselves or pre-Athabaskan Na-Dene groups? I am not prepared to check such hypotheses against archaeological data, but the folklore evidence suggests at least that cultural contacts across Subarctic were complex and deep in time. The Northern Athabaskan and Algonkian (mainly to the north of the Great Lakes) traditions share a series of motifs which are mostly unknown beyond this area. Some motifs do find parallels south of the Subarctic, but they look like small drops diffused from the principal territory where these motifs are widespread. The Northern Athabaskan-Algonkian parallels are not concentrated along a contact zone between historically known languages of the both families but best represented among the groups of Algonkians located to the east and the groups of Northern Athabaskans located to the west. The Iroquois stand here apart from the Algonkians, though some motifs are shared by the northernmost Iroquois groups that were in close contact with their Algonkian neighbors. Presence of specific genes shared by Athabaskans and Algonkians (Scott and O'Rourke, this volume) correlates with the presence of folklore motifs shared by both groups.

Among the Northern Athabaskan-Northern Algonkian parallels four cases are the strongest. The first one is related to cosmonymy (Figure 1). Ursa major (Koyukon, Kutchin, Tagish, Southern Tutchone, Timagami Ojibwa, Naskapi, also Wiandot) or Polaris (Menomini, Montagnais) is a small animal like the fisher (most of Algonkian groups and Wiandot), woodchuck (Montagnais), or ermine (Koyukon); a rather enigmatic "seat" with a tail (Kutchin); or a person hit with a dart (Koyukon, Tagish, Southern Tutchone) (Bloomfield 1928, no. 86:247–253; Desbarats 1969:35–41; Jetté and Jones 2000:500; McClellan 1975:78; 2007, no. 12:78–80; McKennan

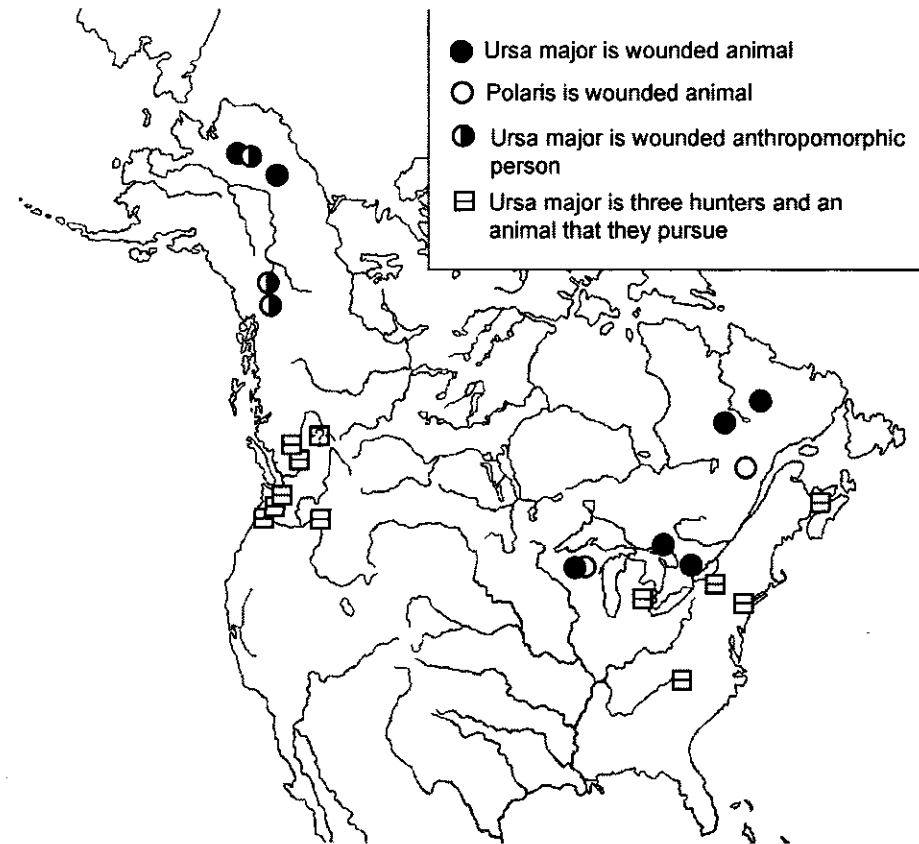


FIGURE 1. North American distribution of selected cosmonymic motifs

1965:73; Millman 1993:110–103; Speck 1915, no. 11:63–64; 1925:28–31; Vanstone 1978:56–58; Walker 1995, no. 12:113–130). When the sky object is Ursa major, this dart or the wound from it is Alkor, a small star near the second star of the handle of the Dipper. Among the Menomini the wounded fisher turns into Polaris, but in another story, in which fisher is neither hunted nor hit with a projectile, it becomes Ursa major (Skinner and Satterlee 1915, no. 39:471–474).

In Athabaskan traditions which identify the sky object with a man, the back of this man is injured. Such a detail has a parallel, though not quite as close, in two very similar myths, one recorded among the Chukchi by Waldemar Bogoras (1907:308–309) and another among the Tangut (Tibetan people of Chinghai) by Nikolai Potanin (1893:327). In both cases Orion's back was broken when he was hit with a pole or stone by his wife or his rival because he tried to make love to the Pleiades-woman. Great distance between Chinghai and Chukotka is alarming, of course, but we should take into consideration that star lore of people of Asia besides Turks and Mongolians is poorly known and during the 20th century was mostly lost. Former existence of other Northeast and East Asian cases of broken back constellation is plausible.

The interpretation of Ursa major as a fisher wounded by a dart contrasts with the interpretation as the three hunters who pursue an animal. This latter story is known to the Iroquois and to some Algonkians outside of the Subarctic, at least the Micmac and the Fox (Berezkin 2006a, 2008). The interpretation of the Dipper as three hunters and animal finds parallels in the Plateau area and is among motifs probably brought by Algonkians from their Fraser River homeland. Accordingly, the spread across Subarctic of the wounded fisher concept, which has no parallels among the Plateau Indians, must find other explanation.

The second motif or a cluster of motifs shared by Northern Athabaskans and Algonkians is related to the earth-diver myth (Berezkin 2007). A person survives the flood on a raft and sends birds and animals to bring mud from the bottom. The successful diver is usually a muskrat. Although different episodes and actors of

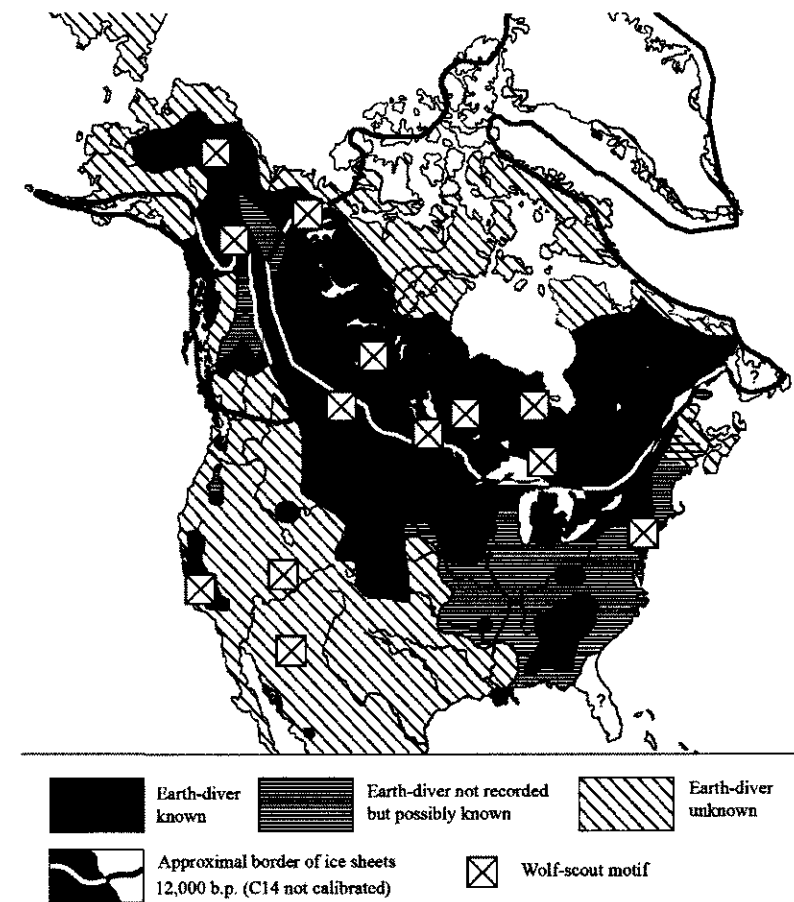


FIGURE 2. North American distribution of the earth-diver and wolf-scout

the story have counterparts in many traditions of Siberia and North America, the Northern Athabaskan and Algonkian cases are the most similar to each other with no systematic differences between them at all (Figure 2).

The third motif is often integrated into the same texts as the earth-diving episode. There is no logical connection between them, so the entire story was probably inherited by different groups from a prototype. After creation of the dry earth, a wolf is sent to run around the earth and to report whether it is large enough (Figure 2). It can be another animal instead of the wolf, but it is always a small to middle-size mammal, mostly predator: fox, coyote, wolverine, mink, caribou. In North American mythologies, all these species, besides caribou, rather often play similar roles and can replace one another in different plots. The wolf-scout motif is peculiar for the Northern zone of northern North America. However, in all other regions of the New and Old World scouts sent to investigate the land after the world catastrophe are birds (dove, vulture, hummingbird, etc.). Animals in the role of earth-scouts are found but as unique cases, having little in common with others. Among Athabaskan groups the motif of wolf-scout is recorded among the Kutchin (wolf and fox; McKennan 1965:104), Kaska (Honigmann 1949:214), Hare (fox; Petitot 1886, no. 13:146–149) and Beaver (Ridington 1988:117–121). For the Algonkians, here the same motif is found among the Northern Saulteau (Skinner 1911:173–175), Sandy Lake Cree (wolverine; Ray, Stevens 1971:20–26), Plains Cree (Ahenakew 1929:320–327; Skinner 1916, no. 1.1:341–346), Ojibwa (wolf, fox, mink, caribou; Blackwood 1929, no. 2:323–328; Josselin de Jong 1913, no. 9:12–16; Radin and Reagan 1928, no. 2, 3:62–67), Plains Ojibwa (Skinner 1919, no. 6–8:283–288) and Blackfoot (Linderman 1995:16–21). The Lenape text appears to be not totally authentic (Hitakonanu'laxk 1994:49–51), but in any case wolf is also named there as the animal sent

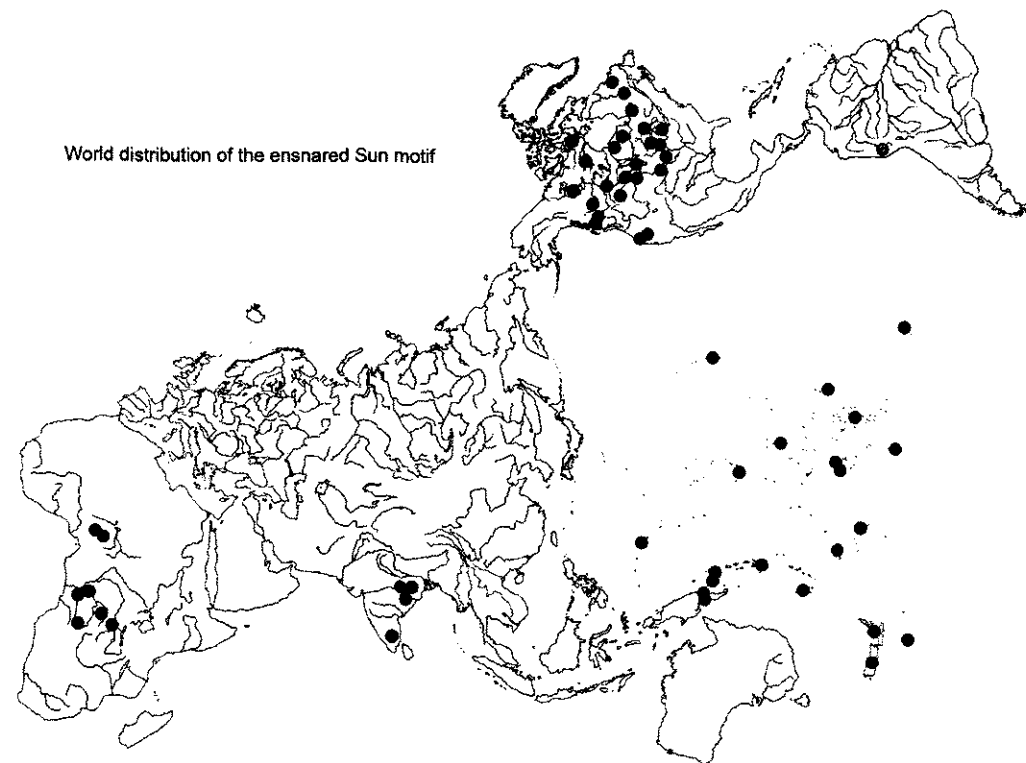


FIGURE 3. World distribution of Sun caught in snare

to investigate the created earth.

Much to the south of the Northern Athabaskan area the wolf-scout motif is recorded among the Yokuts (Gayton and Newman 1940, no. 40:39–40; Kroeber 1907a, no. 15:209–211), Chemehuevi (wolf and coyote; Laird 1976:148–149) and Papago (coyote; Bancroft 1875:76) with more distant parallels among the Pima (Russel 1908:212). In these cases late Athabaskan, not to say Algonkian influence is hardly possible. The spread of the motif into South-Central California and the Southwest probably occurred at a time when the linguistic map of the continent was significantly different from one of the time of the European contacts.

The fourth motif that reflects the links across Subarctic is Sun caught in snare (A728 in S. Thompson's index; Figure 3) investigated by Katharine Luomala (1940, 1965). This is one of the candidates to be included in the set of motifs possibly known already before the initial Out-of-Africa migration, then brought to South Asia and ultimately spread across the circum-Pacific region (Berezkin 2009). The African and the South Asian versions stand territorially apart from the rest, and only in them does the Sun take the form of an ungulate animal. The unique Central Andean version (people put iron wedges into the narrow pass between rocks to catch the Sun) is doubtful. Luomala (1940:20) cites here "The Golden Bow," but I was able neither to identify the original text nor to find any parallels in Central and South America. Stories about the Sun being caught or imprisoned are rare here (one case among the Jicaque of Honduras and another among the Arekuna of Guiana) (Chapman 1982, no. 27:112; Loven 1935:566).

The Oceanic and North American versions are similar to each other and different from all the rest. In both regions, the Sun is a man who gets into a snare made of threads, hair, ropes, and the like. Usually the episode explains why the Sun moves across the sky with the present speed. In Oceanic tales the Sun was initially moving too rapidly, and in North American stories it moved rather irregularly or shined permanently. Both in Oceania and in North America the motif is used not only in narratives but also in practical magic (thread figures applied to slow down the Sun's movement). It's difficult to say, however, if the latter detail is

important because the corresponding Oceanic cases are numerous while the only American data are from the Iglulik Eskimo (Boas 1901:151; MacDonald 1998:224).

The vast majority of American cases of Sun caught in snare are recorded among the Northern Athabaskans and Algonkians. Among the former are the Chipewyan (Birket-Smith 1930:87–88; Lowie 1912:184; Petitot 1886, no. 15:411–412), Dogrib (Luomala 1940:8), Beaver (Goddard 1916:233), and Carrier (Jenness 1934, no. 65:248) and among the latter are Menomimi (Hoffman 1896:181–182, Skinner and Satterlee 1915, no. III1, II12:357–361), different groups of Ojibwas, including the Plains Ojibwa and Canadian Metis with a probable Ojibwa component (Désveaux 1984:61, Erdoes and Ortiz 1984:166; Jones 1916, no. 22:376; Simms 1906:337–338; Speck 1915, no. 17:69), different groups of Cree (Ahenakew 1929:327–329; Cresswell 1923:404–405; Ray, Stevens 1971:107–110; Skinner 1911:100–102, 102–104), Fox (Jones 1907, no. 6:79), Naskapi (Millman 1993:140–141; Speck 1925:2–5, 25, 1935:59–62), Montagnais (Desbarats 1969:58–63; Lowie 1909a:140; Savard 1979, no. 1:4–11), and Blackfoot (Josselin de Jong 1914:104–105).

Groups like Bella Coola (McIlwraith 1948.1:635–640, 1948.2:498–499), Winnebago (Erdoes and Ortiz 1984:164–166; Smith 1997:166–168) and Assiniboin (Lowie 1909a, no.3b:40) could borrow the motif from their Algonkian and Athabaskan forerunners or neighbors on corresponding territories. The recent borrowing is less probable for the Plains Sioux such as the Mandan (Beckwith 1938, no. 34:269–272), Omaha and Ponca (Dorsey 1890:14–15; Dorsey and Swanton 1912, no. 3:20–21), and Iowa (Skinner 1925, no. 41:499). However, for the Yurok (Judson 1994:80) and Wintu (Demetracopoulou and DuBois 1932, no. 67:494) the borrowing from Algonkians or Athabaskans is very unlikely. Therefore, as with the motif of wolf-scout, the small enclaves of Sun caught in snare localized to the south of Subarctic, especially in California, were probably formed thanks to the cultural contacts that had taken place long before Columbus.

In most of the American variants there is a detail which is absent in Oceania. After the Sun got caught in the snare, darkness fell upon earth. Only a mouse or other small rodent (rabbit, shrew, mole, etc.) was able to cut threads of the snare and liberate the Sun. This detail is found in texts of the Beaver, Chipewyan, Dogrib, Bella Coola, Carrier, Winnebago, Menomimi, different groups of Ojibwa and Cree, Naskapi, Blackfoot, Assiniboin, Omaha, and Wintu.

In some Algonkian versions a boy catches the Sun because the latter spoiled his fur or feather cloak (Menomimi, Ojibwa, Swamp, Sandy Lake, and Eastern Cree). Among the Winnebago one text is similar to the Menomimi version, and in another the owner of the ruined cloak is a girl who does not catch the Sun in the snare but shoots arrows into him (Smith 1997:166–168). There are no precise Athabaskan parallels for this episode, but in a Tagish myth the episode with the cloak is used in another context. The abandoned boy makes a cloak from skins of birds and martens, and the Sun exchanges it for his supernatural one (McClellan 2007, no. 78:384–390).

According to the Algonkian tales (Menomimi, Ojibwa, Naskapi, Montagnais), the snare was made of a pubic hair of a woman. The same detail is found among the Bella Coola but also in Tahitian (Luomala 1965: 233) and possibly some other Polynesian versions.

Two factors responsible for Athabaskan-Algonkian folklore-mythological links can be suggested: mutual influence and interaction and common substratum. The choice depends also on dating of Na-Dene spread across the Subarctic.

The more recent this spread, the more probable is a role of early substratum from which both Algonkians and Athabaskans adopted part of their cultural heritage. The absence of the earth-diver among so many western and southwestern Alaskan Athabaskans (Ahtna, Dena'ina, Ingalik [Deg Hit'an], Tanana) is an argument in favor of the lack of intrinsic link between this myth and the Na-Dene. From Algonkian side, we have the same lack of the earth-diver among the Micmac, Malecete, Passamaquoddy, and Abenaki. No cosmogonies at all are known for these groups, making the Algonkian case weaker than the Alaskan Athabaskan one. However, the Micmac were familiar with the story about a hero who wounded a monster, came to him in doctor's guise, and killed him (see below). In texts of the Central Algonkians, this episode is always linked to a description of a flood sent by the water monsters and to diving for earth. Among the Micmac the hero's adversary is a bird and no flood follows. It seems that hero disguised as a doctor is a

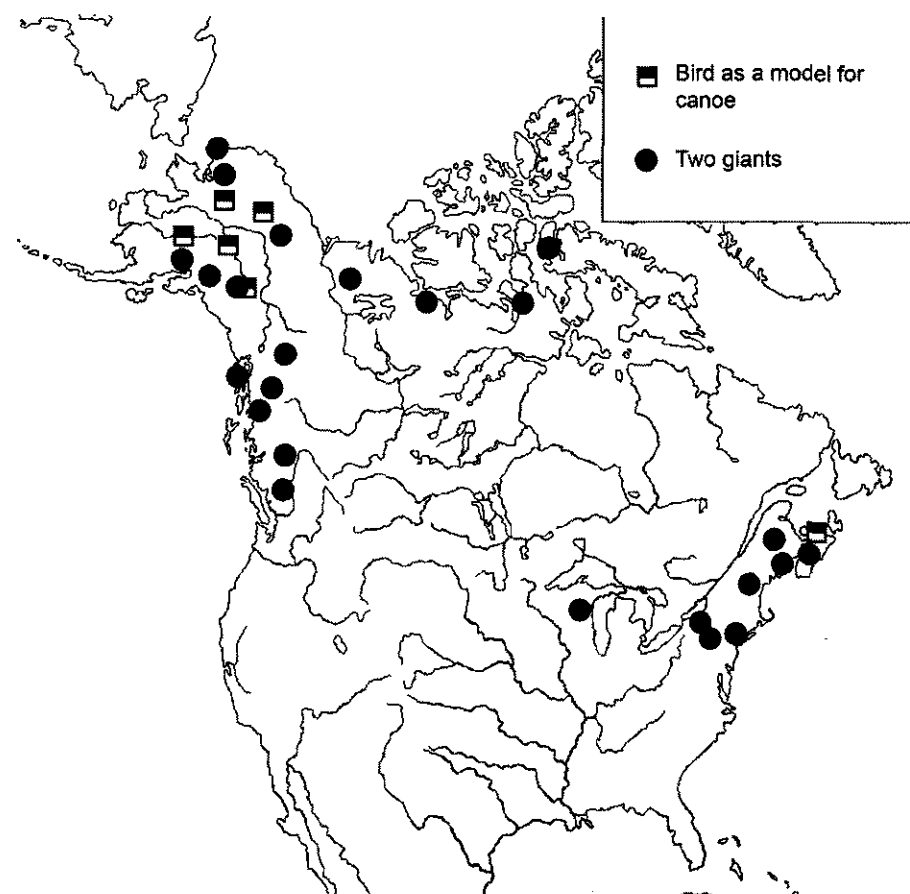


FIGURE 4. World distribution of the bird as a model for canoe and two giants

specifically Algonkian motif but the earth-diver is not and was incorporated into Algonkian as well as into the Northern Athabaskan mythologies only in territories where it had been known before the spread of the corresponding languages.

If the earth-diver were known to the early Na-Dene and if western and southwestern Athabaskan groups lived in Alaska for many millennia, it would be expected not only that the earth-diver would be preserved in Dena'ina, Ahtna, and Ingalik traditions but also that it would influence Eskimo folklore. Because it did not, either Athabaskans reached Western Alaska recently and lost their original cosmogonies, or the earth-diver was borrowed by the Athabaskans from other people and then spread across most of their groups never reaching western Alaska.

The uniformity of Subarctic versions of the earth-diver if compared with more diverse tales known to the south of the Great Lakes can be a result of the founder effect, a development of the northern versions from traditions of particular groups that were peopling the region in the Holocene.

Other motifs registered across both Eastern and Western Subarctic can have different origin than the earth-diver. If the Na-Dene lived in the Subarctic for many thousands of years as J. Kari argues (this volume), there was enough time for an exchange of ideas between them and both Algonkians and the Algonkian predecessors in the Eastern Subarctic. Motifs that demonstrate parallels in the Old World are of special interest. While parallels for the American earth-diver are absent along the Pacific borderlands of Asia and most numerous in continental Siberia, the ensnared Sun has obvious and exclusive Oceanic counterparts. Asiatic analogies for broken-back constellation are not so precise, but they are also found among groups to which the earth-diver was unknown (Chukchi and Tangut). The existence of Oceanic parallels means that some remote ancestors of Austronesians and of Indians of the Subarctic contacted each other, and such a

contact can hardly be localized deep in continental Siberia.

It does not look probable that the historical Northern Athabaskans were responsible for the ensnared Sun in the Subarctic because too few groups, all of them eastern ones (Dogrib, Chipewyan, Beaver), were familiar with this tale. Some earlier population is a better candidate, and if this population spoke a Na-Dene language such a hypothesis would possibly help resolve a controversy between clear and close relation between Athabaskan languages and probable early presence of Na-Dene in America.

In support of this suggestion I address motives that, unlike mentioned above, are almost unknown to the Great Lakes Algonkians but form a link between the westernmost Athabaskans and the easternmost, i.e. the Atlantic Algonkians.

Among the Koyukon, Kutchin, Kolchan, Tanana, and Upper Tanana (Attla 1990:76–88; Brean 1975:17–19; De Laguna 1995, no. 5, 22:96–97, 188–190; Deaphon et al. 1980:74–84; McKennan 1965:104–105; Tenenbaum 1976:28–31) and among the Micmac (Wallis and Wallis 1955, no. 11:330), stories are recorded about a man who while making a canoe took for a model the breast bone of a bird (Figure 4). Not only is the episode itself similar and uniquely known to Alaskan Athabaskans and to Micmac, but it also is incorporated into a series of adventures of a traveling hero which are also similar.

The two giants motif has wider distribution but is also found at the opposite (northwestern and eastern) ends of the North American continent. Man meets a dangerous giant who proves to be friendly to him; another giant fights the first one; the man helps his friend kill him. In the northwest the motif is recorded among the North Alaska Inupiat, Copper Eskimo, Netsilik, Iglulik, Dena'ina, Ahtna, Kutchin, Upper Tanana, Kaska, Hare, Tahltan, Tsetsot, Carrier, Tlingit, and Lillooet (Billum 1979:12–13; Elliott 1931:172–175; Jenness 1924, no. 36, 79:66–67, 83, 1934, no. 1:100–104; Lowie 1912:188; McKennan 1959:197–199, 1965:107–108; Ostermann 1952:237–239; Rasmussen 1931:229–231, 1932:218–219, 258–259; Petitot 1886, no. 12, 18:132–141, 423; Swanton 1909, no. 57:212–214; Teit 1917, no. 7:445–448, 1921, no. 69:346–349; Tenenbaum 1984:73–83) and in the east among the Menomini, Micmac, Malecite, Passamaquoddy, Abenaki, and Lenape (Bierhorst 1995, no. 126: 59–60; Leland 1968:233–242, 246–249; Mechling 1914, no. 16:75–77; Rand 1894, no. 25:190–199; Wallis and Wallis 1955, no. 21, 24:343, 344–345) as well as among Iroquois-speaking Tuscarora and Seneca (Curtin 2001:509–511; Rudes, Crouse 1987, no. 30: 471–489). The motif was not known neither to Cree, Naskapi, or Montagnais nor to the Inuit of Labrador, Greenland, and Baffin Land and could not be borrowed by Atlantic Algonkians from the Eskimo. It was also unknown to Yupik Eskimo in Chukotka and Alaska, so its borrowing by the Eskimo from the Athabaskans (or pre-Athabaskan Na-Dene) is more probable than its dissemination in the opposite direction. Considering minor episodes which are not necessary to discuss in detail, the Eskimo-Athabaskan, the Algonkian, and the Salishan (Lillooet) variants form three groups that are more or less equidistant from one another.

3.0. BERINGIAN-ALGONKIAN AND BERINGIAN-WESTERN NORTH AMERICAN LINKS

Most of the groups among which motifs in question are registered do not speak Na-Dene languages. In selecting this new network of shared motifs and reconstructing a particular episode in the peopling of North America, however, we narrow the field of research for the Na-Dene origins.

The Algonkian traditions of the North American Midwest-Northeast demonstrate two detailed and specific links in the area of Bering Strait. One is a story about a person who comes to the demonic creatures in search of his kin or comrades who have been lost (Figure 5). A demon wounded by him escapes. The hero meets an old woman, who is a shaman in the village of the demonic creatures. Killing her, the hero puts on her skin or clothes and goes to the wounded demon disguised as a doctor. Instead of curing the demon, he kills him and runs away. Among the Algonkians the motif is included in the texts of the Menomini, different groups of Ojibwa, Rock Cree, Sandy Lake Cree, Northern Salteau, Plains Cree, Sauk and Fox, Montagnais, and (as was mentioned earlier) Micmac (Ahenakew 1929:320–327; Barnouw 1977:34–38; Blackwood 1929, no. 2:323–328; Bloomfield 1930, no. 1:16–20; Brightman 1989: 18–20; Carson 1917:491–492; Jones 1901:226–235; Kidder 1994:25–29; Radin 1914, no. 10:22–23; Radin and Reagan 1928, no. 2-5:62–76; Rand 1894:83–93;

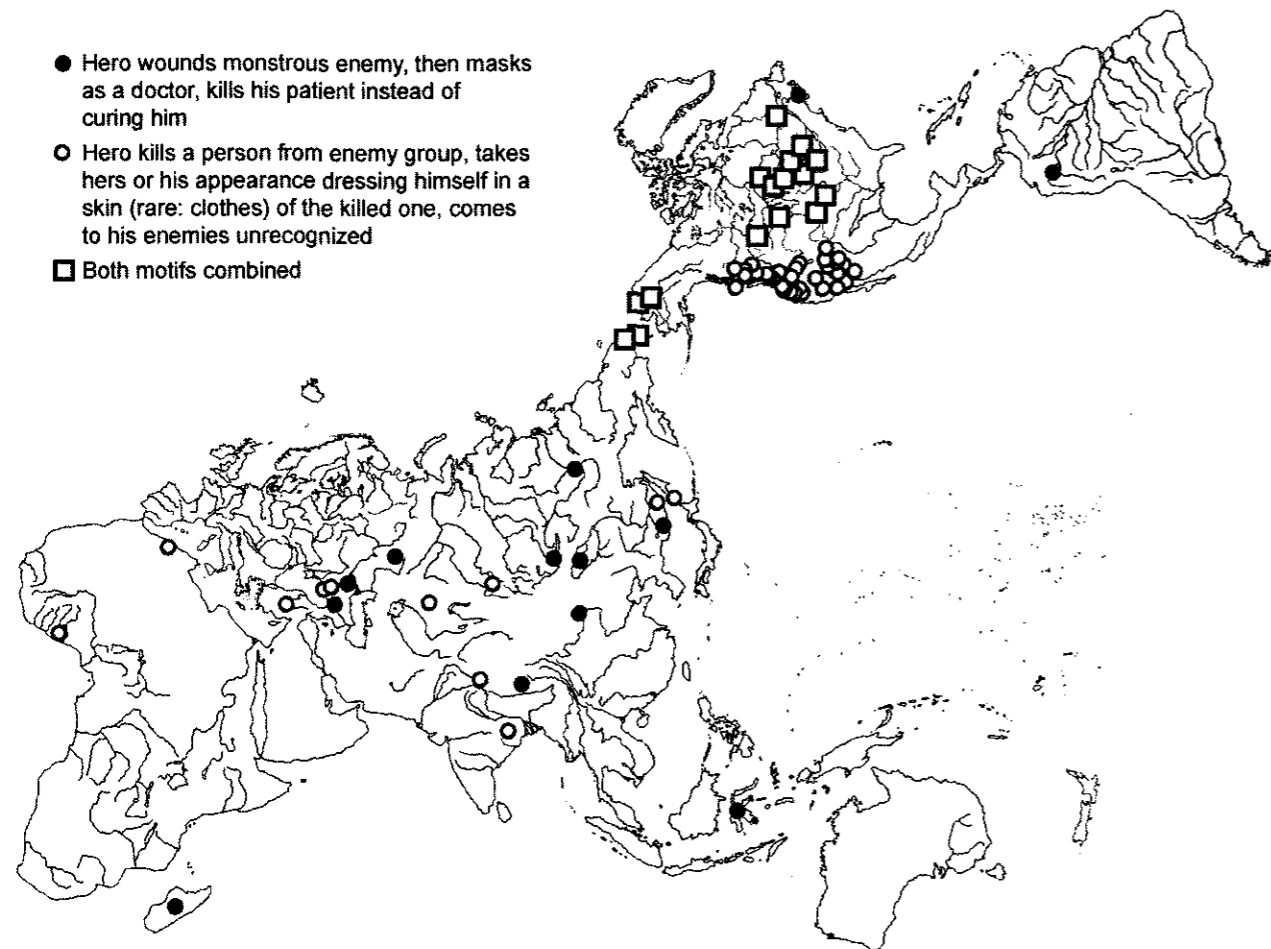


FIGURE 5. World distribution of the hero in guise of a doctor kills his adversary and hero in skin of another person

Ray, Stevens 1971:20–26; Savard 1979, no. 7:28–30; Skinner 1911:173–175; 1916, no. 1.1:341–346; Skinner and Satterlee 1915, no. 7:260–263; Speck 1915, no. 1:34–36; Whitehead 1988:192–204). The stories of Assiniboin, Iowa, Omaha, and Ponca are similar (Dorsey 1890:238–253; Lowie 1909a, no. 5, 14:145–147, 165–166; Skinner 1925, no. 10:468–472; these Sioux-speaking groups share also many other motifs with the Great Lakes Algonkians). There is an isolated South American case among the Chayahuita of eastern Peru (García Tomas 1994:90–299). The Beringian parallels are found among the Chukchi, Asiatic Eskimo, North Alaskan Inupiat, and Koyukon (Alaska Native Writers 1986:79–87; Attla 1989:107–117; Curtis 1976:258–259; Keithahn 1958:52–61; Menovschikov 1985, no. 75, 91:166–168, 210–213; Rubtsova 1954, no. 5:86–92; Spencer 1959:388–390). The latter, being the only Athabaskan group sharing the plot, probably borrowed it from their Eskimo neighbors. The lack of parallels among the Yupik Eskimo and the Koryak puts under doubt both the Eskimo-Aleut and Paleoasiatic origin of the plot in the Bering Strait region. Some pre-Chukchi and pre-Eskimo substratum has to be connected with it.

Parallels for the motifs of hero in skin of another person and hero in guise of a doctor kills his adversary are found far away in Asia among the Buryat, Udihe, and farther to the west and south. However, both motifs are combined only among the Algonkians, some Sioux who had been in close contact with the Algonkians, and the peoples of the Bering Strait region.

The motif of hero in skin of another person, which is rather chaotically represented in the Old World, in North America (besides the Bering Strait region) is found in two well-defined areas: among the Algonkians

and their Midwestern neighbors and across the continuous area in the west-northwest of the continent from Haida and Bella Coola to Ute and Maricopa. Most of the stories of the western traditions in which the episode is present (Haida, Bella Coola, Carrier, Chilcotin, Shuswap, Thompson, Snohomish, Cowlitz, Skagit, Western Sahaptin, Nez Perce, Okanagon, Kutenai, Tillamook, Alcea, Coos, Upper Coquille, Takelma, Karok, Hupa, Shasta, Wintu, Yana, Achomawi, Kawaiisu, Paviotso, Western and Northern Shoshone, Gosiute, Chemehuevi, Southern Paiute, Ute, Hawasupai, Walapai, Yawapai, Zuni, Serrano, Pima, and Maricopa) describe confrontation of the protagonist with some powerful adversaries (Adamson 1934:196–198, 253–254; Benedict 1926, no. 10:12–13; Boas 1898:109–111; 1918, no. 61:183–187; Cushing 1901:452, 462; Dixon 1910, no. 1:8–12; DuBois and Demetracopoulou 1931, no. 18:311–315; Farrand 1900, no. 27:41–42; Farrand, Mayer 1917, no. 8, 12:155–157, 173–175; Frachtenberg 1920, no. 5, 10:67–75, 125–149; Gifford 1933:369–371; Goddard 1904, no. 3:154–156; Guie 1990, no. 16:141–147; Haeberlin 1924, no. 20:408–411; Hanna, Henry 1996:56–63; Hilbert, Vi 1985:45–56, 87–95; Hill-Tout 1911:158–161; Jacobs and Jacobs 1959, no. 8:25–28; Jenness 1934, no. 26, 39:183–184, 207–208; Jacobs 2007:159–172; Kroeber 1935:260–261; Kroeber and Gifford 1980, no. B1:27; Laird 1976:192–207; Linderman 1997, no. 4:41–48; Lowie 1909b, no. 2b, 2c:239–243; 1924, no. 1, 2a, 3, 21:5, 93–101, 161–163, 239–241; Merriam 1992:127–144; Saint Clair 1909, no. 6:32–34; Sapir 1909, no. 17:155–163; 1910, no. 12:157–158; 1930, no. 1:338–345; Shaw 1968:56–62; Smith 1993:45, 91–94, 132–135, 110–113; Smithson and Euler 1994:112–114; Spier 1933:360–363; Spinden 1908, no. 8:19–21; 1917, no. 7:186–187; Steward 1943:294–296; Swanton 1905:136–137; Teit 1909:675–677; Zigmund 1980, no. 16:69–78). Only in texts of the Tututni (Farrand 1915) and the Hopi is the episode just a trick related to sexual adventures of Coyote (Farrand 1915, no. 18:233–238; Malotki 1997, no. 7:111–117). It looks plausible that the Algonkian and the western-northwestern traditions are indirectly related to each other because they both descend from the Chukotkan-Alaskan traditions. The North American distribution of motifs in mythologies seems to follow routes of two streams of prehistoric migrants: one went from Alaska south along the coast and another moved southeast along the Rockies and then across Northern Plains to the Great Lakes region. I suggest that if the Algonkians and the Plateau-southern Northwest Coast Indians (first of all the Salish) are related (at least culturally if not linguistically), they could have split from each other not in the Fraser River basin but earlier, when they both began to move from their Alaskan or even Chukotkan homeland.

The tendencies described are confirmed by the distribution of another motif of the same Beringian-Algonkian complex—person puts his organ on watch. This motif is known in two variants (Figure 6).

According to the first variant, trickster cooks meat and tells his anus to wake him up if somebody tries to steal the meat. Anus does not make an alarm or the trickster does not react. The meat is stolen. This motif is one of the most typical for the Algonkians. It is found among the Naskapi and Montagnais (Desbarats 1969:81–83), Algonkians proper (Speck 1915, no. 4:10–15), Menomini (Hoffman 1896:162–164; Skinner, Satterlee 1915, no. 8:267–270), different groups of Ojibwa (Barnouw 1977:27–28; Hoffman 1896:205; Josseling de Jong 1913, no. 13:23–25; Radin 1914, no. 1, 9:7–8, 21–22; Radin and Reagan 1928, no. 14:97–101; Speck 1915, no. 1:28–31) and Cree (Ray, Stevens 1971:39–40, 44; Skinner 1911:84–86), Fox (Jones 1907, no. 10:279–289), Kickapoo (Jones 1915, no. 3:17–19), Potawatomi (Skinner 1924:339–340), Plains Cree (Skinner 1916, no. 1:351), Plains Ojibwa (Skinner 1919, no. 1:280–281), Blackfoot (Josselin de Jong 1914:10–12; Wissler and Duvall 1908, no. 10, 23:25–27, 39), Gros Ventre (Kroeber 1907b, no. 14:71). The motif is absent in collections of texts of the Eastern Algonkians, Shawnee, Cheyenne, and Arapaho. The non-Algonkian versions of the Midwest and Plains are rare (Winnebago, Assiniboin, Santee) and could be borrowed from the Algonkians.

The same motif in the same context (i.e., combined with the hoodwinked dancers motif) is recorded among the Bella Coola (McIlwraith 1948:2:432–433), but not among other Salish. It is plausible that the Bella Coola borrowed it from the proto-Algonkians like the latter probably borrowed a large series of “western” motifs from Fraser River Salish. All other cases of person puts his organ on watch are found farther to the northwest among the Tsimshian (Boas 1916, no. 22:76–79), Eyak (Johnson 1988:81–84), Upper Tanana (McKenna 1959:194), Dena’ina (Kalifornsky 1991:83–87), Central Yupik (Barker 1995:81–83; Frost 1971:23–26; Gillham 1943:76–85; Smelcer 1992:77–78), Ingalik (Chapman 1914:41), St. Lawrence Yupik (Slwooko 1979:14–20), Maritime Koryak (Bogoras 1902, no. 18:652), and Kerek (Menovschikov 1974, no. 116:368). These

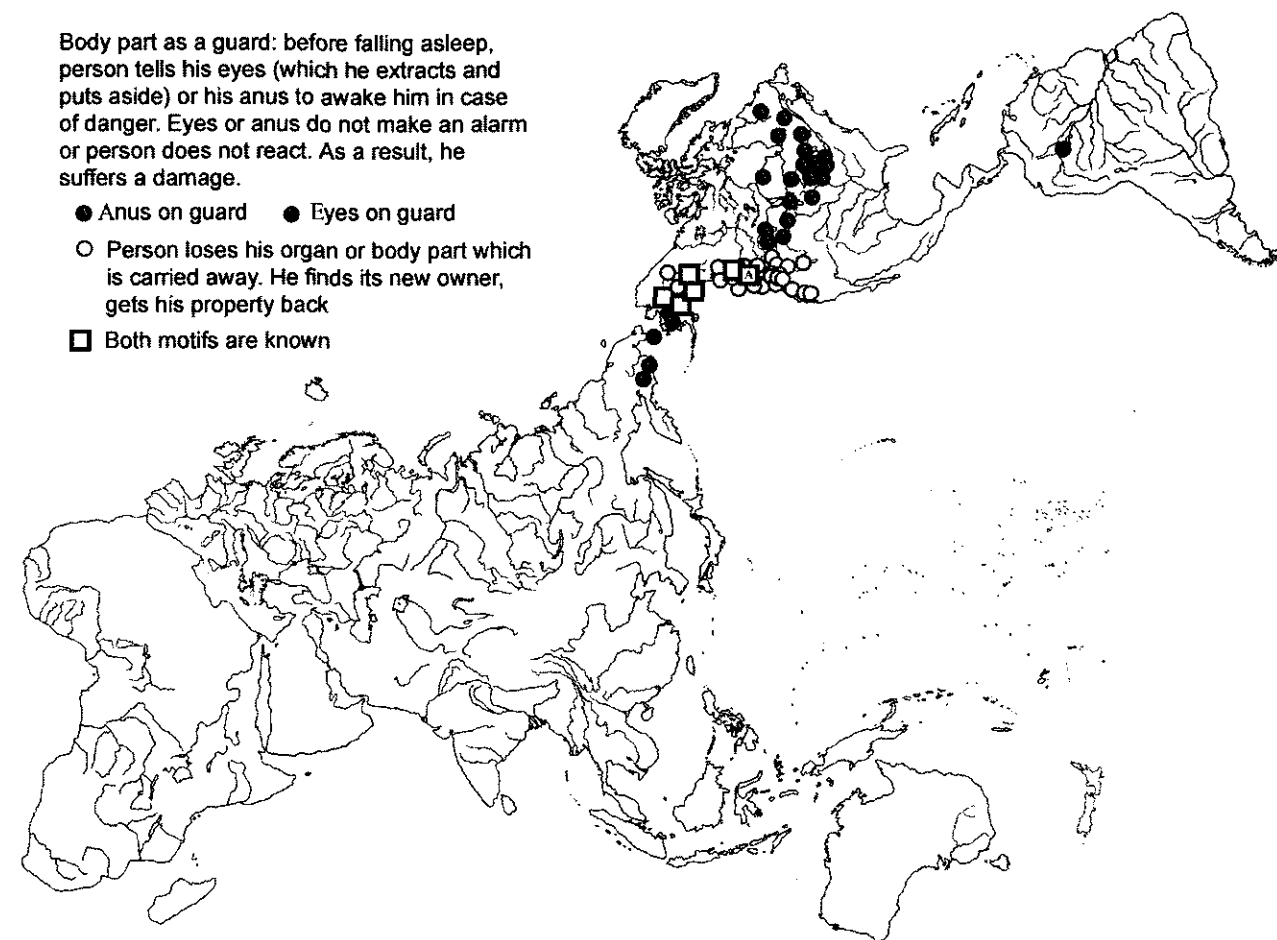


FIGURE 6. World distribution of the person puts his organ on watch and person gets his body part back

cases are more distant geographically from the Algonkian ones and contain other details: not anus but an eye that a person extracts from his eye socket is put on guard and the stolen object is not the food but this eye itself. The protagonists of the stories are Fox, Crane, or Raven. Despite variations in details, the general plot and the characteristics of the protagonists are similar and not known anywhere else in the world.

In most of the Alaskan versions besides the Central Yupik and Ingalik the motif of person puts his organ on watch is combined with the motif of person gets his body part back (he loses his organ or body part which is carried away but finds its new owner and gets it back). The latter motif is widespread across the northwest North America from Alaska to the northern Great Basin and central California, in particular among the Upper Kuskokwim (Ruppert and Bernet 2001:285–287), Kutchin (McKenna 1965:95), Dena'ina (Tenenbaum 1984:125–143; Vaudrin 1969:35–40), Tanana (De Laguna 1995, no. 4:92–95, 120), Upper Tanana (Brean 1975:63–67; McKenna 1959:194), Tahltan (Teit 1919, no. 1.33:224–225), Eyak (Johnson 1988:2), Tlingit (Boas 1895, no. XXV/1:706; De Laguna 1972:871–872; Edmonds and Clark 1989:15; Swanton 1909, no. 1, 31:8, 84–85), Haida (Swanton 1908a:338–340), Tsimshian (Boas 1916, no. 19:74–75), Bella Coola (Boas 1898:109–111; McLlwraith 1948.2:420–421), Kwakiutl (Boas 1916:706), Nootka (Boas 1895, no. XVIII.1:172), Carrier (Jenness 1934, no. 39:207–209), Shuswap (Boas 1895, no. 2:8–9), Thompson (Hanna, Henry 1996:56–63), Comox (Boas 1916:706), Snohomish (Haerberlin 1924, no. 20:406–411), Skagit (Hilbert Vi 1985:45–56, 87–95, 159–163), Puget Sound Salish (Ballard 1927:75), Upper Chehalis and Cowlitz (Adamson 1934:46–52, 198–200, 253–254), Western Sahaptin (Farrand, Mayer 1917, no. 8:155–157), Yakima (Hines 1992, no. 54:80–188), Nez Perce (Phinney 1934:251–259, Spinden 1908, no. 8:19–21), Okanagon (Guie 1990, no. 16:141–147; Hill Tout 1911:148–150), Coeur-d'Alene (Reichard 1947, no. 7:89–95), Kutenai (Boas 1918, no. 61:83–187,

231–243, Linderman 1997, no. 4:41–48), Kikitat (Jacobs 1934, no. 18:42–43), Kalapuya (Gatschet a.o. 1945, no. 4:231–236; Jacobs 1945, no. 4:96–103), Achumawi (Angulo 1928:587), Maidu (Shibley 1963, no. 2:13–19), and Northern Shoshone (Lowie 1909b, no. 19, 20:208–270, 270–271). One case is in South America among the Ticuna (Nimuendaju 1952:118–119), but in the Old World such an episode is unknown. The areal distribution of person puts his organ on watch and person gets his body part back largely overlaps the areal distribution of hero in guise of a doctor kills his adversary and hero in skin of another person. Versions that combine both motifs are found in Alaska. Versions that contain only the first one are in the central and eastern parts of North America (mainly among the Algonkians). Versions that contain only the second motif are in the western and northwestern parts of the continent.

I repeat that these tendencies could result from migration from Alaska in two divergent directions so that the both groups preserved only part of the original tradition and lost the other part.

The organ that has been stolen and then reobtained by the person is very often an eye or eyes, and this detail connects the given group of texts with the Beringian versions in which the eye has been stolen because it was put on watch. To get his organ back, the protagonist often puts on somebody's skin and thus goes to his enemies in other person's guise. In particular texts all these motifs are used in different combinations. The historic connection between northwestern traditions from Chukotka to Northern California and partly to the Southwest is extremely probable.

It is noteworthy that the earth-diver myth, which is so important for Algonkians, does not belong to the Northwestern tradition, so the proto-Algonkians most probably adopted it from the substratum population (see above about the Northern Athabaskan-Algonkian folklore-mythological parallels). The earth-diver is completely absent among the Paleoasiatic and Eskimo-Aleut groups. Across most of the area where person gets his body part back is recorded it is found only rarely and in modified forms different from classic Siberian and American Subarctic versions. Only at the southern margin of the spread of the person gets his body part back among Californian Penutians and Uto-Aztecs do this motif and the classical earth-diver coexist. It is approximately the same area where other drops of Subarctic mythology (wolf-scout and Sun caught in snare) are also recorded.

4.0. RECONSTRUCTION OF DEEP PREHISTORY

Though this paper deals exclusively with data on the American Native culture as it was in 19th and 20th centuries, these data can be used to reconstruct deep prehistory. Addressing traditional narratives, we can treat them either as entities which are meaningful for bearers of a particular culture and considered by them as expressing their unique cultural values, or as combinations of plots and images which are borrowed from earlier generations and from neighboring groups and which have mostly cross-cultural distribution. To a certain degree, the same can be said about any sphere of culture, but the place of narratives is special, given their weak dependence on environmental and social factors. Franz Boas was the first to demonstrate that tales were relatively ephemeral and composed of elements which were subject to easy dissemination and therefore not culturally specific. Boas proceeded from the supposition that historical reconstructions based on the study of mythology were possible thanks to the unconscious reproduction of separate elements of narratives by people who retell their texts (Boas 1940:290–94, 312–15, 331–43, 437–90; Mathé and Miller 2001:111). Those analytical units that Boas named "elements" are equivalent to my term, "motifs"—the concept behind both terms is the same.

Areal patterns in the distribution of motifs preserve information on past migrations and cultural contacts. However, the folklore data themselves do not possess any inner chronology. This was one of the major reasons why the approach of early Boasians was mostly abandoned in the 1920s.

One way to date particular patterns in motif distributions is to compare their areal extents with particular archaeological traditions. The comparison with genetic and linguistic data is also important, but archaeology stands on much firmer ground in dating material culture. Accordingly, any reconstructions based on the study of folklore data must be checked against the picture of the past that archaeology has created.

Both the processing of about 25,000 folklore and mythological texts recorded among the American Natives and the archaeological data demonstrate that the peopling of the New World cannot be reduced to a few events, the crossing of Beringia or the Bering Strait by various compact groups of people, and certainly not the "three migrations" of the Amerind, Na-Dene, and Eskimo-Aleuts. Since the Terminal Pleistocene, when glaciers were no longer barriers for the spread of the peoples, and probably after the melting of glaciers, new groups were continually moving from Chukotka to Alaska and beyond. Using the folklore data presented above, I suggest there were four separate migration units, meaning streams of people gradually moving into new territories. These are summarized in Table 1.

TABLE 1. Migration units suggested from folklore data (ordered by earliest to latest)

Temporal order	Archaeological/Cultural signature	Geographic migration routes	Folklore signature
First	Monte-Verde ancestors	Pacific coast, to South America	Melanesian-Amazonian parallels
Second	Clovis ancestors	MacKenzie River corridor, interior North America	Earth-diver
Third	Algonkian ancestors; Protowestern	Coastal route to the Pacific, North America, one group travels to the Great Lakes area	Many parallels with Pacific Asia (see below)
Fourth	Na-Dene ancestors	Interior Beringia, remained in the north	No parallels with Asia (see below)

The earliest (considering the age of Monte Verde; Dillehay et al. 2008) unit moved along the coast of south Alaska and reached South America. It is probable that these people are responsible for extensive Melanesian-Amazonian parallels in mythology (Berezkin 2002). Melanesia was not of course the homeland of American Indians, even not of the protomorphic groups whose crania are found at Lapa Vermelha and at other South American sites of Pleistocene age. It is probable that the movement of these people to the New World began somewhere in Pacific Asia (Neves and Hubbe 2005, Neves and Pucciarelli 1998). It is worth noting that the only male rituals of Amazonian-Melanesian type ever found in the Northern Hemisphere were described by early Russian sources among the inhabitants of Unalaska (Unalaska) and Kodiak (Davydov 1812:205-208; Veniaminov 1840:309-315).

Another unit that possibly moved along the Mackenzie corridor was responsible for the early peopling of North America, especially to the east of the Rockies. They were creators of Paleoindian stone industries, and the earth-diver is their signature in mythology. Their Asiatic homeland was in continental Siberia where the earth-diver was widespread. Because genetically all the Amerinds have much in common, the physical, cultural, and linguistic difference between the first and the second units initially was probably not too big. However, the Amazonian and the North American sets of mythological motifs are not only distinct from each other but also find parallels in different regions of the Old World, so differentiation between South and North American mythologies only after their bearers already reached the New World is unlikely.

The third episode of the peopling of the New World is reconstructed now on the basis of the parallels between Chukotkan-Alaskan, Algonkian, and western-northwestern North American data. I suggest that during the Holocene, when the New World was already peopled, groups of Asian origin continued to move along the Pacific coast from Alaska down to California and the Great Basin. One of these groups had split from the others (possibly already in Alaska or even Chukotka) and then migrated from the area near the Fraser River basin to the Great Lakes. Its linguistic descendants are the Algonkians, who assimilated with the earlier inhabitants of the eastern Subarctic and the Northeast. Algonkian (especially core Algonkian without Blackfoot, Gros Ventre, Cheyenne, Arapaho, and the Atlantic groups) mythology is a mixture of

motifs brought from the western Algonkian-Ritwan (or Algie) homeland and those that were borrowed from the local Great Lakes and eastern Subarctic substratum. Folklore and mythology of the Pacific Western and Northwestern North America have spectacular parallels in Pacific Asia, too many to describe them now (e.g. invisible fishhook, Berezkin 2009, figure 6). Chukotka and Lower Amur-Primorye require special investigations to identify possible parallels for Plateau (mostly Salishan) tales (Berezkin 2007:115). Archaeologically the movement of people from north to south in western United States and Canada can be related to the spread of Protowestern Tradition dated to the Early Holocene (Geib and Jolie 2008).

The Na-Dene migration was a fourth major movement of people into America. Like the third unit, this one arrived when the New World was already inhabited that prevented deep penetration of the newcomers into America. Unlike the third unit, which was moving along the Pacific areas, the Na-Dene peopled the hinterland. They descend from the creators of Denali stone industry, and their Asiatic origins must be related to the Dyuktai tradition. However, unlike the other three units, the set of motifs recorded among Na-Dene has no obvious parallels in Asia, or more specifically in continental Central or Eastern Siberia, where such parallels are expected based on linguistic ground. This fact does not have a satisfactory explanation though it correlates with the lack of such links in genetics (Scott and O'Rourke, this volume).

If the known Na-Dene languages are the only ones related to this family and existed in North America and if all of them spread from an initial small core localized near the border between Yukon and Alaska, the Na-Dene prehistory becomes more enigmatic. If the Na-Dene languages were formerly spread much farther to the east in North America, but later receded, losing ground first (possibly) to some east North American languages (probably related to the bearers of Agate Basin tradition that were moving from south to north along with the melting of the Laurentide), and then to the Algonkian, Na-Dene prehistory becomes less enigmatic. Folklore-mythological links across the Subarctic, connecting Alaskan Athabaskans with the easternmost groups of Algonkians (but that are absent between the two), are interpreted to be remnants of some ancient cultural-linguistic interface.

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COMPARISON OF A PAIR OF KET AND DINÉ (NAVAJO) MYTH MOTIFS

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1.0. INTRODUCTION

What is to be made of myth motifs in Ket and Diné cultures that share some common elements but that also differ in substantial ways? Are their similarities coincidental and their differences too substantial to support an argument for a common cultural origin? One difficulty in resolving this question is that a common origin for these cultures, if it existed at all, would have been on the order of perhaps 10,000 years ago, and there are few if any examples of comparisons of the ideological systems of oral cultures at such a time depth that would provide standards for comparison. In the case of the Ket and the Diné, it could be argued that we might expect to find some similarities in underlying mythic themes, but perhaps we shouldn't expect to find many similarities in the specific details of myth motifs. Perhaps the best that can be done is to outline commonalities and differences that appear in a pair of myth motifs and venture a tentative judgment as to the probability of their common origin as a guide to future research that could provide further evidence.

The broad theme of the pair of Ket-Diné (Navajo) motifs that we compare here is the travel of mythical beings to meet with sky deities. We have identified four common elements of this pair of motifs:

1. Significant beings in the pair of motifs are forms of fly.
2. Ket and Diné terms for "fly" are potential cognates.
3. The flies have exceptional spiritual powers that are unmatched by other mythic beings.
4. The flies are involved in travel to meet with a powerful sky deity.

2.0. DISCUSSION OF COMMONALITIES AND DIFFERENCES

1. Significant beings in the pair of motifs are forms of fly (Figures 1-4):

In the Ket motif, the fly is identified as a Dragon Fly, referred to by Alekseenko as Dun'd (1996:34-37). It is represented in a Ket metal artifact depicted by Alekseenko (1981:174) as having the two pairs of wings that are characteristic of dragonflies (Figure 1, left image). However, the second image in Alekseenko (1996, figure 5) suggests that Dun'd may also be represented with only one pair of wings (Figure 1, right image).

In another article, Alekseenko (1984:53) presented Dun'd's parka with dragonflies with two pair of wings on it.

In the Diné motif, the fly is called "Big Fly," a gloss of Dó' Tsoh. Most Navajo representations depict it as having two pairs of wings, like a dragonfly, as shown in the "Dontso Sand Painting of Hail Chant" (from Wheelwright 1946) (Figure 2).

In fact, we have found only one depiction of Dó' Tsoh having a single pair of wings—a characteristic of all true flies of the Diptera order. This appears in a drawing of Dó' Tsoh in the center of a basket used in a

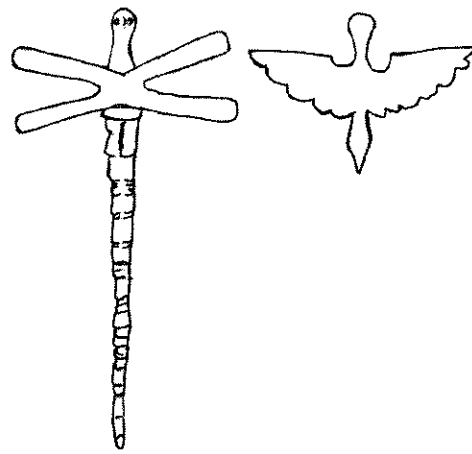


FIGURE 1. Ket *Dun'd* (Dragon Fly)
(adapted from Alekseenko 1981, 1996)

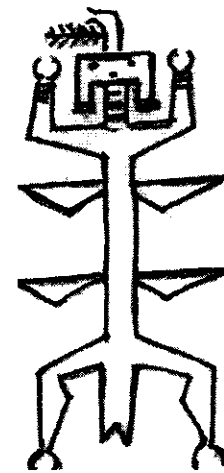


FIGURE 2. Navajo Big Fly with two pairs of wings (adapted from Wheelwright 1946)

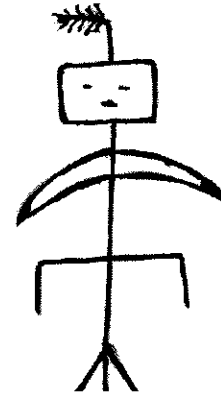


FIGURE 3. Navajo Big Fly with a single pair of wings (adapted from Haile 1938)

cleansing ritual (Figure 3, from Haile 1938).

Nevertheless, according to Wyman and Bailey in their work "Navajo Ethnoentomology," the term *Do'tso* refers to a fly of the family Tachinidae which, as with all "true" flies, does have only one pair of wings (1964:251). In addition, Navajo medicine men informants have confirmed that Big Fly may be described as somewhat larger than the common house fly, is black in color, and has a fuzzy body with a green sheen, which conforms scientific descriptions of the tachini fly (McNeley's personal communication).

However, as with the Ket, there is inconsistency in representations of the dragonfly, for we see in another sand painting (Figure 4, from Reichard 1977) depictions of four dragonflies each of which has only one pair of wings.

Perhaps Navajo medicine people chose not to accurately represent the true wing structures of Big Fly and dragonfly in order to reflect some spiritual qualities. One medicine man informant suggested that a double pair of wings may be depicted on Big Fly so as to emphasize its male-female duality, which is attributed to all living things, as well as its very positive spiritual nature (McNeley's personal communication).

2. Ket and Diné terms for "fly" are potential cognates.

According to Edward Vajda (p.c. and this volume), Ket dragonfly (a sacred symbol) is *d̄x̄n-t* ~ *d̄n-da* 'dragonfly', cf. PA **daŋ* 'fly' (Krauss 2005:129), and Navajo *tsé'édó'ii* 'fly', cf. *tániil'áíí* 'dragonfly' (Young and Morgan 1987:891, 870)

d̄x̄n-t may have some parallel to Athabaskan words for "fly." But we would have to find other potential cognates showing the same sort of vocalism (schwa in Ket) versus /u/ or maybe labialized initial /dw/.

3. The flies in the motifs have exceptional spiritual powers, unmatched by other mythic beings.

In Ket, *d̄x̄n-t* (or *Dun'd*), "Dragon Fly," is the medium of the first and the most powerful of the shamans whose name is *Doh* who has unique access along the great perpetual road of the *Dun'd* to the highest circle of the upper world where the Sky God *Es'* is living (Alekseenko 1996:35-36).

In another motif that reflects the power of *Doh*, he and his helpers dive to the bottom of the sea for a piece of dirt for use in the creation of the earth (Alekseenko 2001:36). *Doh* and a special category of shamans, *Dun'd*, were connected with a special sacred world at the top of the pantheon (p. 26). *Doh* traveled as a swan to the upper world, where invisible deities such as *Es'*, the god of the sky, lived along with spirits

called *Es'deng* that were shaman's helpers (p. 22). The people of the upper world, who were very wise, were visible only to *Doh* (p. 118). A fly was also used as a medium for *Doh's* travels, for in one legend he migrated in the fall south along the Yenisei River to warmer lands, and when he returned in the spring it was in the form of a fly (p. 105-109).

In Navajo culture, *Dó' Tsoh* existed in the first of the lower worlds at the very beginning of life along with *Nilch'i*, "Wind," which also originated in primordial times (Benally 2008; McNeley 1981). According to McNeley, one medicine man said that Big Fly and Wind are "the same" despite their surface differences, since they are virtually interchangeable in terms of their functions as

mentors and guardians of deities and, later, of human beings. Indeed, recorded versions of the myth motif that is the focus in this study vary as to whether it is Big Fly or Little Wind that assists the Warrior Twins in their travel to meet their father, the Sun. The extraordinary power of both Big Fly and Little Wind is evidenced in their omniscient knowledge that enables them to advise, guide, and warn the other deities and spiritual beings. Reichard notes that the power of Big Fly supersedes that of any of the deities for whom it acts (1983:390). This omniscience is attributed to Big Fly's ability to fly anywhere, observe things, and land on one's shoulder from where he can whisper in the ear, and to Little Wind's mobility in moving anywhere and serving as an agent of the four winds of the cardinal directions that are the source and bearers of knowledge.

4. The flies are involved in travel to meet with a powerful sky deity.

In the Ket motif, the Dragon Fly assists the shaman, *Doh*, as his medium, in his travel to the Sky God. In the Diné motif, Big Fly assists the Warrior Twins, as their mentor and guide, as they travel to meet with their father, the Sun.

There is no evidence of such mythological creatures like Ket's dragonfly in neighboring Siberian cultures but there is evidence of Navajo Big Fly (or *Nilch'i*, "Wind") creature from other Athabaskan and neighboring groups.

As Athabaskan speakers moved into the American Southwest, they came into contact with the Pueblo cultures that had long been resided in the area. The Navajo in particular were subjected to cultural influences from Pueblo groups. Might the mythological motif in question have been borrowed from these cultures? We do find a myth motif in Zuni culture to the effect that the Sun begat War Twins who later visited the Sun and then killed the monsters on the earth—very much like in the Navajo myth (Parsons 1939:51, 199, 204). However, we find no references to Big Fly or Wind mentors, assistants, or guides. Dragonfly in Zuni culture has "supernatural power," and is also a "shamanistic creature" in San Juan mythology, but further details are lacking (ibid.:191). Parsons notes that beetles in Hopi culture and ants in Zuni culture are helpful creatures in war in "covering tracks," and she cites a comparison made by Newcomb and Reichard with Navajo insects that "protect and warn" (p. 191), but there is no specific evidence provided that these insects function as mentors or guides.

The argument for a distant connection between the Ket and the Navajo motifs that are the focus of this paper would have been strengthened had we found similar motifs among the Northern Athabaskans, who shared a common history with the Navajo before the last millennium. In Tlingit mythology dragonflies were thought to be transports of the human soul for shamans and symbols of transformation (The Dragonfly Project "Why Dragonfly?" <http://www.haineslibrary.org>).

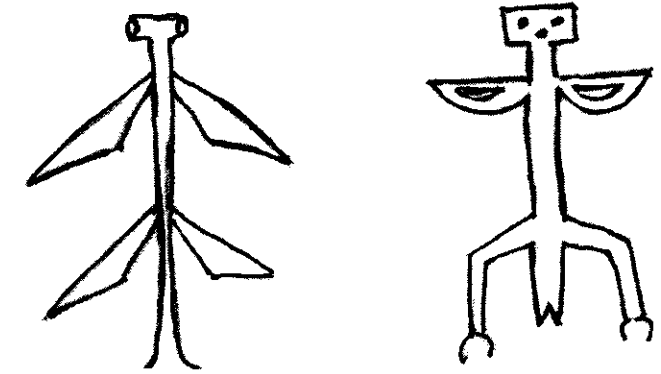


FIGURE 4. Navajo dragonflies with a single pair of wings (adapted from Reichard 1977)

We do find most of the elements of the Navajo myth motif in the legends of the Southern Athabaskans. For example, the White Mountain Apache tell of Monster Slayer going to his father the Sun and the obstacles that he has to overcome, but there is no mention of mentors (Goodwin 1939; Goddard 1918, 1919). The same is true of a legend of the Lipan Apache (Opler 1940:3). In the case of the Chiricahua Apache, although "various animals" are said to have helped one of the War Twins there is no clarification of in what way they helped (Opler 1940:3). In the case of the Jicarilla Apache, however, there is reference to "Whirlwind" always finding out what is happening and conveying the message to "Holy Boy"; and, as the War Twins journeyed to the Sun, "their ears" told them what to do (Opler, 1938:49-50). But, nowhere in Southern Athabaskan legends have we found reference to Big Fly apart from the Navajo (for an overview of "Wind" in Northern Athabaskan cultures see McNeley 2005).

3.0. CONCLUSIONS

The Ket and Navajo motifs are conceptually the same, for each describes a kind of fly endowed with special power that assists another spiritual being in its travel to meet with a deity in the sky.

The terms for "fly" and "dragonfly" in these two cultures are potential cognates.

There is a similar inconsistency in representation of *d̄r̄n-t* (dragonfly) in Ket and Big Fly in Navajo (number of wings).

Differences between the two motifs include variation in the species of flies, variation in the nature of the beings that are being assisted by the flies (a shaman in the Ket motif and the Warrior Twins in the Navajo motif), and variation in the kind of assistance that is provided to the other being (i.e., the Ket Dragon Fly provides a means of travel for the shaman, and the Navajo Big Fly serves as an advisor and guide to the Warrior Twins).

We find in the Zuni Pueblo culture a motif of War Twin sons of the Sun traveling to visit their father in the sky, but there is no reference to helping assistants. The legend of War Twins visiting the Sun is also common among Southern Athabaskan groups, but only in the case of the Jicarilla Apache do we find explicit mention of a form of Wind serving as mentor. There is a reference to a Dragon Fly as an assistant to a shaman in Tlingit culture.

The available evidence does not unambiguously establish that the myth motifs at issue are derived from a common cultural origin. However, the evidence may provide a piece—along with other cultural, linguistic, archaeological, and physical pieces—that can collectively be used for constructing a picture of the relationship, if any, between the Kets of Central Siberia and the Navajo and other AET speakers of North America.

ACKNOWLEDGMENTS

In 2002, Dr. James K. McNeley, Diné College, invited me to assist him in a brief pilot project to explore cultural similarities between the Kets of Central Siberia and Dene speaking peoples of North America. The purpose of the project was to do a preliminary test of the hypothesis that Ket-Athabaskan cultures have elements in common due to a possible common cultural ancestry. The study was based on hypotheses published independently by Merritt Ruhlen (1998) and Edward Vajda (this volume) that *Yeneseian and Athabaskan-Eyak-Tlingit (AET) languages are genetically related*. We reviewed ethnographic reports in the University of Alaska Anchorage library together with Ket ethnographic data in the private library of Dr. Edward Vajda in Bellingham, WA.

During this research many similarities were discovered in animistic concepts of the world, attitudes towards death, and obtaining spiritual power by shamans. In Ket and Athabaskan cultures, key notions describing shamanism include dreams, spirit-helpers, songs, trails, and such paraphernalia as drums, rattles, rods, costumes, and dolls. There are common myth motifs shared between Siberian and North American peoples (including Yeniseian and Dene people), for example, the Earth-Diver Myth (Thompson 1966; Napolskikh 1989; Honigmann 1949:214; Alekseenko 2001:57); the myth of Creation of Mosquitoes (Erdoes 1984:192-193; Alekseenko 2001:249); the myth of opening boxes/bags with the sun, moon, stars, and warm wind (Kamenskii 1906:58, Alekseyenko 2001:255).

This paper was prepared with major help and support of Dr. James K. McNeley, who did extensive library research on Southern Athabaskan mythology and provided copies of Navajo sand paintings. The paper focuses on Ket-Diné (Navajo) parallel myth motifs in which 'Dragon Fly' in Ket and 'Big Fly' in Navajo assist other beings in traveling to a deity in the sky. The area of concepts of spiritual power was chosen because one of the previously discovered linguistic cognates, *shaman*, belongs to the religious domain (Vajda, this volume).

A possible strategy to trace cultural similarities would be to look for contexts for terms that have been identified as cognates. This might help us understand why exactly these cognates have survived and could be linked together.

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Part 3. Commentaries on the Dene-Yeniseian Hypothesis

ON THE FIRST SUBSTANTIAL TRANS-BERING LANGUAGE COMPARISON

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1.0. DISCOVERY¹

Yeniseian-Dene (Yen-AET) of Edward Vajda is correct. His demonstration, the truly important aspect of his scientific achievement, ranks amongst the great discoveries of this type of productive inferential reasoning, i.e. linguistic modern cladistics, to use the modish geological paleontological noun/adjective. It is by paleontologists' reasoning belatedly recognized in strata cut more attentively by their peat-irons than by their reasoning. Paleontologists seem to be oblivious to the development which came between ca. Jones's 1786, or even the Swede Jäger's 1686 conclusion (still remembered in 1772 and 1779), and Leskien's 1876 crisp phrase (to Saussure's 1878 formulation) of the exceptionless law-governed rule of the queen of the human sciences, the Archimedian physics (or Mendelian logic) of living matter. Historical (= diachronic) linguistics = *vergleichende Sprachwissenschaft* ['comparative language science'] as confirmed by the classic law of Karl Verner correcting by 1877 unanalyzed apparent violations to Jakob Grimm's 1820–22 Law for the Germanic obstruent consonants.² What could be more beautiful than Verner's Law, where everything is reduced to phasing and Brownian mistargeting, and you are told when and where.³

Edward Vajda's achievement, illustrated on spectacular observational data, has now led to the complete and exact scientific validity of all these accepted complex aspects of historical linguistics (=cladistic linguistics). That is to say, the detailed and idiosyncratic Ket-Dene equivalences observed can only mean a precise millennium-deep branching of a single linguistic code discovered for the first time to have bridged irrevocably the Bering water (or ice) barrier many millennia ago between the Old World (Central Ural-Yenisei and Western Siberia) and the New (North America from Alaska as far as the Athabaskan Grand Canyon and the Rio Grande).

2.0. ANALYSIS

Consider first just assured nearby familial relations we already believe today. The earlier assertion (ca. 1770) of Magyar-Finnish basic equivalences for Finno-Ugric by Sajnovics (1786 to 1876–77) were not

¹ This is an expanded version of my February 2008 D-Y Symposium paper entitled "Yeniseic-Ket/TlinaDené & IndoHit-tite Comparison: Types of Equivalence & Diagnostic Discontinuity: Persuasion from Non-obvious Evidence ~ or Cranky Sameness." I would like to thank James Kari for his helpfulness, practical and considerate, his friendly and tolerant erudition in forcing me to produce I hope a legible manuscript for a learned but highly varied public. I thank, too, such friendly colleagues and valued predecessors.

² Formulated earlier in fact by the Dane Rasmus Rask (1787–1832).

³ Note also that Verner's systematic equivalences (Robins 1967:184 and note 82) not only erased apparently random violations, but they also imposed a chronology such that they apply after Grimm's great and strengthened "law," and with a natural phonetic value which conforms to Occam's (ca. 1280–1344) renowned razor, i.e. as spirants differing only by voice, and also captures *s > z (> r) and this means that *d^h > ð and probably *g^h > γ (because palatalized OE g > y e.g. in *yester-day*; and Dutch *g > x), etc. had already occurred.

classically general and exact as were those increasingly for Indo-European.

In fact, it is still hard today to mention a complete and ample, clear and instructive survey free from technical detail and specialist argument, in a Western language, and not in encyclopedic compression, on Uralic (i.e., ca. 10 Finno-Ugric + Samoyed, bringing another half-dozen languages, and adding perhaps Yukaghir). But we are not complicating matters with the old debate about joining Altaic (i.e., Turkic, Mongolian, Tungusic, and perhaps, even likely, the distant Korean and then Japanese with its strong Austronesian diffusion). One can read common sense in informed erudition amongst the works of Austerlitz, Abondolo, Hajdú, Harms, Itkonen, Joki, Korhonen, Janhunen, L. Campbell.

The equivalences for Semitic (and still for Afro-Asiatic; *pace* Omotic) seem until recent decades to have been notably, and embarrassingly (on Afro-Asiatic there is simply too little agreement to guide an outsider) best mainly for the visibly conservative Arabic and perhaps South Arabian and Ethiopian. Even Hebrew philology and Barth's Law for Akkadian cannot rank in professional prestige and respect with the Vedic metrics and Verner's Law (1877 publication). Moreover, Rask's generally admired position at the birth pangs of IE discovery have wavered across the spectrum of modern linguistics for its assignment of emphasis, with fame never doubted (see especially the sharply observant views of Percival 1974).

A recent general book, Marcantonio 2002, is confused and confusing on matters of principle for the comparative method although stuffed with gathered information (such as pp. 173–175 section 6.5 and 222–224 section 8.4 on Yukaghir) and pp. 306–328, a very useful lengthy list of exact bibliographic references. Look up Robins 1968, pp. 170, 193.

Still, while it is difficult to point to a clear, readable, unblemished survey of the comparable data assuring us of a Uralic family, there can be no doubt that a start toward this goal was made earlier than Bopp's 1816 Indo-European effort, and in fact in the 18th century; moreover, Rask, whose reprint of 1918 was written in manuscript 1811–1814, had read Sajnovics. This, as well as Gyármathi's early work was recognized by Pedersen and also Thomsen. All of this, and the valuable word-collecting pursued earlier in the 18th century, make Gulya 1974 and less so Greene 1974, well worth reading as background to our entire topic, as well as Metcalf 1974 (in the same volume), tracing our detailed intellectual history back to Jäger in 1686.

3.0. PROGRESSIVE ANALYSIS

Though triumphs of patience and skill, many largely successful familial reconstructions have been geographically compact: e.g. Krauss and Leer's Na-Dene (=AET), Bergsland's Eskimo-Aleut;⁴ and Michelson-Bloomfield-I. Goddard's Algonquian, strewn on the way to Algic, (to cover Algonkian and Ritwan, the latter two being California languages, Wiyot and Yurok), together with Arapaho (notably), Cheyenne, Blackfoot (I. Goddard and earlier); British Celtic-Welsh and Cornish-Breton, most Dravidian;⁵ Turkic with Chuvash; even vast Bantu; chronologically shallow or blest with writing (Romance, Ainu, Arbëresh,⁶ even Mongolian); or helped by shared culture, European Romanès, Afrikaans with Rotterdam Dutch, Portuguese coastal colonies in India and Africa.

Then come heroic reconstructions across distance or time: I. Dyen and Dempwolff's Austronesian plus A. Pawley and Blust; Önge in the Andamans joins Austronesian in 2007 (Blevins 2007);⁷ the Austro-Asiatic complex: Munda, Nicobarese, Khasi, Mon-Khmer, Palaung-Wa, Senoi-Semai in Malaysia, Vietnam-

⁴ Bergsland 1964.

⁵ Dravidian is well understood. For admirable work, any scholar will profit from Emeneau 1984 and Krishnamurti 1961, plus later publications.

⁶ Arbëresh—I reckon from personal fieldwork in the 50 villages in Italy south of Naples at ca. a dozen separate linguistic groups, related to Arvanitika in Greece.

⁷ See now Robbeets 2003 dissertation. While there remain serious questions, it shows a very intelligent approach to the problem, and has an excellent, complete and critical summary of past scholarship. Austronesian, from Madagascar through Malaysia-Indonesia to Pacific Polynesia has been well tended for a century, esp. 1934–1938, and as recently as J. Blevins (Önge) three years ago, in 2007.

Muong, Katuic, Bahnaric (some 150 languages) and dubiously Nihali. Champollion et al. Egyptian; Laroche's Luwian, Sapir's 1913 (1951:49) Uto-Aztecan with much valuable help from anthropologists, archaeologists, and historians; long Sinologic collaboration (busy from Canada to Denmark) with native and Karlgren and Chinese; Kaufman and Justesen's (1993, 1998) Epi-Olmec and Mixe-Zoque (and Mayan);⁸ SIL collaboration (see Longacre 1964) and also Kaufman 2006 Otomanguean, and Poppe covering Altaic (in some sense) . . . I must have forgotten some. The picture keeps changing: Siouan joins others, it seems at least for Yuchi (with Rankin); Penutian (?); but for Hokan see Kaufman 1989, 2006; Carian joins Anatolian (1990s) and Messapic-Illyrian with Albanian (1990s–2005). We must be critical but open minded.

Now add to this list as proofs of nonobvious systematic equivalence Vajda's Dene-Yeniseian, not forgetting Krauss and Leer's Dene, Heinrich Werner's Ket tones, and Fortescue's 1998:313–314 categorial insights. As measures of progress, there is an interval of time that I consider indicative if not logically important. Uralic has learned its lessons (feebly or modestly but diligently) since 1770, Indo-European with great success and exactitude, since 1786—220 years. Vajda's Dene-Yeniseian was proven to our group on Feb. 26, 2008, in Fairbanks from field work then of about 10 years. Cladistic linguistics has learned something! And our requirements are now more demanding and aptly convincing, as we shall see.

4.0. PRINCIPLES FOR LONG-RANGE LINGUISTIC RELATIONS

It will be useful to take up certain general and principal (almost external) questions and to consider them against a background of Osthoff and Brugmann's (in 1878) which I listed and reviewed in Hamp 1978:427–28. Linguistic history presupposes communication and communication exploits *lack of change*; we must allow for that—that is what genetic descent in any sense implies. What interferes with this? Social movement can mean micro-change, and we can brand that as irregularity—for linguistics! English *radio* and *wireless* surface 1903–1910 and 1895–1903, respectively, while *electric(ity)* had been around since the mid-17th century (from Latinized Greek 'amber'). Maybe that connects somewhat with the dates of Marconi (1874–1937) and Edison (1847–1931); maybe not. But regular or not (one-time rule, which may be important!) it doesn't affect our present task.

Sometimes we observe stability. Old Lithuanian said *esti* 'is' just the way Indo-Europeans did (now it is *yra* 'here is' by a few regular changes). We are glad. Yet we don't give up searching behind micro-rules—irregularities grammarians call them, but we love them when they're archaically *residues*: fossils, idioms, ('something smells' archaically in Albanian just as '*wreaking*' havoc in English). Indo-Europeans avoided, it seems, saying 'eat', they preferred 'eat up', in an old-fashioned phrase with an outdated (**ho-?(e)d-*) 'up' which has also spawned German *fressen* beside *essen* (Hamp, in press). An Armenian 'eye' has all alone the consonant (a *k* instead of an aspirate *k*) a linguist wouldn't expect. Remember that we must always try to exploit *the reason for no change*; contexts or function are important, e.g. synchronic paradigms; *dove* has replaced *dived*. Why? That is part of *total accountability*.

On documenting lineal history we apply total accountability. When dealing with natural language we must always face problems of sorting dialect variants and not throwing out valuable evidence. Look up *ain't* / *aren't I?* vs. *isn't*.

1. the validity of successor reconstructions including near synonyms:
illinois for **ilinwe*; Latin *pont* 'bridge' = *Srb./Cr. put* 'road', etc.
2. the value of survival of fossils in dialects; voicing in Southern England (*zomerset* as a joke),
3. the survival of fossils in a dominant language contextually; *vat*, *vixen* = *fox*
4. loss by abrasion as non-violation of regularity; pronounce Norridge for Norwich, Greenwich
5. judging priority or chronology by inferential grammar; Fr > ME 14c. :*serg* 1503 (spelling!) + *sergeant-major* (French syntax!).

⁸ Comparative and historical Mayan by Kaufman and others, ancient and modern, is very well treated for more than a half-century, and also Mixe-Zoque, unpublished by Kaufman, since the mid-1960s.

Following on a hunch, I've looked at a book I haven't read for a half-century. The author wasn't sympathetic to Noam Chomsky, and you, linguists as well as others, almost surely have scarcely read him. He was a talented polymath and Algonquianist (and musician) (1916–2000). Forget your tastes and read C. F. Hockett, *A Course in Modern Linguistics* 1958, Chapters 32–35 (morphophonemics); 38–39 (dialects); pages 461–65 (lack of writing, internal reconstruction); 57–58 (the comparative method);⁹ 59–60 (grammar, some lexicon; we have learned much since and could learn since Bloomfield and Sapir, and not only from the post-1957 revolution). Read what you need and what you like and understand. For those that want the guts of it briefly, now go back to our topic of change. Particularly Hockett's chapters 52–54, of which 53 and 54 consider the sequel that can follow the results of 52, page 443, and the end of section 52.3.

On historical linguistics, despite the merited criticisms of sloppiness by the eternally sharp-witted F. Householder (1963; see the delicious last paragraph, p. 388),¹⁰ strangers to the field may appreciate Winfred P. Lehmann (†2007), *Historical Linguistics: An Introduction*, 1962 (especially chapters 5, 6, 8, and 10, basically the first and last of these, and possibly chapter 9). Lehmann deals with Verner's Law on pages 95–96, 102–103 (for *s > z > r, and not later z) 155; these will be found dissected and sharpened in my footnote 3 above. Lehmann quite properly refers to the un-superseded and rigorous Henry Hoenigswald (†2003),¹¹ *Language Change and Linguistic Reconstruction* (1960), with the words (p. 248) "not an elementary text" and (p. 97) "should first read several briefer accounts, like those noted above." An example of some of the discussion aroused: the computation in the equivalences (Davies 2008:865f is impeccable but fails to answer questions many of us ask, e.g. where and how does Verner's Law fit in here, or Grassmann's? What is the "partial phonetic likeness in Welsh *ug-ain* Albanian *z-et* '20'? It is **uik*; of course we don't start the analysis with them.)

Nonlinguists, as well as linguists, may find it useful also to consult Peter Ladefoged's (1971) *Preliminaries to Linguistic Phonetics* for a broad but detailed and explicit survey of the events in the parameters of speech in the world's languages. Our languages are exemplified by Navajo (ibid.:54) for illustrating effective laterals, but the total plan of the book is very systematic. See also Abercrombie 1967, depending on need, Chapters 3–4, or 2–6, and Pullum and Ladusaw 1986.

Greene 1974, writing on the history of science is too general for our purposes and to his last sentence (p. 500) we can already give an answer to the author which is easier to see than in 1974: there is not a single Darwinian unifying configuration; there are at least several, productive for over 150 years now. We talk like/ to humanists if we want to. We get results.

5.0. THE START OF A CHANGE

It seems clear that what starts (or impels the continuation of) all this is not part of the realm of linguistics. It is random molecular motion first observed in botany by Robert Brown (1827) for an accumulation of liquid or gas and called (from 1870–1875) *Brownian movement*.¹² It is only when it is received by intelligent or sentient beings that the event becomes a subject of linguistics; i.e. as part of the potential phonetic change it is still the first analytic step in what always can and must be a process of phonological diachronic analysis or interpretation. Now a subject of *human science*.

A sloppy analogue from paleontological cladistics seems to be (I defer to my betters): repeated alteration (e.g. cell-wall penetration of molecules/atoms) + age to reproduce > evolved shape; example = hyomandible > inner ear bone (Hamp 2008:684–685, 828–829).

⁹ I have shown that 'fish' alters the detail in interesting and important ways when we apply knowledge from more examples, but pretend this is all we know and could learn. See Hamp 1974 and 2007:331.

¹⁰ But in his last criticism he seems to forget William of Occam, not to mention the IE branches of Iranian and Nuristani, Celtic, and Old Prussian with Albanian (I may add).

¹¹ For an historically important, inclusive and admirably sympathetic obituary see A. Morpurgo Davies 2008 with abundant references to Hoenigswald and his work.

¹² *Brownian movement*: Irregular motion of small particles suspended in a liquid or gas, caused by the bombardment of the particles by molecules of the medium; first observed by Robert Brown in 1827 (1870–75). *Random House Dictionary of the English Language*. Unabridged, 2nd edition.

TABLE 1. A Brownian sequence transcribed phonetically

I dont want to	'I DO NOT WANT TO'
I dont. 'want.to	
I don ^ɾ uan ^ɾ ʌ	/ɾ/ - special dental destinations
I don ^ʔ uɑ:nʌ	[ʔ] ~ [t ^h] etc.
I dou ⁿ uɑ:nʌ	/doun/
I do ^ɿ :ɑ:nʌ	
I do ^u ʌɑ:nʌ	'I do 'wan(n)a' [pronounced as <i>dough</i>] unique contexts but regular here

Brownian movement usually means change, but *regularity*. Yet we do encounter oddities that seem to be irregularities. In such a case we must pause (=look hard) and seek a neglected reason, even surprisingly discover one that is lurking. I am a lifetime believer in *Ausnahmslosigkeit* ['exceptionlessness']. Seeming irregularity can indeed arise from Brownian movement in socially controlled phonetic targeting plus *erosion* of regular fellow shapes (e.g. by disuse).

Parallel idiosyncrasies as confirmation of method. Shedding of heavy phonetic marking in Yeniseian and Athabaskan-Eyak obstruents to approach areal neighbors' systems is understandable. Note that Mongolian earlier lost the [u] distinction. Ket could be archaic; with tones, for example, or their pre-Brownian makings; for there are not tones among neighbors to serve as models to promote copying; cf. Fortescue op. cit.

Ruhlen's (1998) similarity approach is for our present problem the wrong method, especially for long distant relation. Ket-AET can convert the world. Nostratic + Ruhlen-Bengtson display the inverse concept: accept anything-everything. We need criteria for graded judgments. Nostratic has none of these requirements. Cladistic linguistics is a well-defined, if untidy, team. We must seek (fragmented) *systematic* agreements, with *idiosyncratic* matches, partly overtaken by layered other systems or agreements, most of which are manifested in Leskien (1876)-Lautgesetzlich ['phonetically regular inherited'] forms. Putative change should always be *motivated*. Equations should be morpho-syntactic with semantic hypotheses.

In what is popularly or canonically considered science, quantity or size susceptible of statistical analysis is regarded as important, or often even as indispensable. In our discipline, which perhaps may be called the queen of the human sciences, large quantity is often not required, and at times distinctly undesirable or excluded. In Hamp 2000 I have reconstructed Old Irish (h)uile¹ 'all', comparing Greek πολυ- /πολλά, with the best attested Irish. This case has the interest of being isolated. (See original for complex detail.) The Old Irish feminine singular tantum with *invariance* makes us with distrust seek a plural origin (collective means, yes, singular). The uniqueness in both the Greek and Old Irish patterns is critical to the equation and demonstration; the morphology in both agrees idiosyncratically in using the same derivations to cover precisely the senses of 'all' and 'much, many'.

Such a statement takes for granted (since August Leskien 1876) the *Ausnahmslosigkeit* der Lautgesetze ['the exceptionlessness of sound laws'] and we will not therefore discuss that aspect of comparison any further. But of course such equivalences apply to the entities we are observing and identifying in the above paradigmatic patterns.

On quality of equivalences, it is not enough, at the beginning, to make matches only of semantics, or of grammatical categories. That goes only as far as showing perhaps Sprachbund ('language area') identity. For genetic identity we must find Lautgesetz ('sound law') equivalence (including for best results hidden Lautgesetz) and entities so identified in demonstrated grammatical relation (distribution or stated rule(s)). In distant relations, by attrition through time, we may expect these entities to be reduced by segments (or to *significant zero* or from surface phonetics to morphophonemic membership¹³) to small or undesirable size (a single AET lateral or Yeniseic spirant-sonorant). The more of these shrunken shapes we have, the more syntactic or paradigmatic idiosyncrasy we ask for. If both of these reach zero, we presently give up our search.

For material too complex to offer in detailed presentation we review here in Table 2 in summary form.

¹³ The main reason for wanting phonological and morphological-syntactic analysis of reconstructed past levels.

Except for 4.4 and 4.6 perhaps, Vajda's and Leer's materials exploit all criteria in this table.

TABLE 2. Probable discovery order or {productive adoption} for argument

Note: techniques that are generally recognized vs. neglected

- 0. dissected *Browning* movement (early 19th cent.) acoustic / physical / physiologic -> phonologic / interpretive grammatical semantic
- 1. surface *Lautgesetz* (Aristophanes, Ashoka, Sanskrit drama, Rask, Grimm, Leskien, Saussure, Verner) "exception", tones (Karlgren, Chao, Fang Kuei Li)
- 2. major class pattern (Jones, Bopp) verbs (IE, DY)
- 3. total accountability (Meillet *am/is*, Hockett) every item, aspect, feature or level
 - 3.1. alternative segmentation (Z. Harris), beyond synchronic (feature or labialization, rarely noticed)
 - 3.2. marginal, archaic, (Bartoli), minority (Varro, Hesychios, Vuk, Abbé Grégoire, Dante) standardization
- 4. distortion of system
 - 4.1. *idiosyncrasy* (Meillet, Fortescue, Vajda, Hamp 1996 > 1998)
 - 4.2. *hidden Lautgesetz* (Hamp 1998, overtaken by other changes)
 - 4.3. asymmetric pattern (e.g. Kartvelian dative argument with aorist)
 - 4.4. contrary pattern (Ital. *mano fem.* 'hand', pl. *le mani*)
 - 4.5. *squash* (pervasive) (unexpected C or V sequences) (parts of Vajda's tones)
 - 4.6. *monadnock* (DY spike erosion remnant of ancient regularity or of DY verb complex)
 - 4.7. *abstract underlying* projection (can harbor occluding intrusion, e.g. pronoun chronology)
 - 4.8. phrase-structure -> productive morphology, *compounds
- 5.1. areal/social diffusion (Sprachbund; different, but history)
- 5.2. cultural diffusion -> loans, kin terms, birch bark, Sapir on Navajo from the north)

6.0. THE DECISIVE EVIDENCE FOR DENE-YENISEIAN

6.1. Consonants

Consider then Krauss and Leer's meticulous consequent consonant equations (transcribed harmlessly), which we may tabulate systematically by articulatory/acoustic features, applying some obvious general phonetic rules (Table 3). See also in Appendix A, Table 12A, and Table 3 in Leer's article in this volume.

TABLE 3. AET consonants

	dental	alveolar	alveol-palatal	lateral	palatal	velar	rounded velar	uvular	rounded uvular
stops voiced	d		ʃ		ǰ	g	g ^w	G	G ^w
plain	t	c	č		k	k	k ^w	q	q ^w
glottalized	t'	c'	č'	ɬ'	k'	k'	k ^w '	q'	q ^w '
spirants		s	š	ɬ	ǰ	x	x ^w	X	X ^w
glottals					ʔ'	ʔ	ʔ ^w		
approximants		sx	šx		y		w		
nasals	n				ɲ	ŋ	ŋ ^w		

General rules:

*ND C' (glottalized affricates) > Tlingit (fricative)' (not all; glottal is tenacious in Northwest North America)

Velar } > Tl (w) rounding; fric. > plain stop
Uvular, Glottal } palat.

g^w } > Eyak g
G^w }

Very good reasoning on *dl, tl, *dz. Note that only *tl' occurs in Northwest Coast areally: Wakashan, Salish, Chimakuan (Quileute).

Leer's Section 2.1. Beside ñ it could be *m because we find that m labiality is gravity and therefore Leer's Sec. 1.2. gravity, v. Landahl and Hamp 1997. Hence η = ng (cf. Tlingit) in absence of labials. (Cf. Bantu borrowing Arabic pharyngeals as labials.¹⁴) Therefore *ȳ > η̄ > ŋ̄ { ñ_{GRV} > LAB

This could have come from phonological juncture [~tien:] with spread of nasal. Cf. naive non-nasal English η for French nasal vowels in "fancy" words, and may also help explain what is assembled in Vajda 2001:309, note 5.

NB The Hupa evidence matches Frachtenberg's broader derivational consonantal alternations, areal Northwest North America, i.e. seems to mark Hupa areally as marginal to its region, and historically, with Bartoli conservatism.

Leer's Section 2.1. "Average" languages where plain voiceless or breathed consonants with explosion > aspiration lose p (Celtic, Armenian, Mongolian, Mayan; see more generally Hamp 1970 as a mouth-front oral. Languages lacking labials can thus suffer lenition of mouth front k^ʰ in final V__; ɸ^ʰ gets in coda by devoicing. Cf. early Celtic and Romance lenition. Albanian, lacking gemination phonetically, has done as Eyak, and with def. -t instead of plosion leaves it unexploded. The point being this: by observing nonobvious phonetic facts of change, infrequent but recurrent we understand and explain "irregular" events as regular, usually when they sweep all such instances in a context.¹⁵

Prompted by the Dene-Yeniseian hypothesis, Jeff Leer has come to see Tlingit's relationship to Athabaskan-Eyak in an entirely new way. When we turn to Leer's presentation of the current state (1964-1981-2009) of Krauss and Leer's morphophonological reconstruction of the (Eastern World's) Athabaskan-Eyak and Tlingit genetic relation (incorporating what must be some results of areal diffusion, e.g., the laterals, the absence of labials, the expansions in voicing and glottalization), we see clearly also the incorporation of system-features built out upon products coming originally from results of Brownian (mis)targeting.

A few remarks on specific matters in Leer's paper (this volume), already mentioned for Sections 1.2 and 2.1): His set (9) contains two very pertinent remarks on the presumed absorption of consonants in clustered affixation. (22) shows important results from much perspicuous analysis. Section 2.1.4 isolates a grammatically crucial palatalization for future clarification. The next page involves a rich family of lexical derivations with highly interesting further lessons for us, and note the metaphoric value in (27a), (27b), and (27c). The semantics of (29) 'rock' and 'stone' are interesting and convincing; cf. parts of Indo-European. #32 -very interesting and useful analysis. (33)-valuable morphology. (34) very valuable. (40) NB the semantics, (42) also, in Indo-European, exact preverb + verb equivalents are rarissima, one or by a stretch a few. Almost as totally rare are exact nominal noun compounds. But remember that both of these types reconstruct

¹⁴ That is, acoustically gravity comes from narrowing of the cavity fore (=labiality) or aft. Note also French, Romance, Makedonski Albanian, Bantu notably palatalize labials as altered palatals.

¹⁵ For a complex case where for divergent reasons such a set of vowel conditions has applied, see Hamp 2009.

phonologically with junctural phenomena between. Tlingit points to the same sort of separateness (and thus juxtability) that PIE leads us to. Section 2.1.6 NB (Tables 7 and 43a, b, and c) with very interesting data and perspicuous comment. For comparable phonetics, of the seemingly weird yet real situation in Scottish Gàidhlic (Argyll), where a simple voiceless stop, having become pre-aspirate, then goes on to strengthen the preaspiration to give a preceding fricative [x], plus the stop. Thus a cluster is produced ultimately from features by Brownian targeting; and this can in turn produce morphology. #45 is a beautiful etymology. #46b has a productive grammatical comment. (49a, b, c, a) fine set. (50) fine semantic analysis. (52a, b) and (53a, b) show fine reasoning. Section 2.2 a clear section. Section 2.2.2 NB rare for PA. Section 2.3: Let us salute M. Krauss, (76) in Eyak is valuable! (78) How about *k'wyVnd-? cf. the Eyak; in AE rounding of k'w gobbled y. Conclusion: superb and productive.

Alongside the rich PAET consonant tabulation we now place the similarly ordered Ket display based on Vajda's comparative results. See also Appendix A, Table 1.

TABLE 4. Ket consonants

stops						
+voice	b	d				
-voice		t			k	q
spirants		s	j	ɬ	h	
nasals	m	n	ɲ		ŋ	

It will be immediately noticed that not only does Ket show a notably smaller inventory than AET (of course AET is far richer in consonants than average in the world), but occupation of rows is far sparser and less compact. Yet we may say immediately that our purpose now is not to compare these patterns directly as areal mapping tasks. Rather let us note that the analysis of the labio-velar column has moved to the labial (more average in the world) though true movement was inverse, fitting into North American idiosyncrasy. In this way we see the tattered makings of a more substantial consonant rectangle.

Now just as we may do by looking at a consonant chart, such as in Hamp 1980a for Proto-Austronesian instead of a lean quadruplet of consonant rows (of 17~22 alphabet letters) for Indonesian/Malay, or a short triplet of 8 letters for Hawai'ian, we place our much fuller rectangle which Vajda arrives at for Proto-Yeniseian, adjusted for Appendix A, Table 1. Now we have a much fuller 5x4 rectangle, with space for Tongass Tlingit to cluster prosodic glottal occlusions and aspirations to lead to AET tonal prosodies, as we have seen.

TABLE 5. Proto-Yeniseian consonants

stops					
-voice	p	t	č	k	q
+voice	b	d	d'	g	ɣ
continuants		l/s	l'	ɣ/š	h
nasals	m	n	n'	ŋ	

My proposed 1979a chart based on Arin was less inclusive, but it was based on 1968 data and before the discovery of Ket tones.

TABLE 6. Arin consonants, from Hamp 1979a

stops					
-voice	t	t'	p	k	q
+voice	d	d'	b	ɣ	
continuants			f	x	h

6.2. Tones

Fortescue, having removed Haida (1998:213) from (Na-)Dene proper (a decision I agree with, cf. Hamp 1979b:461), makes an excellent observation (ibid.:213-214) of shared features between Ket and (Na-)Dene in

three independent categorial instances: linkage between glottalization and tones, singular/plural suppletion in some verbs, and noun class agreement in verbal prefixes. These are not merely shared, but these features also are idiosyncratic, a characteristic I consider to be among the genetically most diacritic, i.e. decisive. We want to be grateful for Fortescue's sharp-eyed insights.

If then we follow up the distinctions of Tongass syllabic prosodics and obstruent series features as I tried to do (Hamp 1979b:462-63, knowing then nothing from Kai Donner via Joki and from Dul'zon about Ket or Yugh tones in syllabics), I think I was able to explain how in principle we could expect to see the core lexicon of Dene with obstruents simply dichotomized into +/- continuant (ibid.:463), a plausibly "average" consonantism. This would have meant a modest syllabism of the form *V(+h/?), and a possible development to series of C', as we find in AET.

Thus we see how to a large extent by internal reconstruction the complex tonal system of Athabaskan by equations with Eyak may first be reduced from its Athabaskan character to a set of equations with Tlingit, but then translated to an atonal glottalized prosodic form through the precious extinct Tongass Tlingit that Leer (1978) has preserved for us. And now Vajda has been able to correlate with Athabaskan "high/low" marking, whereby high tone (as in Chipewyan) but low tone (as in Navajo) continue a syllable with original glottalized coda and the opposite if without—to correlate with Yeniseian cognates with original glottalized coda, which show high tone while those without have lower laryngealized tone, unless some other condition, such as one causing, e.g., falling tone, interferes (Krauss 2005; Vajda, this volume, section 3.2). In this fashion I must take issue with the final paragraph before Vajda's section 3.2.1, i.e. that the tonal oppositions in Yeniseian developed after the split from Na-Dene.

This agreement in Athabaskan (AET) and Ket (Yeniseian) idiosyncratic tones in opposed sets of what must be cognate lexemes (yet with differences for matching sounds in raw phonetics that indicate millennia of divergence) certainly carries itself and alone practically a guarantee of genealogically identical source—that is to say, the same language in probably mutually comprehensible dialects. We see moreover that we can repeat this result in totally different linguistic contexts another half-dozen times or so. Numbers with that quality (and exactitude) in comparative linguistic method are big numbers.

What is more, I submit, seeing from this internal reconstruction of syllabic prosodies on both sides of the Bering Straight (Yeniseian Ket and Yugh, and Tongass together with Athabaskan) the feature of glottalization as an important factor (persistent fulcrum?) is impressive. Where might this lead? At least to a tonal and glottalization hook on which systematic equivalences might also be hung. Thus then *V(+h/?) behaves like Saussure's A, which became "laryngeal (!)" (> : in IE), but also imparting tones. Tongass Tlingit is the missing link in the development of glottal prosodies and tones. Very ancient, since it affected typology; areal glottal C' stranded release type.

Also, take special note that what Vajda discusses in section 3.1, "Patterns of coda simplification in Proto-Yeniseian," took 150 years in IE scholarship; in section 3.2, "Yeniseian tonogenesis in light of Na-Dene," took 100 years in Albanian scholarship and even 150 years for secondary vowel length analogous (section 3.3, "Secondary tonogenesis . . .") to Ket tone; and for the sonorants (section 3.4) more than 150 years for Celtic and Albanian scholarship within IE.

6.3. Personal pronouns

Among the personals (in the terminology of Benveniste) we find for neighboring Algonquian (Cree): *ni-* 'my, I' and *ki-* 'thy/ou, you(r)'. But in the plural

1pl	(exclusive)	<i>ni-</i> BASE(-stem) - <i>inân</i>
2-1pl	(inclusive)	<i>ki-</i> BASE(-stem) - <i>inâw</i> (a native gives a)
2pl		<i>ki-</i> BASE(-stem) - <i>iwâw</i>

third and indefinite are differently organized. But what we call 1 pl. is never completely obvious, especially to a bilingual.

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As we consider Dene-Yeniseian pronouns (as in Vajda's Table 15) and when we recall that Mongolian and Tungusic have well-established inclusive and exclusive distinctions, it is easy to expect what happened to the missing pl. equations, esp. in terms of Fortescue's earlier Siberian diffusions. But we must not forget our rule of total accountability (see Hamp 1980b).

6.4. Verbs

Think about some actions; they can be done in different ways—directions, ways (instruments), manners, times, speeds, geometric patterns (knitting, tatting lace, tying knots) etc. etc., limited by some types of action or not . . . metaphoric, intimate—just think of English, but each human language covers the same or parallel or analogous ground. Our poets and authors rifle the supply of adverbs, suffixes (even fossil hidden ones, e.g. *chop*, *chip*, and proclitics (*recede*, *precede*). Also switch semantics (*cut down* 'direction', *cut up* 'completion', *shape up* 'conform', *light up* 'sufficiently'). Change lexicon (*cut* 'with a knife', *carve* 'with a big flexible knife', *chop* 'with an axe'). In English *eat up* is usually a simple perfective to *eat* and not 'eat to exist'.

We should not be surprised to find distributionally the same variety of verbs elsewhere than English and therefore also in Yeniseian-Dene. Notice that the above allows for plenty of room for random allotment to independent exploitation that we can hope to find ultimately in a reconstructed DY glossary. In fact, a start at that is to be found in the lists of examples for Vajda's long section of phonological equivalences, i.e. the asterisked forms in his section 3.5, as well as for Leer's AET examples.

Such a list rapidly becomes long for only 2000 years or so yet here we find precious *idiosyncracies* such as *manger* = Italian *mangiare*, Romanian *mîncă* 'eat' < Latin *mandūcō* 'chew', while Spanish archaically *comer* < *com-edere* 'eat up'.

But for the time depth of Dene-Yeniseian we expect to recover a much shorter list. What Vajda presents is already impressive. And what he presents in identified detail for the grammar (Sections 2.1, 2.2, and 2.3) is even more impressive. It alone is conclusive and *predicts grammatical spot* for *appropriate lexical entities separately*.

Indeed nothing else could display more morphological detail, even what may be called irregular verbs showing maximum *idiosyncrasy*: with exact reconstructions of major elements inhabiting ordered systematic positions in affixal structure. Thus we see for the position number 5 of the Ket verb (Vajda's Table 11, and Section 2.2.3), with relics of shape classifiers **d* 'long', **n* '(a)round', **h** 'flat: -*d-abdo* '(X) chops (e.g. a log); -*n-abhil* '(X) trims it (round about) for edges of bark or hide; -*h-abdaq* '(X) shoots something (e.g. an arrow) at a flat target' or Ket -*hu-ltes*, Yugh -*fu-ltes* (**h**V) '(X) stood (positioned vertically) up to a flat spot'.

And analogously for positions 4 and 3 (of Vajda's Table 11) etc. for other semantic-syntactic parameters. We can do this sort of thing for Indo-European but not abundantly for any sentence, and for very few other language stocks or families.

What Vajda has rescued is remarkable. We now take the verb pattern, it is our task to dredge up. First refer to Vajda's section 2.2.2 Table 7 on Navajo and Table 8 on General Athabaskan by the numbers: (to total accountability). Position 10 is neo-/productive, like *dredge up*, *chop down*. Then 9, as first in Table 8 Athabaskan, like *re+im-port*, *re+a-waken*. 8 and 7 some expansion in a very prefixing language; cf. Vajda sec. 2.1. 6, 5 speech situation objects (=6 Yeniseian) and deictic (NB *semantics*) pronominal prefixes in Navajo and Athabaskan; and also with Yeniseian agreement:

9—6, 5—4—3—2—1a—1—0 (the verb)

That is how I label (number) Vajda's tables 8 and 11, which contain (Table 7):

TABLE 7. Comparing positions in Athabaskan and Proto-Yeniseian verbs (Vajda, this volume, tables 8 and 11)

Table 8 Generalized Athabaskan	Table 11 Proto-Yeniseian
4 * <i>n, d, qu</i> "qualifiers" (incorp. nouns in Tlingit)	4
3 TAM markers * <i>sə, Gə, nə</i> (Eyak TAM moved)	3
2 speech act subject	2
1a stative <i>ñi</i> ; 1 "classifier" (<i>∅, d, l, l</i>) PAE phonological archaism	Table 11 with Yen. statives around verb
0 verb + TAM suffix	
And Yeniseian 3p with animacy and gender not at 2 but between 3 and 4	

This formational pattern, comprising a skeleton of some 15 or more phonologically identified elements, with a plausible rule-governed meticulous history of probably over ten millennia, and assigned to an 8- or 9-place prefixed morphologically identified series affixed to a verbal predicate head with one suffix or circumfix—and the whole unified in a harmonic set of semantic relations—such a pattern with a history disclosed by recognized diacritic inferences can reasonably have between the genetic families of Yeniseian and Dene only a single known common origin.

A few comments on the verb complex: We see in the presentations by Vajda and Leer, and earlier by Krauss, Werner (1966, 1997), and Kari (1979:185–86ff, 1989, 1990:38–59, and this volume¹⁶), almost all the criteria that I have listed above in Table 2 exploited and fulfilled and illustrated. To summarize in terms of those criteria, numbers 0, 1, 2, 3a, 3b, 4.1, 4.2 (*ñ-y*), 4.3 (asymmetric 'eat'), 4.5 (squash -a 'eat' <4.1), 4.7 ('eat', 'give', **l* and **d*, Yen. 'fly'). 4.8 (Table 14 perfective/stative aspect circumfix in the Ket verb), perhaps 4.6 (monadnock, but this is probably too hard to decide at this stage). Only Table 2 4.4 seems to be lacking, and that is rare to expect and very unlikely at long range. The reconstruction process proves to be very productive on the Ket-Yugh past tense *o*; see esp. notes 16 and 17, and telic/atelic marking. Noteworthy is the progressive and P/S distinction (Vajda's Table 14). The problem of amalgamation in his Table 17 for animacy marking. Vajda's footnote 24 is important. I disagree in one respect with the last paragraph in section 2.2.2. I think that there is more room for difficulty with personal pronouns than Vajda asserts, and I included such remarks in a paper given in 2000. In brief, since we are speakers, the pronouns precisely of Benveniste's speech situation (or act) are somewhat like proper names in our lexicon. They, unlike ordinary words, *refer*, to a greater extent, rather than carry meaning.

7.0. CONCLUSION

What Vajda presents in ten + four years (compressed into two) has been done for about ten + a dozen (say a score of) language families in the world outside of Indo-European in between 250 and 50 or 100 years each of hard comparative study and publication. All of these non-Indo-European families, from Algonquian to Zoquean, have cost good scholars decades of time. The job that Vajda, Leer, and a few others have accomplished and that is presented in this volume of APUA in a couple of hundred pages and during one or several active decades (depending on who and whose work you count) has been achieved in such complete detail and validity as we find for only perhaps one half dozen of the world's language families. The validity and strength of proof of Dene-Yeniseian and the right kinds of probative elements have been achieved in a short period of time that has been business-like and not meandering.

The geographic distance between the branches of these birch-land hunter-gatherers is simply spectacular. But this is distance with exactitude. A reasonable time interval for understanding a common Dene-Yeniseian population with a traceable language history, and as Fortescue (1998:213–16, 253) perceptively has pointed out, could be quite plausibly from 10,000 to 14,000 years ago.

¹⁶ Who covers additionally important categories of derivation.

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PROVING DENE-YENISEIAN GENEALOGICAL RELATEDNESS

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1.0. INTRODUCTION

To sum up at the outset, I believe that Vajda's evidence (this volume) for Dene-Yeniseian relatedness passes the criteria for success that I have been advocating for over a decade—that is, on statistical grounds Dene-Yeniseian appears to be a genuine family. Still, given what (admittedly little) is known about rates and mechanisms of high-latitude language spread, I think Dene-Yeniseian relatedness is implausible on geographical grounds. I am not sure what to make of this contradiction, but I am happy to see a long-range comparison (in the fullest literal sense of “long-range”) actually pan out statistically. What I will do in this chapter is show how and why the connection is statistically acceptable, how and why it is geographically problematic, and what potential pitfalls I am aware of with the statistical criteria. Vajda's reconstruction is a work still in progress, but it is unlikely that the essential statistical properties of his evidence as analyzed here will change appreciably.

Distant relatedness can be proved not only by demonstrating recurrent correspondences and producing parts of a reconstruction. In fact, correspondences and reconstruction are not necessary at all. Relatedness has been demonstrated for the Afroasiatic family (Greenberg 1960, Newman 1980) though regular correspondences and reconstruction for this family still elude us, and it was demonstrated for Indo-European by Jones 1786 before the concepts of regular correspondence and reconstruction even existed. Rather, relatedness is proved by showing that the number of resemblant elements between languages or language families significantly exceeds what would be expected by chance. Chance is, of course, relative to the closeness of the resemblances and the number of attempts made to find resemblant words, for example the number of such words out of the total wordlist searched. This chapter evaluates the number and closeness of resemblant forms found in Vajda's Dene-Yeniseian comparison against conventional statistical significance and against what is called the *individual-identifying* threshold in Nichols 1996, 2007a.

The individual-identifying threshold is a level of rarity sufficient to identify a unique individual language with reasonable confidence. Since there are about 7000 languages on earth, 1/7000 or 0.000143 is the probability of any one language turning up, as it were, by accident. Multiplying that by a conventional level of statistical significance gives 0.0000029 (approximately three in a million) for $p = 0.05$ or 0.0000014 (one in a million) for $p = 0.01$. As a rule of thumb, a probability level expressed with five zeroes after the decimal point is in the right order of magnitude. If two languages share a set of forms that have this probability of occurrence or less, it is reasonable to assume that the set of forms in the two languages is one and the same and the two languages are related. Of course it is not impossible that the resemblance might be due to chance, but the likelihood of this is so low that relatedness is the more parsimonious assumption. If the languages present two or more pieces of individual-identifying evidence the case for relatedness is virtually compelling.

The threshold can be met with either wordlist items or grammatical paradigms. In either case what is

compared is forms associated with meanings or functions, i.e. putative cognates as in standard comparative linguistics. I argue here that Vajda's cognates are probably sufficient in number and precision to meet the threshold, and his morphological subparadigms are sufficient in extent and precision.

The procedure a linguist uses when seeking possible cognates is what I call a *search*: the linguist compares an item in one language to a semantically similar item in another, seeking a match or correspondent or resemblant. If the target word does not match, the linguist can either reject the comparison and look for semantically similar words that might match, or relax the criterion for resemblance. That is, in the event of a non-match the linguist can do some further casting about among semantic senses and/or phonological forms. The probability of success with this casting-about procedure is calculated by taking each different phoneme and each different sense tested to be one more attempt: thus if a match for a word meaning 'black' and beginning in /b/ in one language is sought by surveying words in /b/, /p/, and /f/ and meanings 'black', 'dark', and 'night' in the other language, there are nine attempts (three consonants x three senses). The probability of success is calculated in the same way as the probability of, e.g., tossing heads if given several attempts:

- (1) Cumulative probability = $q_1 + q_2 + \dots + q_i$
 where $q_{i+1} = p(1 - q_i)$
 p = event probability
 q = cumulative probability
 q_i = cumulative probability after the i -th trial

The event probability in the case of a coin toss is 0.5, and each successive toss uses up 0.5 of the remaining probability space (which totals 1.0). The probability of tossing heads if given up to two tries is 0.75; for up to three 0.875; for up to six attempts it is 0.98. (This is the probability of getting heads on the first toss, or failing that on the second, or failing that on the third, and so on up to six.) For matching a word, the event probability is the likelihood of finding that form and that meaning on one attempt. The calculation of event probabilities is explained in Nichols 1996 and reviewed in sections 2-3 below.

2.0. SEARCHES IN WORDLIST COMPARISONS

In a wordlist comparison, where the linguist seeks possibly cognate words or roots, sources of freedom arise in how broadly or narrowly phonological resemblances are defined, how broadly or narrowly semantic similarity is defined, and how forms are parsed.

2.1. Degrees of phonological freedom

In seeking evidence of deep relatedness of course some phonological latitude must be allowed, as it is quite unlikely that sounds would be identical after millennia of separate development. The linguist doing a search for possible cognates seeks words with recognizably similar sounds and meanings, aware that wonders of the comparative method like English *two* : Armenian *erku* 'two' will be uncovered only later, after sound correspondences are worked out in detail. A conscientious linguist also attempts to ascertain that the words compared are native and are lexical roots in each language. Since the Na-Dene and Yeniseian roots compared in these efforts usually contain one or (most often) two consonants, I calculate probabilities for one-consonant and two-consonant roots. Vowels—their phonology and phonotactics relative to the consonants—are left out of the calculation entirely.

For convenience, and also based on actual ranges attested in the long-range comparative literature, we can speak of three kinds of roots based on the degree of resemblance of their consonants: *identical* consonants; *similar* consonants, ranging over about 3 distinctive features or sound classes or (what is much the same) about 1/7 of the phoneme inventory; and *generic* consonants, with up to 5 features' leeway or about 1/4 of the phoneme inventory (and possibly with some overlap). The generic type is closest to what has been the practice in long-range work on the Americas (e.g. Greenberg 1987). The typical ranges of the four

generic consonants in that literature seem to be labials; apical and similar obstruents; velar and postvelar obstruents; apical and similar resonants. Note the important fact that both similar and generic consonants are resemblant consonants, defined by phonological similarity and not by regular correspondences.

The probability of lexical occurrence of any consonant depends on the size of the consonant inventory and the lexical frequency of the consonants, but figures on these frequencies are almost never available (though language experts can generally identify higher-frequency and lower-frequency phonemes). Therefore, though it makes the calculation much more rough, I ignore this issue and calculate probability equally for all consonants. In any event the ranges of three or five distinctive features that define similar and generic consonants generally include some higher-frequency and some lower-frequency consonants, so that frequencies for the units actually compared may well even out. Furthermore, the alternative definitions phrased in terms of a portion of the whole consonant inventory enable different numbers of consonants to be compared (important when one compared language has a large consonant inventory and the other a small one). In a wordlist comparison we seek, for each root in one language, a root with the same two similar or generic consonants, and the same or similar meaning, in the other language.

Thus a two-consonant root has two similar consonants or two generic consonants in the same order. They are the first and second consonants of the root, respectively, with no consonant preceding, following, or interspersed in the root. The forms in (2) represent the same two-consonant root, and any of them would count as a match to any other.

- (2) *qof, geb, akpu, xpi* (similar consonants)
 those plus: *hemi, ogw* (generic consonants)

Phoneme systems average about 20 consonants worldwide (Maddieson 1984 and my own counts), so the probability of a particular consonant occurring in a match is 0.05; for a similar consonant (three attempts), 0.14; for a generic one (five attempts), 0.23. (3) shows the probabilities for identical, similar, and generic two-consonant roots. They are calculated by multiplying the probability of C_1 by that of C_2 .

- (3) Identical CC root: $p = 0.0025$
 Similar CC root: $p = 0.02$
 Generic CC root: $p = 0.05$

Once regular correspondences are worked out, regularly corresponding consonants count the same as identical consonants.

2.2. Semantic freedom

Degrees of semantic freedom are harder to calculate, as neither for any one language nor in general do we have well-understood semantic analogs to distinctive features and finite emic systems with which to circumscribe semantic ranges. Ranges could be defined in advance, for planned searches, but since what is at issue here is existing work I estimate the range partly from the number of different word glosses in putative cognate sets and partly from an intuitive assessment of semantic distance. The latter is necessary for binary comparisons, where the number of languages limits the number of different senses that can occur in a word set to a maximum of two. It amounts to deciding whether two word glosses are identical, very similar (perhaps with considerable overlap of denotation), or not particularly similar. For purposes of calculation, I count identical glosses as having one degree of freedom, similar glosses as three, and less similar ones as five. The latter is probably an underestimate, and underestimating the number of actual attempts taken makes it artifactually easier to meet the individual-identifying threshold.

2.3. Phonotactic freedom

There is one degree of phonotactic freedom if the two consonants occur in the same order in the two putative cognates. If metathesis, interspersal of another consonant, and similar kinds of selective parsing are permitted, I count this as one more attempt. In practice, most long-range comparison uses selective

parsing, as shown by the occurrence of transposed or bypassed consonants in some fraction of the putative cognate sets. Counting the general availability of recourse to selective parsing as one more attempt probably underestimates the degrees of freedom this procedure actually adds to the endeavor, and therefore makes it easier to reach the critical threshold. The fictive words in (4) fit the two-consonant root template K-P if selective parsing is allowed, but not otherwise.

(4) *kep, kedep, dekp, pek* (segments representing K and P underlined)

2.4. Wordlist matches needed

Table 1 shows the number of two-consonant putative cognates needed to exceed chance under various conditions. Two thousand is, in my (limited) experience, the approximate number of distinct roots to be found in a good-sized dictionary (of 5000 or more headwords) and can be used for estimating parameters of searches using languages that are at least moderately well described lexically.

TABLE 1. The number of resemblant two-consonant roots required in a binary comparison, with varying degrees of phonological and semantic leeway and for wordlists of various sizes. Similar calculations for one-consonant roots. Entries are minimum numbers of word matches required to reach significance at $p < 0.05$. p = probability of finding one such word. * These cells most closely reflect the conditions of most actual long-range comparisons.

No. of consonants	Consonant type	p	Wordlist size:			
			100	200	1000	2000
<i>A. Semantic identity (one sense)</i>						
2	Similar	0.02	5	8	28	51
	Select parse	0.04	7	14	51	95
2	Generic	0.05	9	16	63	117
	Select parse	0.09	14	26	106	202
1	Generic	0.14	20	37	159	307
	Select parse	0.27	34	65	294	574
<i>B. 3 senses (very similar)</i>						
2	Similar	0.06	10	19	73	121
	Select parse	0.12	18	33	138	265
2	Generic	0.14	20	37	159	307
	Select parse	0.25	32	61	273	533
1	Generic	0.37	45	86	396	777
	Select parse	0.54	64	120	567	1118
<i>C. 5 senses (less similar)</i>						
2	Similar	0.1	15	28	117	223
	Select parse	0.18	25	46	201	389*
2	Generic	0.23	30	57	253	492
	Select parse	0.38	47	88	406	797*
1	Generic	0.54	64	120	567	1118
	Select parse	0.72	80	155	744	1441

2.5. Ruhlen's Dene-Yeniseian comparison

Ruhlen 1998 gives putative cognate sets as evidence of Dene-Yeniseian relatedness. Table 2 shows the numbers of various kinds of forms for Proto-Yeniseian and Proto-Athabaskan. There are no sets that have Eyak but no Athabaskan witnesses, and none with Tlingit but no Athabaskan, so statistically this can be

presented as a binary Yeniseian-Athabaskan comparison. There are a number with only Haida on the Na-Dene side; but since Haida has not been shown to be related to Eyak-Tlingit-Athabaskan, and since the number of Haida-only sets is not large enough to improve the statistical showing, I consider only the Athabaskan ones.

TABLE 2. Numbers of two-consonant Yeniseian-Athabaskan sets from Ruhlen 1998

2 consonants, strict parse	11
2 consonants, selective parse	9
1 consonant, strict parse	5
1 consonant, selective parse	2
0 consonants	1
Total	28
Total using selective parse	11 (39%)
Total with two consonants, selective parse	20 (71%)

Most of the sets contain two or three glosses; hence the semantic leeway can be modeled as 3 senses. The consonant resemblances are generic. The frequency of sets with selective parsing shows that this was a regular part of the search. (Selective parsing chiefly affects the glottal stop, which Ruhlen matches to a consonant, matches to glottalization of an ejective, or bypasses, as needed to improve matches.) These procedures are all part of normal heuristic searches, and a number of Athabaskanists have commented to me that Ruhlen's sets look quite convincing.

Ruhlen used a 200-word Proto-Yeniseian wordlist and an Athabaskan wordlist of over 1000 items. This is probably best modeled as 1000 attempts, since there were some 1000 Proto-Athabaskan words to which one or another Yeniseian word could be compared; or, depending on exactly how the search was carried out, it might be modeled as 200 attempts. For a search with these parameters (generic consonants, selective parse, three senses), 61 words are needed out of a 200-word list or 273 out of a 1000-word list. The sets look convincing, but they number only 20—not enough to exceed chance.

An additional complicating factor is that both language families are represented by reconstructed protolanguages. This affects the probabilities in that the chance of a proto-word occurring in the protolanguage is 100% (by definition), while the chance of any proto-word having a representative in a given daughter language is less than that. I have not attempted to work this factor into the calculation, but it would increase somewhat the number of words needed to reach the threshold.

2.6. Vajda's comparison

Vajda (this volume) uses a similarly sized Athabaskan wordlist and a Yeniseian one larger than 200 words (but apparently under 1000). He uses not resemblant consonants but regular correspondences (or at least recurring correspondences), which can be modeled as one degree of freedom (or perhaps two, in that there are cases where one Yeniseian consonant corresponds to two Athabaskan ones or vice versa). The senses are quite close. There is no selective parsing. Nearly all words have two consonants or more. With these search parameters (identical or near-identical consonants, close semantics, no selective parsing, 1000 words), 73 words would be enough (see Table 3B), and Vajda has about 100. This exceeds expectation at $p < 0.05$ and can be taken to establish relatedness.

3.0. THE STATISTICS OF SEARCHES: MORPHOLOGICAL PARADIGMS

Shared morphological paradigms easily cross the individual-identifying threshold because they consist of several specific forms in strict positions in the paradigm. The relationships in the paradigm are a kind of ordering. Table 3 shows a four-member paradigm in which each cell has a one-consonant root. Evaluated as individual morphemes they would have little probative value, but when evaluated as a set the basic

probabilities of the members are multiplied by each other to yield very low overall probabilities. (See Goddard 1975:252 for the history of arguments concerning Algic relatedness and for the probative value of this prefix set.)

TABLE 3. Algic pronominal affixes. I, II = Wiyot allomorph sets

	Proto-Algonquian	Wiyot		Yurok
		I	II	
1st person	*ne-	du(')-	d- < *n-	'ne-
2nd	*ke-	kh'u(')-	kh-	k'e-
3rd	*we-	u(')-	w-	'we- / 'u-
Indefinite	*me-		b- < *m-	me-

The probability of finding four consonants in a particular order is 0.00000625. If in addition we consider them to be not merely ordered but also occupying particular functional positions in a four-member paradigm, the probability is multiplied by 0.25⁴ for a total of 0.00000024 or two in a hundred million. If these are viewed as similar consonants, the respective probabilities are 0.0000187 (this does not quite meet the threshold) and 0.000015 (two in a million).

A frequently mentioned diagnostic paradigm is the Germanic suppletive positive-comparative set shown in (5). There are four consonants (*g, *d, *b, *t) which count as identical because they reflect particular proto-consonants with regular consonants. There are two paradigmatic positions (positive and comparative/superlative, probability of 0.5 each). The overall probability for the consonants alone is 0.00000625; including the paradigmatic functions it is 0.0000156. Counting these as similar consonants (as they would be if this set were offered as evidence before Proto-Germanic was identified or reconstructed), the overall probabilities are respectively 0.00038 and 0.000096 (one order of magnitude away from the threshold).

(5)

English	<i>good</i>	<i>better</i>
German	<i>gut</i>	<i>besser</i>
Swedish	<i>god</i>	<i>bättre</i>

Another paradigm that meets the threshold if the consonants are specific is the three-member Afroasiatic paradigm of gender-number suffixes in determiners: masc. sg. -n, fem. sg. -t, plural -n (Greenberg 1960). A paradigm of two one-consonant forms does not meet the threshold (Nichols and Peterson 1996).

It is important that all the examples of paradigms that meet the individual-identifying threshold are exhaustive paradigms or complete subparadigms and not, say, three or four forms chosen from an eight-member paradigm because they match well. That would be a search (three successes with eight attempts allowed), and its overall probability would be much higher and its probative value much less.

Even so, finding one paradigm in a whole language is itself a search (through all the paradigms for one matching one), so while one paradigm that meets the individual-identifying threshold is very solid evidence (of a kind almost never presented in long-range comparison) it cannot necessarily be taken to establish relatedness by itself.¹ At least one other piece of evidence should be found, either another paradigm or a large enough wordlist comparison.

Now let us consider how Vajda's Dene-Yeniseian grammatical paradigms compare. The TAM prefixes

¹ Proof that one paradigm does not suffice is Callaghan's discussion (1980) of close resemblances between Indo-European and Proto Eastern Miwok verb paradigms. The initial observation of the similarity can be described as a search of all the paradigms of the protolanguages. Importantly, however, since Callaghan was not doing a binary comparison of grammar and vocabulary in the two families but happened to notice this similarity in two language of the families known to her, this is a search not of two languages or two families but of all languages and protolanguages Callaghan had any knowledge of. Such a search involves so many attempts that even this once-on-earth-in-six-millennia coincidence showed up. As Eric Hamp pointed out at the Fairbanks meeting, the utter lack of resemblance between the noun case paradigms of the two families in itself suggests strongly that the resemblance in verb paradigms is a coincidence. Callaghan's own argument is that the Eastern Miwok paradigm is not found even in Proto-Miwok but formed secondarily in one daughter branch.

shown in (6) are a two-member paradigm with a probability of 0.00125 if counted as identical consonants (as they can be, assuming Vajda's correspondences). This is not even close to the threshold.

(6) Dene-Yeniseian TAM prefixes (Vajda, this volume: Tables 12, 13).

*xⁱ telic *ca atelic

In both language families the TAM prefixes can be followed by the Yeniseian stative-resultative *jə-/-ej, Na-Dene perfective/stative *ñi-/-ñi. This is a single morpheme containing just one consonant. In both families it is either a prefix or a suffix depending on the verb, so for the probability assessment it is the same as one prefix and one suffix, with possible but not firm regular correspondences, so again a probability perhaps as low as 0.00125. Another paradigm is the TAM affixes shown in (7). They are prefixes now in Ket but were formerly suffixes to the first element of a bipartite stem, and they are suffixes in Na-Dene. This is an exhaustive paradigm in Ket but not in Na-Dene. This is another two-member set and not even close to the threshold (p=0.0147).

(7) TAM affixes (Vajda, this volume: Table 14).

*l progressive *ni perfective

These are three pieces of individually insufficient evidence. However, between the three of them they exhaust the TAM marking in both families, so they can be regarded as a single complex TAM paradigm distributed over two affix positions and three slots. The probability for the whole paradigm is the product of that of its three subparts, and as shown in Table 4 the whole paradigm has a probability that crosses the individual-identifying threshold, even if the consonants are taken to be similar rather than identical. As explained above, they can in fact be safely taken as identical, since they are based on regular correspondences. The complex distribution over two affix positions and three slots is unusual and should also reduce the probability (I would think considerably), but I do not know how to calculate this.

TABLE 4. Probability value for Dene-Yeniseian TAM paradigm

	TAM prefixes	Stat.-Perf.	TAM suffixes	Cumulative probability
Identical consonants	0.00125	0.00125	0.0098	0.00000015
Similar consonants	0.001875	0.001875	0.0147	0.00000005

Another set of grammatical comparanda is the spatial and shape prefixes shown in (8) (Vajda, this volume: section 2.2.3 and his table 18). I gather these exhaust their paradigm, i.e. there is no search among a larger set of forms. If so, then the probabilities are as shown in Table 5, if the consonants are treated as identical (and they can be, as they are based on regular correspondences).

(8)

*n-	'round'; 'around'
*d-	'long'; 'along'
*qu-	(Ath.) / hu- (Yen.) 'flat; area'

TABLE 5. Probabilities for DY spatial and shape prefixes

Consonants	Forms	Functions	Cumulative probability
Identical	0.05 ³ = 0.000125	0.33 ³ = 0.037	0.000005
Similar	0.14 ³ = 0.002744	0.33 ³ = 0.037	0.000102

The conclusion from all of the morphology reviewed here is that Dene-Yeniseian offers two pieces of near-sufficient or sufficient evidence for relatedness in the verb paradigms. This is good enough evidence to support the claim that Na-Dene and Yeniseian are related.

4.0. LINGUISTIC GEOGRAPHY AND TYPOLOGY

As shown in Map B, it is over 6400 km (4000 miles) from the Yeniseian homeland along the upper Yenisei to the Na-Dene homeland in eastern Alaska to northwestern Canada, and it is about 11,000 km (7,000 miles) from the linguistic range of the Yeniseian family to the southernmost Apachean range. If the Dene-Yeniseian connection is real, this is the longest pedestrian language spread on earth. This distance could not have been traversed overnight. The fastest known relevant rates of pedestrian spread (Nichols 2008) are shown in Table 6, together with the times required for a language spread to that distance at those rates. The Apachean spread rate is the world record speed for a pedestrian spread. This spread was basically a beeline to a known destination that was a trade and raiding magnet (see Ives 2003 and Ives and Rice 2006 for possible causes and mechanisms of this spread), and nothing like that situation is likely to have obtained in the Arctic. In addition, as pointed out in Table 6, the Apachean and Mapudungun spreads are sprints and not rates for entire spreads. Thus the slowest of the rates shown in the table—the interior mid-latitude high—is the most sober estimate of a fastest likely spread rate. Though we have almost no clearly measurable examples of pedestrian language spreads in the Arctic, based on other latitudinal differences high-latitude spreads are unlikely to have been more than moderately faster than mid-latitude ones. Therefore, a move from the Yenisei to southwestern Alaska or vice versa would probably have taken several millennia, and a move from midway to either attested homeland would have taken a few millennia.

One clear implication is that Proto-Yeniseian and Proto-Na-Dene should be phylogenetically discrete and in fact quite discrete, separated by millennia. Also, it would probably be more realistic to posit a midway homeland, with ancestral Yeniseian moving west and ancestral Na-Dene east, than a homeland in either of the two families' homelands (cf. Fortescue, this volume). The time depth that the latter would imply for the split of Yeniseian and Na-Dene seems much greater than what Vajda's reconstructions suggest, as the amount of phonological and semantic change that he finds is not particularly great.

In addition to the sheer distance, the route between the Yeniseian and Na-Dene homelands includes the Bering Strait, with coastally adapted cultures on both sides. It seems to me that any postglacial crossing of the strait would have to have been made by coastally adapted people possessed of the technology, knowledge, and motivation to make the crossing. This would seem to require an adaptation to coastal culture and economy on the one side, and an adaptation to interior culture and economy on the other side. Alternatively, perhaps a coastal Proto-Dene-Yeniseian gave rise to daughter branches each of which separately spread to the interior and their speakers adapted to interior culture. Spreads and adaptations in either direction would require enough time to gain the demographic, economic, and sociolinguistic strength to impel a spread. All of this would surely add to the time required for the migration, and it makes one wonder how much of the original technology, oral tradition, and vocabulary would have survived these radical economic and cultural shifts.

TABLE 6. The fastest known relevant rates of language spread, and the years required to spread 6400 km at those rates. The Mapudungun and Apachean spreads are peak rates sustained only for about 500 years.

		Years required for:	
		6400 km	3200 km
Mid latitude, interior:	1.07 km/yr*	6000	3000
Mapudungun	2.67 km/yr	2400	1200
Apachean	3.20 km/yr	2000	1000

* Highest rate for all measured non-coastal pedestrian mid-latitude spreads (Nichols 2008: Table A3). This is the spread rate of the Western Desert family in Australia. The rate for the Algonquian spread is very similar (1.06 km/yr).

In my opinion the number of cognate sets Vajda has found, and the degree of phonological and morphological resemblance between Proto-Yeniseian and Proto-Na-Dene forms that he adduces, rules out the possibility that Proto-Dene-Yeniseian was spoken in Beringia before the postglacial sea-level rise.

The Dene-Yeniseian connection is also typologically problematic. Not in the sense that the two families are typologically unlike; as has been pointed out for decades (see Vajda's literature review), they are strikingly similar and distinctive in their structure. Rather, there are other typological considerations that may outweigh their similarities. Structurally, the Yeniseian family is in many respects a typologically southern Eurasian one (Nichols 2007b): it has genders, non-suffixal verb inflection, split subject alignment with a good deal of ergativity, head marking, prefixal verb agreement, and other southern properties. Language families have tended to drift northward in Eurasia, and the most parsimonious account of the origin of Yeniseian and its remarkable typological differences from the rest of the central Siberian languages would be to posit a northward movement from somewhere in Central Asia. Its historically reconstructable trajectory has been northward along the Yenisei (Vajda, in press, 2009), and it would be natural to extrapolate from that trajectory to earlier times.

Languages of the Americas can be grouped typologically and geographically into two sets. There is a coastal and near-coastal Pacific Rim population, marked among other things by personal pronouns with first person *n* and second person *m*, numeral classifiers, relatively high frequency of verb-initial word order, primarily transitivizing verb derivation, and occasional languages with diminutive consonant symbolism. Then there is a probably older population found all over the Americas, and identified by a high frequency of radically head-marking, polysynthetic languages with incorporation and bipartite stems and generally lacking the Pacific Rim features. (For the two strata see Bickel and Nichols 2006. For some of the structural features just mentioned see Caballero et al. 2008; DeLancey 1996; Fortescue 1998; Nichols 2001, 2002; Nichols and Peterson 1996; Nichols, Peterson, and Barnes 2004; Nichols and Nichols 2007.) The Na-Dene languages, or at least the Athabaskan family, belong to the latter group in most respects. Therefore, judging from the typological evidence, a more parsimonious account of the Na-Dene origin would have an earlier origin in North America (e.g. a northward drift to the Na-Dene homeland from somewhere farther south in non-coastal North America), rather than a spread directly from Siberia.² Both Yeniseian and Na-Dene are typological outliers in their historical ranges, so on typological grounds nothing is gained by tracing Yeniseian to Alaska or Na-Dene to Siberia. We can account for their typologies at least to some extent by deriving them from more southerly linguistic populations in their respective hemispheres.

This kind of typological argument assumes that structural properties can last longer in areal populations than in individual languages or families. That would appear to be the obvious and only possible conclusion from the large size of some language areas (Bickel and Nichols 2006; Dryer 1989), and it seems logical to expect inherited features to last longer where they have areal support than where they do not. Of course, however, demonstrated genealogical relatedness trumps typological affinities and linguistic geography in the search for origins. Therefore, if the Dene-Yeniseian connection stands up to future scrutiny and future statistical criteria, the southerly typological affinities of at least one of the two branches, and possibly both, will be irrelevant to genealogical classification.

5.0. CONCLUSION

To summarize, by the statistical criteria laid out here the lexical evidence presented by Vajda is probably sufficient to demonstrate relatedness. The morphological evidence is sufficient to demonstrate relatedness.³

² Ultimately, of course, the ancestors of all indigenous American languages came from northern Asia. At issue here is only the proximate origin of Proto-Na-Dene.

³ Sufficient in a statistical sense. In my experience, most historical linguists, if asked what proves the relatedness of the Indo-European languages, cite such things as the vast reconstructed cognate vocabulary, the extensive grammatical reconstruction, the light shed on word formation, accent classes, etc. in the daughter languages, and the confirmation of the reconstructed laryngeals in Hittite. In my terms these are confirmations and correct predictions rather than

The geographical and chronological plausibility seems low, but this may reflect our imperfect understanding of processes of language spread and ethnic movement in the far north. Certainly it is worthwhile to assume the two groups are related and inquire into how and when that might have come to be.

There are several respects in which the statistical assessment of diagnostic value used here might be flawed. I may have underestimated the effective wordlist size in Vajda's comparison (and others), and I have very likely underestimated the degrees of semantic freedom involved in many comparisons (section 2.2 above). His comparison may in fact be better described as a many-to-many comparison of any Yeniseian language to any Na-Dene language, and not the strict binary comparison assumed here. Finding one resemblant paradigm in two languages or families is actually a wide-ranging search as discussed in section 3 above; but finding two paradigms is also a search and might still not actually be sufficient to prove relatedness. Comparing protolanguages rather than attested languages may have larger statistical implications than I have assumed (section 2.5). Conventional significance levels (which the 1/7000 probability of any language was multiplied by in section 1) may not be enough for identifying a unique individual language. Searches for relatedness span time, so perhaps the number of languages involved is not the modern 7000 but the total of all that have existed over the time span. In any case the number of languages extant in the time frame of Proto-Dene-Yeniseian is likely to have been larger than today. Any of these considerations increases the number of attempts and hence the amount and security of evidence required to demonstrate relatedness.

Nonetheless, Vajda's evidence meets the criterion I have been demanding of long-range comparison, and it does so separately in both its wordlist and its grammar comparison. This makes it radically different from previous efforts on Dene-Yeniseian and other recent long-range efforts. I believe the quality and quantity of evidence are better than what we have for some other groupings that are accepted as families. Therefore I believe Dene-Yeniseian should be classified as a family by comparativists, and it should absolutely be accepted as a provisional classification even by skeptically inclined comparativists.

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proof, but the fact that they are so widely regarded as necessary evidence indicates that a good deal more work will need to be done before Dene-Yeniseian is accepted by most historical linguists.

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YENISEIAN: SIBERIAN INTRUDER OR REMNANT?

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In my 1998 book, *Languages Relations across Bering Strait*, I presented the somewhat superficial evidence available to me at the time supporting a genetic link of some kind between Na-Dene and Yeniseian languages (cf. especially pp. 213–215). With the much more detailed results of Vajda's work in progress on this relationship now available, as first presented at the Dene-Yeniseic symposium in Fairbanks, February 2008, and now expanded in this volume, the position expressed in my book needs to be revised. First and foremost, I should admit my surprise at so many convincing lexical correspondences having now been unearthed—in my book I was pessimistic about this ever being achieved given the apparent time depth involved. Vajda has not tried to force these correlations upon nonspecialists who lack the specialized knowledge to judge the fine line between look-alike and true Dene-Yeniseian cognate; he does no more nor less than apply the well-tried methods and criteria of comparative philology upon the structurally exotic families involved. The absolute number of sets unearthed is still not particularly impressive by Euro-centric standards (not enough to declare the straightforward genetic relationship to be simply proven), and there are numerous problems of detail remaining to be sorted out, as Vajda himself stresses. But the perspective has certainly changed and there are far fewer grounds for skepticism or pessimism about the endeavor than before. Important issues are at stake. For example, as more and more cognates become accepted we are forced to decide: was the split between Yeniseian and Na-Dene more recent than we thought, or have these languages changed more slowly than those of more densely populated parts of the world? As Potter pointed out at the symposium (which unfortunately I could not attend), there is at all events no indication of migrations from Siberia into the New World between about 10,000 years ago and 4500 years ago, when Eskimo-Aleut newcomers arrived (Potter, this volume).

Since I wrote my book, Vajda has made considerable progress in discovering correspondences between specific grammatical affixes of the two families, especially aspectual and spatial/shape morphemes, some of which have a direct bearing on the idiosyncratic prefix complexes just before the verbal root in Na-Dene. I regard such elements, representing the most ancient morphological layer of the languages concerned, as the most convincing evidence to date for a direct genetic relation between them. Particularly intriguing here is the possibility that not only the (mainly) valency-reducing *d-* prefix of Na-Dene is shared by Yeniseian (where it among other things derives verbs from body parts), but also that the Na-Dene valency-increasing *l-* prefix is related to the instrumental nominalizer of that shape in Yeniseian. Vajda's arguments here are complex and tentative but in general quite reasonable: they involve reanalysis and absorption of single-segment morphemes of a type well known from the reconstruction of grammatical morphemes in more familiar language families. I might just add that his suggestion of the reanalysis within Na-Dene of a nominal instrumental suffix as a valency-increasing verbal suffix, though unlikely on the surface, has a parallel in Eskimo-Aleut, where *-un/-utə-* has precisely this dual function today (verbally used it forms instrumental transitive applicatives). His analysis supports not only the immediate comparison of relevant forms between the two families, but it also casts light on the internal reconstruction of proto-Na-Dene.

Now the recent discovery by Leer (2008, this volume) of a palatal consonant series preserved in Tlingit but merged with the 'ts' series in Athabaskan has parallels according to Vajda within Yeniseian (but not in Ket itself). This and other morphological oddities might suggest that Tlingit is in fact closer to Yeniseian than Athabaskan (i.e., might have split off from the common stock later than the latter did). This is indeed one logically possible model that, among others, was mentioned during the symposium by Comrie (this volume). In the event, Vajda argues that there is actually no reason to conclude that there is such a special relationship between Tlingit and Yeniseian since the number of cognates is no higher than that between Yeniseian and Athabaskan. It is nevertheless symptomatic of the new situation that such reconstructional hypotheses can now be discussed on a rational footing. The cooperation of Vajda and Leer, the foremost linguistic expert on Tlingit, has evidently been fruitful already and will hopefully continue to be so.

What appears to have guided the endeavours of Vajda (or at least whetted his appetite) has been focus on the quirky aspects of both language families (a strategy that Erik Hamp has always advocated). This is not only a matter of irregular morphology, but it also concerns deviations from typological expectations. In this he has been lucky: it is hard to imagine two language families, Yeniseian and Na-Dene, which are more typologically odd (think just of the discontinuous templatic morphology and the overwhelmingly prefixing nature of these languages despite predominantly SOV word order). Some such typological oddities can be explained by relatively recent contact with dominant neighbors—thus presumably the case system of otherwise head-marking Ket, which reflects influence from Russian and/or surrounding Siberian languages. *Once these more superficial deviations from typological expectations have been eliminated (since they display no obvious internal motivation) there is a core remaining that cannot be explained away as due to contact phenomena.* Vajda has to some degree followed these typologically salient fault lines, but I have a feeling more could be made of this—after all, only a few rival diachronic scenarios are possible to explain the origin of such individual oddities, internally or externally.

One particular area that now needs to be revised in the light of the growing likelihood of a common Dene-Yeniseian baseline is the position of Haida, if it is now to be definitively excluded from this company (and as Vajda has shown, Haida does not share the key commonalities that Na-Dene and Yeniseian do). How might Haida fit into an alternative areal and genetic picture for the broader American Northwest Coast (Map D)? What, for example, are we to make of the fact that Haida (unlike Na-Dene or Yeniseian) displays the same unusual combination of instrumental/causative prefixes and locative/directional suffixes as the Hokan and Penutian languages of northern California and Oregon (as described by DeLancey 1996)? Only a finite number of plausible grammaticalization scenarios could have produced this morphological configuration—where could the prefixes, for example, have come from? Adverbials? Auxiliary verbs? And how likely would it be that such elements would have occurred in that position given the basic SOV word order predominant in all these languages? Vajda has made a start on this for the Dene-Yeniseian hypothesis itself by considering the route whereby auxiliaries may have been absorbed into the verb complex, becoming prefixes in both families still bearing their own ancient pronominal 'slots' with them (but with different positioning of accompanying TAM suffixes).

One other intriguing piece of evidence concerning Haida and its possible role in early coastal migrations from Asia that might also touch upon the Dene-Yeniseian question has recently come to my attention. This is the use of the terms in Haida for 'out-to-sea' (toward the open) vs. 'up-into-woods-from-beach' (toward a closed area)—its major axis of geographical orientation—also for directions within the house, namely 'toward the central fireplace' (aligning with 'out to sea') and 'away from the fireplace' (aligning with 'up into the woods'). This is paralleled in Tlingit (cf. Leer 1989:584–585), and also in Northern Wakashan (cf. entries 1127 and 2636 in Lincoln and Rath 1980)—but it is not reconstructable for proto-Wakashan, nor is it found in Tsimshianic. The correlation is perhaps not unexpected for a seafaring island people like the Haida, who could have brought it further to these other mobile coastal people of the Northwest coast. Significantly, it is found in Nivkh on the Amur estuary and northern Sakhalin Island on the corresponding Asian side (Krejnovič 1986:165), and this could perhaps be diagnostic of early contact if not common origins (Maps A, C). Krejnovič claims in fact to have discovered the same kind of terminological correlation among the Kets

along the Yenisei river, far inland.¹ Vajda (p.c.) gives Ket *igda* as meaning 'down to the riverbank, into the fire'. In fact something very similar (or remnants of it) is found in inland Athabaskan, as in Koyukon prefix string *nee-gho-* 'to the shore, away from the fire' and Lower Tanana *netha* 'off from shore, into the fire'. One might argue that this is too idiosyncratic and culturally specific to be the result of pure chance. Could it reflect rather a common North Pacific Rim substrate in mid-Holocene times when the shores of Beringia were becoming submerged and various groups were being disrupted and forced both east and west?

Rather than focus on either detailed linguistic reconstructions or on the significance of prehistoric cultural links (which others are far better qualified to assess than I am), I should like to turn to one of the general questions that was raised at the Dene-Yeniseian symposium, namely whether it is more likely that Yeniseian reflects the source of the original Na-Dene expansion out of Siberia, or whether it represents a later return from North America/Beringia to Siberia. One might set up four distinct hypotheses, two of which accept that Tlingit and Yeniseian have an especially close/early relationship, and two that do not; within each of these we can distinguish one hypothesis that sees Yeniseian as returning from North America (or Beringia) and one that sees Na-Dene leaving Yeniseian behind on its way toward America. Let us label these hypotheses as

hypothesis A	+Tlingit-Yeniseian/Athabaskan split, +Na-Dene from Siberia to America
hypothesis B	+Tlingit-Yeniseian/Athabaskan split, +Yeniseian from America to Siberia
hypothesis C	-Tlingit-Yeniseian/Athabaskan split, +Na-Dene from Siberia to America
hypothesis D	-Tlingit-Yeniseian/Athabaskan split, +Yeniseian from America to Siberia

There are variations on these (concerning for example whether the hypothesized split—or its converse—might have taken place in Siberia or in Alaska), but these can be ignored in this simple *Gedanken* (thought) experiment. The archaeological record (as presented by Potter at the symposium) may not as yet be able to give any definitive answer as regards weighting these alternatives, but the intriguing discovery by Tamm et al. (2007) of an mtDNA link between Na-Dene and Ket's Samoyedic neighbors the Selkup (but not the Ket themselves) may well hold the key (or the promise of one).² The authors interpret the presence in at least one Selkup subject of haplogroup A2a, typical of Alaskan Na-Dene but not otherwise found in Siberia, as indicating a migration back to Siberia later than 10,000 years ago. According to Vajda (*this volume*) the Ket themselves, by contrast, show links to the ancient forest fishermen of the upper Yenisei to the south—as do the modern Turkic-speaking Shor, who reflect a strong Yeniseian substrate. Vajda refers here to the mitochondrial samples taken from Kitoi culture burial sites dated to 5000 to 4000 BC. This makes sense only if early population movements involving language shift are factored into the picture. It is to be hoped that more genetic data of this kind will become available in the near future.

First, consider hypothesis A (with Na-Dene moving from Siberia to Alaska). This hypothesis would be supported by the apparent morphophonological closeness between Tlingit and Yeniseian, but it would require two migratory waves across Alaska, namely an Athabaskan one (leaving Tlingit-Yeniseian behind), followed by a Tlingit one that passed right through Athabaskan territory to its present position. Athabaskan would probably have been hemmed in within Beringia at this time by the ice barrier still lying beyond. Hypothesis B (with Yeniseian moving back to Siberia) has the converse problem: Yeniseian, when it finally

¹ He also cites Prokofjev (1935) regarding the neighboring Selkups, who apply the terms *karræ* 'downhill, down bank to river, downriver' and *konnae* 'uphill, up from river, upriver' also to 'from interior (living area) of house toward fireplace (nearer exit)' and 'away from fireplace toward interior' respectively (Prokofjev 1935:11). He relates this to admixture with an earlier population that according to legend lived 'underground' or 'in caves' (a suggestion repeated by Krejnovič for Nivkh). The alignment of 'upriver' with 'interior of house' and 'downriver' with 'toward exit of house' by riverine people is in itself not so surprising—but note that in Nivkh this is combined with separate 'up from shore' and 'out onto water' terms used for 'toward/away from fireplace' (the fireplace being in the middle of the house, surrounded on three sides by living/sleeping platforms), just like in Haida and Tlingit.

² Note that certain Selkup groups are known to have intermarried with Kets after moving north (cf. Prokofjev op. cit.:9).

split from Tlingit-Yeniseian, would have had to traverse Athabaskan territory to get back to Siberia (or else Tlingit and Athabaskan would somehow have to have shuffled positions subsequently within Alaska/Beringia). However, hypothesis B could nevertheless be salvaged if Athabaskan split from Tlingit-Yeniseian to occupy a more northerly position than the latter, some of whose speakers subsequently set off back to Siberia along a southerly route. (There is indeed a further possibility—as also mentioned by Comrie—namely, that all three language groups, Tlingit, Athabaskan, and Yeniseian, split at roughly the same time, presumably in Beringia.) Against both hypotheses A and B it can be argued that the Tlingit-Yeniseian morphological parallels mentioned above could well represent ancient retentions, with (partly) parallel mergers of a common and natural kind having occurred in modern Ket and Athabaskan—it is of course shared innovations, not retentions, that one needs in order to prove a 'special' relationship.

Now, let us consider hypothesis C, the one that corresponds most directly to Vajda's original conception of the situation (though he remains open to the return hypothesis suggested by the mtDNA evidence). This avoids the problem of accounting for the position of Tlingit today (reasonably explained as a rather recent movement down to the coast from northernmost inland British Columbia/Yukon territory from a common Na-Dene homeland not far from that area). But it runs into another problem: the time scale of the movements of Palaeo-Arctic peoples out of Siberia 10,000 to 12,000 years ago (the archeologically most likely source of the original Na-Dene population) would seem to be incompatible with the relative closeness (structural and lexical) between Na-Dene and Yeniseian, if speakers of the latter did indeed 'stay behind'. This problem has grown, not receded, with Vajda's identification of a growing number of plausible lexical cognates. The languages involved must have evolved remarkably slowly to account for this, as Vajda is inclined to believe was indeed the case. Note, however, that the neighboring Samoyedic languages, also spoken by Siberian hunter-gatherers, have changed rather radically vis-à-vis the Finno-Ugric branch of Uralic—and probably within a lesser time frame than we are discussing here. Moreover, Eskimo-Aleut, which came across from Siberia considerably later, has a somewhat less transparent relationship with its probable nearest Siberian congeners, Yukagir and the Uralic languages, than Na-Dene has with Yeniseian.

Hypothesis C would, furthermore, be compatible with the mtDNA data cited above only if one could accept that some part of the Dene-Yeniseian population remaining in Siberia moved gradually northward over the millennia following the splitting away of Na-Dene, absorbing other peoples already there. This could have occurred under encroachment from the expanding Samoyeds, themselves pushed north under pressure from nomadic peoples farther south. The result could have been that the bulk of the small original genetic population largely underwent a language shift to Samoyedic, whereas those who moved farther north, maintaining their language, in turn absorbed people of a different genetic makeup. A complex picture, but not impossible. Consider the situation where speakers of northern Indo-European languages are genetically quite distinct from the population now in at least one plausible candidate for the Indo-European homeland—let us, for the sake of argument, say that this was Asia Minor, where non-Indo-European Turkish is now spoken by a population that may (for all I know) be closer to the genetic profile of proto-IE speakers than, say, Danes are. It is certainly known (e.g., from the extent of Yeniseian toponyms) that the Yeniseian languages were once spoken over a much wider area than they are today, especially farther to the south.

Finally, hypothesis D would share both the advantages and the problems of hypothesis C, but it may have the edge as regards explaining the mitochondrial DNA data, as far as it goes: one might expect Yeniseians returning to Siberia later than 10,000 BP to share one or more genetic mutation(s) acquired in Alaska with the Na-Dene remaining there. However, explaining how Yeniseian speakers (modern Kets at least) could have subsequently lost that mutation while speakers of unrelated Selkup should have acquired it, DEL requires an explanation only slightly less tortuous than that entailed by hypothesis C. Of course this could change if it later turns out that also a percentage of Ket speakers do in fact bear such a mutation.

So what does one make of all this—does hypothesis C win over hypothesis D or the reverse? Unfortunately it is too early to be categorical on the basis of the slender evidence available. At least one other factor does suggest that C is indeed the most likely of the four hypotheses, namely the a priori unlikelihood that a linguistically coherent group—albeit within a vast territory populated only by other small, far-flung

groups of hunter-gatherers—should have made it back from Alaska all the way to the upper reaches of the Yenisei without encountering rival groups that would have affected them linguistically if not absorbed them outright (the Old World was, after all, the cradle of technological advances that only gradually reached the New). The alternative to the migration of a single compact population, namely a broad 'spread zone' expansion back into Siberia, would seem still more unlikely, since this would surely have left some trace, both linguistic and (physically) genetic, in the Paleosiberian populations that until recently predominated in that vast area, linguistically overlaid in part only by Altaic and Uralic languages from farther south and west. I know of no such traces. On the contrary, much about Yeniseian languages points toward influence from dominant surrounding populations that have caused them to move further away from their Dene-Yeniseian roots and closer to a Siberian typological 'norm' (e.g., in their relatively recent development of case systems). However, the jury is still decidedly out.

In fact, in the spirit of Vajda's call for constructive criticism (which is generally more useful than complete—and possibly premature—agreement), I wish to act now as advocate for hypothesis D, or rather a variant thereof. This hypothesis, which assumes the relatively late return of a Dene-Yeniseian speaking group to Siberia,³ has the advantage of accommodating both the linguistic and the (slender) mtDNA evidence to date, and it is disprovable in the Popperian sense if contradictory genetic evidence does show up. Consider then the possibility that the link between the modern Ket and the Kitoi culture population mentioned above is substantiated and that no further specific mutations shared by modern Ket speakers and Na-Dene speakers in Alaska are found. This presumably very old 'Yeniseian' population shares common genetic markers not shared with other Siberians or with native North Americans, note. One could interpret this as indicating that an ethnically homogenous—but not Yeniseian-speaking—population was in place in the upper Yenisei basin in excess of 7000 years ago, and that some group bringing the proto-Yeniseian language from Alaska arrived after that time. Let us say that they were the bearers of Tamm et al.'s A2a mtDNA haplotype. This would obfuscate the interpretation of the genetic situation since there is no reason to believe that the hypothetical non-Yeniseian speaking population (perhaps autochthonous to the area for considerably more than 10,000 years) should not also have represented the source of the original migration of the pre-Na-Dene from Siberia to Alaska and thus indeed have been linguistically related to Na-Dene—only at a far more distant remove.

Indeed, in a number of ways Yeniseian looks more like an intruder than a remnant—it is more like a Siberian analogue of Hungarian than of Basque within Europe. Of a long-standing remnant like Basque one expects a toning down of differences, a gradual blending with neighbours, and nowhere is that more apparent than as regards phonology. Basque phonology is much like Spanish phonology (as is Ainu phonology compared to Japanese in a very different part of the world). Ket phonology is wildly different from that of its neighbors. It is as if it simply has not had time to accommodate to the Siberian 'norm'. What it—like Hungarian—has borrowed from its neighbors is a certain number of structural traits plus a large number of lexical items.

This scenario would explain why the linguistic distance between Yeniseian and Na-Dene seems intuitively to be less than the supposed 12,000-year time depth between them would allow and at the same time it avoids having to assume an archaeologically invisible migration from Siberia to the New World during the empty 'window' before 4500 BP. Why such a returning group should have wanted to—or managed to—make such a lengthy 'journey back' is another matter, but note that if this took place about 6000 years ago (around the Holocene thermal maximum, when many groups were on the move in the area), this would have been at a time when Eskimo-Aleut-speaking newcomers, with new technologies better suited to exploitation of the already much dwindled coastlines of Beringia, were expanding toward Bering Strait. Their movements (on top of the actual receding coastlines) could have disrupted a Dene-Yeniseian-

³ Perhaps about 6000 or 7000 years ago—note the apparent lack of archaeological evidence for permanent inhabitation of the Okhotsk coast at that time (Ben Potter, p.c.) and the 'fire/sea' words discussed above as suggesting at least some form of contact between Nivkh and Yeniseian as well as Na-Dene. This could be indicative of a southwesterly route toward the Amur river and Lake Baykal on the way to the upper Yenisei.

speaking Palaeo-Arctic continuum, forcing those on the Asian side (the remains of western Beringia) back toward the southwest, before the Chukotko-Kamchatkans in turn moved into that area from the Aldan and Lena basins. The western groups, forced progressively farther west on this scenario and moving finally into proximity to the eastward-expanding Samoyeds, could, I suggest, have been Yeniseian speakers. Perhaps the movement of Athabaskans farther to the southeast into Oregon and beyond at a somewhat later date could reflect a kind of mirror-image of the same mechanism at work on the American side. As for potential objections about the sheer distance the Yeniseians would have had to traverse on this scenario, one need only compare the similar distances covered by the spread of small groups of nomadic northern Tungusic people (Ewens and Ewenkis) out from the upper Amur/Baykal region in much more recent times, all the way from Kamchatka in the east to the Yenisei in the west and from Sakhalin in the south to the Arctic coast in the north. This spread—and the preceding Yukagir one—may have obliterated all intervening linguistic traces of a returning mid-Holocene Dene-Yeniseian migration (see the maps in Fortescue 1998: 252ff for the approximate timing of successive migrations back and forth across Siberia). Note that the northern Tungus (as well as other peoples now in place in the north of Siberia) represent a genetic admixture with an earlier Siberian population (cf. Levin 1963:280f.); genes and languages have been well and truly blended through successive movements of people in this vast, sparsely populated area.

Of course, all of the hypotheses sketched above may be greatly oversimplified (if not downright wrong), but at least they illustrate the kind of synthetic reasoning that needs to be applied to solving the remaining mysteries that surround the extraordinary homologies between Na-Dene and Yeniseian. In the final instance, it is the linguistic evidence—and accompanying arguments for specific reconstructions—that must cast the deciding vote, in particular as to whether proto-Yeniseian can be shown to be closer to proto-Na-Dene than to Proto-Athabaskan-Eyak. This fine-grained evidence we all eagerly await.

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TRANSITIVITY INDICATORS, HISTORICAL SCENARIOS, AND SUNDRY DENE-YENISEIAN NOTES

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These brief notes are a reaction to the extensive paper by Edward Vajda (this volume). From the outset I would like to mention those aspects of this paper that I do not feel myself an expert in. First, I am not a practicing historical-comparative linguist. Of course, I am familiar with the historical-comparative method and its application to several families, including Na-Dene. But my guess is that only someone who has done first-hand work in historical comparison and reconstruction can objectively assess the degree of rigor with which the comparison proposed by Vajda is implemented. Second, I have never studied Yeniseian and my acquaintance with this language family is rather superficial.

The fields of my expertise that are relevant to the paper in question are the following two. First, I have studied Athabaskan languages for many years and am familiar with certain languages belonging to all areal groupings of this family. Second, I am a typologist and prefer to assess any linguistic hypothesis not just in itself and by itself, but also from the point of view of its cross-linguistic feasibility. It is from these positions that I can offer some thoughts regarding Vajda's paper.

Vajda's paper includes two major parts. Section 2 is devoted to a comparison of Yeniseian and Na-Dene verb morphology, while section 3 deals with lexical comparison—an analysis of putative cognates, as well as sound correspondences. I will begin with some brief comments on the lexical part and then discuss the morphological part in more detail.

The lexical/phonological comparison (section 3) looks promising. Sound correspondences appear quite robust. My problem, however, is that this positive evaluation of mine is purely subjective. What are the objective criteria one uses when evaluating a distance relationship hypothesis? The assessments Vajda is using himself are of the following kind: cognates in basic vocabulary are "sufficient in number to establish systematic sound correspondences"; "a modest but sufficient number of lexical cognates (about 100 roots or simple words, so far)" (beginning of section 3); "a modest number of cognate compounds and derived words displaying structural and semantic parallels unlikely to have arisen through chance" (section 4). I have the following questions. How many lexical items are necessary to establish a relationship (even when stable correspondences are in place)? What can and what cannot be due to chance coincidence? At this time I do not have an answer to these questions, and I am not sure historical linguistics has them.

In historical linguistics, far too often attention is paid to sound alone, and a theory of what "semantic likeness" is supposed to be is left to pure intuition. Also, historical linguists are notoriously bold in their hypotheses on what semantic relations between cognates can be like. Against the background of such practices, I would like to emphasize that Vajda's comparisons most of the time involve roots of an identical or really close meaning, so his hypotheses are on the safe side from the semantic point of view. I noted just a few items that looked suspicious to me. For example, in subsection 3.5.2.9 PA *-la 'point, end, hand' is connected to Ket words for 'barb on the end of a fishing hook' and 'string'. The shape of this morpheme is so cross-linguistically common, and the morpheme is so short, that assuming cognacy under such a shaky semantic relationship seems just too bold. By the way, in the recent years there are substantial efforts from

several groups of typologists (Zaliznjak 2006, Croft et al. 2009) who are trying to establish an empirical semantic foundation for the search for cognates. Perhaps these efforts are worth the attention of historical linguists.

One more comment is due regarding the lexical part of the study. In section 4 Vajda remarks that the attested cognates "include words for biota, natural history, and skill sets that specifically reflect hunter/gatherer life in the northern subarctic taiga forests". It is most likely indeed that both the prehistoric Na-Dene and the proto-Yeniseians resided in the Subarctic. However, the nature of the geographical zone linking these two ancestral areas is different. It is Beringia, that is the Arctic. No matter on which side of the Bering Strait could be the DY Urheimat, proto-Yeniseians or proto-ND could not have gotten from one taiga area to the other in a flash. There must have been some centuries spent in the Arctic. And if so, it would not be expected to see fully parallel flora, fauna, and economy vocabulary. (Cf. Johanna Nichols' (2008) counts of how long it might take in the prehistoric times to get from point A to point B.) Vajda actually suggests (section 4) that "these items are for the most part also congruent with subsistence in Arctic environments", but apparently this claim needs to be fully elaborated and confirmed with biological and geographical evidence, in order to become fully convincing.

Despite these reservations, I would like to repeat that the lexical/phonological part of the paper gives an impression of credibility. As Vajda himself points out, massive further work is in order that hopefully confirms the DY hypothesis.

Now I proceed with the morphological part of the paper (section 2). This is where knowledge of Athabaskan is much more essential for evaluating Vajda's suggestions, compared to the lexical part.

The most ancient Athabaskan prefixes stacking in front of the verb root form the following template: "mode" - 1 and 2 person subject - perfective - transitivity indicator (= "classifier"). Eyak and Tlingit largely share this structure, so it is safe to assume that it was established morphologically at the proto-ND stage. Vajda proposes that the Yeniseian has a congruent morphological structure and posits a number of specific comparisons between the Na-Dene and Yeniseian prefixes (see below). What bothers me most of all is that the ND transitivity indicators do not find a clear counterpart in Yeniseian: "there are no classifiers in Yeniseian, even though Yeniseian does possess morphemes cognate to some of the classifier components" (section 2.2.4).

In diachronic typology it is commonplace that morphology emerges from syntax (Givón 1971:413). This means that those affixes that are closer to the root froze from erstwhile function words into bound morphemes earlier than more remote affixes. Therefore, transitivity indicators (TIs), located in the immediately pre-root position, must constitute the earliest acquisition of the proto-ND inflected verb. However, there is no obviously comparable set of morphemes in Yeniseian, and, as a matter of fact, no comparable morphological position. Vajda (subsection 2.2.4) does offer several observations on possible Yeniseian cognates of the Na-Dene TIs, but these certainly do not qualify as a fully fledged counterpart of the TI position. My point is the following. If one proposes a homology of two not exactly identical morphological structures, one must also come up with a possible scenario of how differences between these structures historically emerged. I am not sure what scenario could fully explain the absence of the TI position in Yeniseian.

There are two alternatives on the timing of the putative DY relationship with respect to the TI position. First, what we know as the Na-Dene template could have emerged still at the proto-DY stage. In other words, the Na-Dene template could also be the proto-DY template. (Note that the valency-related functioning of TIs is strikingly similar across Athabaskan (see e.g. Kibrik 2008), both structurally and semantically, and is also similar in the rest of Na-Dene, and it therefore appears that the coherent system of valency marking through TIs evolved very early.) Under this scenario proto-Yeniseian supposedly must have had the same morphological system as well. If so, how could the TI position be missing in Yeniseian? There is a theoretical possibility that the TIs could have eroded through morphophonemic processes in Yeniseian, and then a specific diachronic machinery of such erosion needs to be postulated.

According to the second scenario, the Na-Dene template could have evolved after the split between Na-Dene and Yeniseian. Then, given that the TIs are missing from Yeniseian, it would be reasonable to assume

that the TIs still were not a part of the inflected verb at the proto-DY stage. All the more so, the more remote morphological positions (including perfective, subject pronouns, and mode) could not have emerged at the proto-DY stage. There is no chance that the TIs could have wedged inside the inflected verb in Na-Dene and/or develop a new set of functions after Na-Dene split from proto-Yeniseian.

I am not sure which of these two incompatible scenarios is consistent with Vajda's theory. On the one hand, he seems to entertain the first scenario, saying (in section 2.2.4) that "it is likely that such consonantal prefixes simply elided before the consonant onset of Yeniseian verb roots" and that "in Yeniseian, the pre-root verb prefixes shown in Table 21 merged with the root to create the modern verb base". On the other hand, he goes on to say that the TIs "never developed the productive grammatical valence-change functions found in Na-Dene." Given this equivocality, I am not sure what the value is of similarities between the Na-Dene and the Yeniseian verb templates. I am afraid that, as long as the status of the immediately pre-root TIs is not clarified, morphological argument for the relationship largely fails.

To recapitulate this central criticism of mine, in order to convincingly put forward the morphological homology between the verb templates of the two families, one needs to offer a specific historical scenario, involving a timing of changes. Given the really fundamental difference between the two templates—the salience of TIs in Na-Dene and the conspicuous absence thereof in Yeniseian—the morphological parallelism between the two templates remains unconvincing.

I also have several more local comments on the morphological part of the paper that are worth mentioning, including the following:

- In the discussion of different verb templates in section 2.1 it is not exactly clear how their similarities or differences are assessed. It seems that the judgment is largely intuitive.
- The Yeniseian morpheme *n-*, the putative correlate of the Athabaskan classificatory element for roundish objects, appears too rarely ("in a tiny handful of verbs", section 2.2.3) to propose a connection for such a phonetically common affix. Moreover, some of the examples are questionable—in particular, by Athabaskan standards birchbark or rawhide (first example in (4)) qualify as flat rather than roundish objects. Examples for *d-* also seem to be too few for being conclusive.
- Highly unlikely seems the hypothesis that the Na-Dene *l*-TI might be related to the homophonous instrumental/comitative postposition, connected to the preceding subject pronoun (section 2.2.4), for the reason that the pronouns appearing in the subject position and those attached to postpositions belong to two very different pronominal sets.

Generally, I feel that most of the hypotheses put forward in the morphological part of the paper are not yet sufficiently convincing. Probably the most plausible connection is that between the Yeniseian and Na-Dene telic and atelic aspect markers (section 2.2.1), assuming that they are corroborated by identical sound correspondences in the lexical materials (section 3.5.2). However, given Vajda's suggestion that these morphemes are originally auxiliary stems, their cognacy in the two families does not tell anything about the relatedness of verb templates per se.

One final comment can be made. The paper abounds with specific proto-Athabaskan and proto-Na-Dene reconstructed forms. Sometimes the argument is not easy to follow because the sources of such reconstructions are less than obvious. On the other hand, the effort associated with the Dene-Yeniseian hypothesis apparently makes the Na-Dene data itself more accessible and brings them into focus. In this sense, this effort is beneficial for the Na-Dene studies even at the stage when the external connection is not yet sufficiently supported.

I hope that my criticisms can count as constructive and that some of them can help further develop this promising hypothesis about long-distance relationship.

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DENE-YENISEIAN, PHONOLOGICAL SUBSTRATA, AND SUBSTRATIC PLACE NAMES

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I am grateful for this opportunity to contribute some thoughts to this volume on the Dene-Yeniseian hypothesis. Because of my interest in the issue of substrata, and as an Athabascanist and Eskimologist who also has a background in Indo-European (particularly Germanic) historical and comparative linguistics, I would like to make two observations.

First, I want to draw attention to Fortescue's observation (this volume) that Yeniseian looks more like an intruder than a remnant. He argues that if Yeniseian had been in situ for a very long time, the phonological differences between it and the neighboring languages would have toned down, whereas the phonological differences between Yeniseian and its neighbors remain striking. Fortescue points out that Yeniseian, in this respect, is more like the intruder Hungarian in central Europe than like the pre-Indo-European remnant Basque in western Europe. Indeed, Hungarian is phonologically rather unlike its Indo-European neighbors, whereas Basque phonology is very much like Spanish phonology. It is not so much that Basque phonology accommodated to Romance, but rather that, as vulgar Latin was acquired by speakers of Basque, they left an articulatory trace on the language they shifted to, i.e. Spanish might be Romance with a Basque phonological substratum.

Vajda's response to this observation might be, I presume, in another paper (Vajda, in press a). There, Vajda suggests that the shift from Yeniseian to Turkic or Samoyedic occurred over a few generations, in other words rapidly enough so that Yeniseian bilingualism among native Turkic or Samoyedic speakers was minimal, but efficiently enough that the Yeniseian speakers could learn their new mother tongues without retaining a noticeable substratic phonology. But this argument is not convincing; we expect that in any shift situation, there should be a phonological substratic effect, particularly if the area where the shift took place was a large one. And from Werner (2005:2-5) and Vajda (in press a) we know that the area which contains Yeniseian substrate hydronyms (river, stream, and other bodies of water names) was much larger than the historical Yeniseian language area, so we would expect more of a phonological substratum in areas which shifted away from Yeniseian perhaps centuries ago.

We are aware, of course, that the notion of substratic phonology, as implied by Fortescue's observation, and Vajda's presumed response, is a problematic one. The problem with phonological substrata is that it is quite easy to come up with intriguing examples of suspected substratum influence, but it is almost impossible to ascertain the significance of the phenomenon, as it is impossible to venture more than educated guesses about what the substratic language (or languages) might have been. One example of such a potential phonological substratum is in Van Ginneken's (1934) paper on intriguing phonological isoglosses which appear to ignore the Germanic-Romance language boundary in northern France and Belgium. Van Ginneken himself draws no conclusions regarding these, but probably the phonological influences of an extinct pre-Romance, pre-Germanic, maybe even pre-Indo-European language might be at play. The problem is, of course, that we cannot put a language name on this potential substratic influence.

Another example of mysterious phonological isoglosses might be slightly more relevant to the Dene-

Yeniseian hypothesis, since it occurs in Athabaskan, the major branch of Na-Dene. As first mentioned in de Reuse (2005), certain Apachean (Southern Athabaskan) languages have a voiced tap or flap (or r-like) allophone of the non-stem initial /d/, pronounced [t] in stem-initial position and in slow speech in any position. The languages with the flap/tap allophone are the southernmost Apachean languages, i.e. Western Apache, Chiricahua Apache, and Mescalero Apache. The northernmost Apachean languages, i.e. Navajo (as spoken on the contiguous reservation), and Jicarilla Apache do not have this allophone, i.e. /d/ always remains [t]. It is also interesting that the southernmost Navajo dialect, spoken on the Alamo Navajo reservation in New Mexico (Jalon Begay p.c., October 2009) also has the flap/tap allophone, so that the no flap/tap vs. flap/tap isogloss cross-cuts Navajo dialect boundaries.¹

Now, Hinton (1985) in a thorough study of Yuman /r/ and surrounding languages in the Southwest, does not mention any r-like sounds in Apachean, which is not surprising, since the published literature did not note them before my own fieldwork and philological research. She points out, however, that there are stop allophones of /r/ in some Yuman languages (see also (Berardo 1992:64-66), and that there are flap/tap-like allophones of /r/ in some Takic and Numic (Uto-Aztecan languages). The conclusions regarding Apachean are not easy to draw; all we know with certainty is that Apacheans entered the Southwest later than either Yumans, or Uto-Aztecan. It is not clear whether this flap/tap and stop allophonic variation in Apachean comes from Uto-Aztecan, from Yuman, or maybe even from a substratum underlying Yuman and Uto-Aztecan in the area.²

To conclude regarding this first observation, arguing for a specific language name for a phonological substrate is always extremely tricky. Nevertheless, one would hope that the very distinctive phonetic and especially prosodic features of Yeniseian might have left some sort of substratic trace somewhere in the languages between the modern Yeniseian area and the modern Na-Dene area.

The second observation is inspired by Vajda's mention of substrate hydronyms in the Yeniseian area (in press a, and his "Yeniseian, Na-Dene, and Historical Linguistics" paper, this volume). Vajda's discussion of substrate hydronyms reminds me of the "Old European" hypothesis by Krahe (1963), and of its bold reinterpretation by Vennemann (2003).³ Krahe had argued that before the Indo-European branches that are presently posited established themselves in Europe there were already Indo-Europeans in Europe, as evidenced by his etymologies of European hydronyms. Vennemann's hypothesis is that these "Old European" hydronyms are actually not Indo-European at all. He hypothesizes that after the last Ice Age, speakers of languages related to Basque, which Vennemann calls "Vasconic", spread northward and named all the river systems of western and northwestern Europe. So, all obviously non-Celtic, non-Germanic, non-Romance, and non-Slavic hydronyms would be of Basque origin.⁴ Vennemann is a leading Indo-Europeanist and a brilliant Germanist, but he is less of a specialist in Basque, and it is not surprising he exposed himself to criticism by Basque specialists (e.g. Trask 1995), as well as by comparativists (Sheynin 2004; Baldi and Page 2006). Vennemann's Vasconic hypothesis will remain controversial. Nevertheless, Vennemann's Vasconic substrate hypothesis is very intriguing, and many of his etymologies, but most likely not all, might well turn out to point to a Basque substratum in western Europe.

What the Dene-Yeniseian hypothesis can learn from criticism of Vennemann's Vasconic hypothesis is the following. The Vasconic hypothesis has been criticized carefully by Baldi and Page (2006), who argue that the etymologies are so speculative that they do not point more to Basque than to Indo-European. In other words, the Vasconic place-name phonology and morphology set up by Vennemann is not so distinctive as

¹ The marginal presence of a flap/tap allophone in Plains Apache (formerly called Kiowa-Apache), as well as its solid presence in several Northern Athabaskan languages of Canada, are presumably unrelated phenomena.

² We can also conclude that Athabaskan itself, notwithstanding its well-documented phonological conservatism, is not impervious to potential phonological substrate influences.

³ This is a collection of papers published earlier, of which the most relevant to Vasconic were published earlier as Vennemann (1994) and (1995).

⁴ Vennemann also argues for Semitic or Afro-Asiatic substrata and superstrata in Western Europe, but since these are not connected to hydronyms, I will not discuss this issue here.

to point unambiguously toward Basque (or a language genetically related to Basque), and that is a potential problem. The problem is less acute concerning Yeniseian, since Vajda (p.c.) points out that the Yeniseian substrate hydronyms are quite transparently Yeniseian in that most of them contain a clearly Yeniseian element 'river' (Werner 2005:3–5), whereas Vennemann's Old European hydronyms are not connectable to Vasconic or any other language family in this unambiguous way.

I do not know what Yeniseian placenames other than hydronyms look like, beyond the suggestive comments in Vajda (in press b), but if they are as distinctive and unusual as Na-Dene placenames, as cogently described by Kari (this volume), research on Dene-Yeniseian placenames would be less open to criticism than Vennemann's research is. If Yeniseian is indeed genetically related to Na-Dene, this very distinctive Na-Dene pattern of placenames might well have left a distinctive substratic trace in the Old World. If, for example, the ancestral Dene-Yeniseians crossed Chukotka Peninsula in their way to Alaska before it was occupied by Yukaghir, Chukotko-Kamchatkan, and Eskimo-Aleut speakers, they would have had an opportunity to name the rivers. While it appears that most of the river names in Chukotka are now etymologically Chukotko-Kamchatkan, it might well be worthwhile to look for Na-Dene-like calquing patterns in these placenames. Such calquing patterns would count as a sort of substratic evidence.

One problem with the Dene-Yeniseian hypothesis, as pointed out by Nichols and Kari (this volume), is the apparent existence of phonological, morphological and lexical correspondences indicative of a genetic relationship, in spite of the huge geographic distance and time depth between modern Yeniseian and modern Na-Dene. Modern Na-Dene does not extend farther west than Alaska, whereas the oldest verifiable location of Yeniseian speaking groups is the area between the southern tip of Lake Baikal, northern Mongolia and the Upper Yenisei (Vajda, p.c.). Yeniseian appears to be a recent intruder into central and western Siberia, and there is no evidence of Yeniseian languages anywhere east of Lake Baikal.⁵ Can languages that far removed in space and time retain enough similarities to allow us to establish a genetic relationship? What is so exciting about the Dene-Yeniseian hypothesis is that it might well be able to provide us with an affirmative answer to this question.

Let me suggest, as a conclusion, that an affirmative answer to this question would be bolstered considerably if further research could uncover substratic placename (and maybe even phonological substratic) evidence for the eastward movement of the ancestral Dene-Yeniseians. Such research should take into account the fact that the toponymic picture for Siberia is quite complex, and that Yeniseian placenames are just one layer in that picture, thus not necessarily a substratic one (Vajda, p.c.). Such research should also be carried out through a narrower collaboration with specialists in the language families intervening between Yeniseian and Na-Dene (i.e. Uralic, Tungusic, Turkic, Mongolian, Yukaghir, Chukotko-Kamchatkan, and Eskimo-Aleut).

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⁵ Edward Vajda (p.c. to author and editors, March 4, 2010), who comments further: "In general I suspect that the Yeniseian presence in much of western Siberia dates from less than 2000 years ago, with the movements northward into the Middle Yenisei and into western Siberia (and even easternmost Europe) occurring as a result of the spread of pastoral nomadism into the forests north of the steppes."

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DENE-YENISEIAN, MIGRATION, AND PREHISTORY

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It is decidedly premature to attempt reaching any hard and fast conclusions about how Dene-Yeniseian attained its current geographic distribution when we have just arrived at the threshold of a clearly framed recognition that there is a definable language connection. Yet, there is no denying that the question of just how such a distribution arose—with a separation between Siberia and northwestern North America involving thousands of kilometers—is simply fascinating. Potter and Fortescue (this volume) discuss a number of scenarios that might explain the Dene-Yeniseian distribution. Long-term exploration of the historical processes behind this distribution would, in my view, make for an ideal field of play involving a collaborative, interdisciplinary approach. Trigger (2008:513–514) has suggested that where we are able to derive convergent lines of evidence concerning a particular aspect of prehistory, we can have greater confidence that our inferences about the distant past might be on track. With his injunction in mind, it is worth considering the current state of affairs with respect to an interdisciplinary conceptualization of the Dene-Yeniseian phenomenon. In this regard, one might suggest that there is a reasonable degree of consensus concerning the following propositions:

1. Both Yeniseian language structure and a set of several dozen cognates (that follow predictable phonological shifts) reveal a deep connection with Dene, Eyak, and Tlingit.
2. There is a significant degree of dissonance between biological anthropological and genetic data on the one hand and linguistic data on the other hand. The only surviving Yeniseian population today, that of the Ket, has a genetic profile aligning it better with its region of Siberia. That profile bears little resemblance to the genetic profile for Na-Dene speakers in North America. As Scott and O'Rourke (this volume) conclude, there is nothing about the current genetic or human biological data that would provide specific and unequivocal support for a biological connection paralleling the Dene-Yeniseian language data.
3. Little is known of the ancient DNA profile of human populations that are distributed across the vast region from the Yenisei to Alaska, but it does so happen that there are data for important burial populations in the Lake Baikal region, and particularly the Kitoi Phase. There are strong parallels in the modern mtDNA data for both Ket and Shor speakers and the ancient mtDNA profile for Kitoi Phase populations, particularly in terms of high proportions of the relatively rare haplogroup F (Mooder et al. 2006).
4. The classificatory character of the Ket kin system, so anomalous in its Siberian context, can be explained as the consequence of a shift from cross/parallel categorization and a propensity for bilateral cross cousin marriage to "generational" characteristics brought about by strong forces of residential or corporate group exogamy.
5. While a variety of explanations might be proposed for the Dene-Yeniseian distribution, including some with a relatively *in situ* character, the distances are so immense that any viable explanation will require a significant degree of human population movement or outright migration.

We are thus rather quickly led to ask how the linguistic evidence presented in the current volume can be so compelling and yet seemingly at odds with the genetic data. Rubicz et al. (2002) reacted to Ruhlen's (1998) proposal regarding Na-Dene and Yeniseian languages by concluding that the Na-Dene and Yeniseian populations were both genetically and linguistically unrelated. Additional data such as that provided by Malhi et al. (2002; 2003:114) for mtDNA haplogroup data reinforced the genetic differences. In northwestern North America, mtDNA haplogroup A frequencies are so high (80% and above) as to be regarded as essentially "fixed" in northern Dene and other populations. Yet, modern Ket (and neighboring Shor) populations have very low mtDNA haplogroup A frequencies, with rather high frequencies of comparatively rare haplogroup F (Mooder et al. 2006). These particular frequencies appear to have some antiquity in Siberia. Ancient mitochondrial DNA recovered in the course of the Baikal Archaeology Project shows that Kitoi Phase burials from the interval from ca. 6000–8000 years BP exhibit haplogroup frequencies with A at 0.13, C at 0.03, D at 0.23, and F at 0.48 (Mooder et al. 2006:354).

Rubicz et al. (2002) provided three caveats at the conclusion of their article that may allow a more cogent understanding of this apparent impasse, which has become even more profound with Vajda's meticulous demonstration that there truly is a language relationship. Rubicz et al. suggested that the situation might be explained if:

1. Yeniseian and Dene populations did not share a common genetic ancestry, but that there had been horizontal language transmission from one of these groups to the other; or,
2. Yeniseian and Dene did have a common origin, but languages and genes evolved at different rates; or,
3. Yeniseian and Dene had common linguistic and genetic origins, but recent genetic differentiation had obscured the genetic relationship.

These caveats have the advantage of freeing us from customary assumptions that may otherwise inhibit our prospects for understanding the fascinating riddle Dene-Yeniseian presents, and especially for directing us toward lines of evidence that might be easy to overlook.

1.0. DENE-YENISEIAN PREHISTORY

It would seem highly unlikely that the linkage between Dene and Yeniseian could be the consequence of a split on the order of the last 2000–3000 years. The respective populations are simply too divergent in genetic terms, there has been too great a degree of language change, and there is really nothing in the archaeological record that would warrant such an assumption. As a consequence, it is more plausible to see the physical separation of Dene, Eyak, and Tlingit on the one hand and Yeniseian on the other hand as a mid-Holocene (ca. 4000–6000 years) through terminal Pleistocene (ca. 10,000–18,000 years) phenomenon.

Since one set of scenarios (encompassing Potter's options 1–3, this volume) would involve rather "deep" time, it is natural to wonder whether submergence of the Bering platform might not have been the pivotal paleoenvironmental event dividing an ancestral Dene-Yeniseian speech community. Currently, the final stages of inundation of the Bering platform are thought to lie in the range of 11,000–13,000 years ago (Manley 2009). Dene and Yeniseian might have become isolated on opposite sides of the Bering Strait, leaving Dene to diversify in North America. The situation for Yeniseian remains more mysterious: it might have become a population as far west as the Chukchi region, coming to move more deeply into Siberia in Holocene time. Alternatively, Yeniseian might be a central Siberian remnant of a population that once extended more extensively toward eastern Beringia, including northwestern North America.

Whatever the exact case, it could be that small-scale demographic processes, including frequent fissioning of groups, resulted in sequences of founder effects (cf. Hunley et al. 2008). These processes could culminate in different genetic signatures for daughter populations that were once closely related, but had been diverging for 10,000–18,000 years. The archaeological evidence reviewed by Potter shows that significant

areas of Siberia along with eastern Beringia were being colonized in late glacial times, which could mean that they featured populations that were relatively homogenous, both linguistically and genetically. Larger archaeological entities, such as Diuktai, could then conceivably “map onto” language families, such as proto-Dene-Yeniseian, with a certain degree of isomorphy. As Kari (this volume) explores, it could be that the conventional interpretation of time depth for historical linguistic methods is incorrect. Some languages (with Dene-Yeniseian providing prime candidates) are far more conservative in their rates of change, so that their differentiation may have taken considerably greater lengths of time that could extend into the terminal Pleistocene era.

There are two primary challenges to these deep-time scenarios. A number of historical linguists are reluctant to abandon conventional time frames in which it is believed to be feasible to detect relationships between languages. In these quarters, there is a general sense that it will not be possible to succeed in such endeavors beyond roughly 5000 years ago (and certainly not in time ranges two to three times beyond that). There is also a subsidiary difficulty with this line of thought: logically, if such languages are inherently conservative, then it would seem reasonable to think all of our estimates for linguistic divergence would be similarly affected. Thus, we would either have to acknowledge that rates of language change may fluctuate dramatically over time even within conservative languages, or, that the time depths of other changes would have to be revised proportionately. In the latter case, one would project that the Apachean expansion in Na-Dene, for example, ought by these measures to be a mid-Holocene phenomenon itself. Few anthropological, archaeological, linguistic, or genetic researchers would be likely to see this as realistic.

The second difficulty lies with the fact that large archaeological constructs frequently turn out to be polyethnic in character: artifacts may reflect linguistic and cultural identities, but, unfortunately, material culture very often masks, distorts, or inverts social relationships where language and cultural differences certainly are present (Anthony 2007, Trigger 2008). At such time depths and over such vast regions, the ethnography of hunter-gatherer societies compels us to allow for the prospect that multiple ancient language and cultural identities could have been involved.¹ For the present, I would be more comfortable in seeing large entities such as Diuktai and early Denali as technocomplexes, without imputing language identities (cf. Le Blanc and Ives 1986:88). Dene and Yeniseian ancestors almost certainly existed in the populations creating these ancient material cultures, but this does not mean that we can confine our reasoning to this single language family, when ancestors to others may very well have been involved, too. As attractive as the mechanism of a terminal Pleistocene Beringian diaspora of Dene-Yeniseian speakers would seem to be, then, there are some potentially prohibitive drawbacks to an explanation of this nature.

There is another juncture at which the archaeological record strongly suggests that important human events were transpiring across the Bering Strait region. The Bering Strait region was not impermeable once the Bering Land Bridge vanished, and the later mid-Holocene interval of ca. 4000–5000 years ago is precisely the time range in which the Arctic Small Tool tradition (ASTt) appears in North America (Dumond 1984; McGhee 1996). This interval would be in better accord with conventional historical linguistic timelines and also deserves some careful consideration. Since Irving’s (e.g., 1962) definition of it, the ASTt has often been thought of as emanating from the larger Bering Sea region (including northeast Asia) as part of a rapid spread in Arctic coastal and near coastal regions (e.g. McGhee 1977, 1996; Powers and Jordan 1990). ASTt populations used maritime resources, but at times they relied significantly on terrestrial resources such as caribou and musk oxen, entering far into the Canadian Barrenlands in later time ranges (e.g. Gordon 1996).

Recent findings from geneticists appear to have shed further light on ASTt origins. Tamm et al. (2007) articulated a larger scheme where they saw an early penetration of Beringia, prior to 15,000 years ago, in which typically New World mtDNA signatures had an opportunity to arise, and after which rapid expansion

¹ As a broadly comparable example concerning the initial Upper Palaeolithic populations colonizing Europe, Vanhaeren and d’Errico (2006) made a careful and intriguing argument that Aurignacian bead distributions reveal an early, differentiated ethno-linguistic geography, despite other broad similarities in Aurignacian technology. Their argument is based on the manner in which ethnographic studies show that objects of personal adornment are superior indicators of ethno-linguistic diversity.

into the Americas took place. At ca. 4000–5000 years ago, these authors saw clear evidence for the later arrival mtDNA hg D2. There followed a subsequent spread of hg D2a, as well as a back migration into northeast Asia of mtDNA hg A2a—a typically New World phylogeny (connected with Dene speakers) found also among Evenks and Selkups in southern and western Siberia. Gilbert et al. (2008) investigated the mitochondrial genome of 3400–4500-year-old human hair from an early Greenland Saqqaq settlement, connected with the rapid ASTt spread across the high Arctic. The sample yielded results falling within haplogroup D2a1, previously observed for Aleut and Siberian Sireniki Yuit populations. As a consequence, these authors argued that early ASTt populations emanated from the Bering Sea region 4500 years ago and were not directly related to either earlier Native American or later Eskimo populations. Human population movements across the Bering Strait were clearly taking place in this time range and may be highly relevant to our long-term understanding of Dene-Yeniseian.

The idea of seeking an explanation for the Dene-Yeniseian phenomenon in this time range might be thought to founder on the sense shared by many archaeologists that the ASTt phenomenon concerns Eskaleutian ancestors exclusively. I would suggest, nevertheless, that this might be one of those areas where suspending our habitual assumptions could lead to avenues worth serious exploration. Accepting that Dene populations were long established and widespread inhabitants of the western Subarctic interior of North America by mid-Holocene times, much as Potter and Kari argue in this volume, it could be that various combinations of the caveats outlined by Rubicz et al. can help us find alternative ways of resolving the apparent discrepancies in linguistic, genetic, and archaeological data. These caveats are particularly helpful inasmuch as they remind us that languages, genes, and culture do have the capacity to vary independently. While Anthony (2007) painted a rather bleak picture (from ethnographic material culture studies) of the prospects for matching material culture configurations like archaeological phases or complexes against specific language identities in any reliable way, he was much more sanguine concerning material culture frontiers or borders of long duration. In his review of that literature, Anthony (2007:102–119) illustrated that such persistent frontiers may often be created at the terminus of significant migrations. These frontiers may shift geographically or in material culture content, but they can otherwise exist over centuries or millennia. In global perspective, material culture frontiers do in fact seem to mark stable distinctions between long lasting speech communities. The specifics varied in each case Anthony treated, but in general, the relative stability of these language boundaries did not mean that they were impermeable. On the contrary, people may move quite freely across such frontiers, as genetic studies reveal, although there may be very strong expectations about conforming to material culture or language norms on opposite sides of a frontier.

Dumond (1980; see also Potter, this volume; Ives 1990:33–38) has written cogently about deeply entrenched contrasts in northwestern North America concerning interior and coastal peoples. To the north, this distinction often involved Eskaleutian peoples in coastal and near coastal settings, and Dene ancestors on the interior. To the south, the distinction involved Northwest Coast societies (such Haida, Tlingit, Tsimshian, and Bella Coola) and Plateau peoples (principally Dene). This configuration existed in various iterations in the past, including that of ASTt and the interior Northern Archaic that Potter (this volume) illustrates. In accord with the received archaeological wisdom, one might justifiably think a material culture and language frontier was created at the terminus of an ASTt migration into North America. Even this fairly recent configuration is too deeply buried in time for there to be many specifics available to us. Yet, following Anthony’s lead, it would seem to be reasonable to allow that an ASTt/Northern Archaic frontier may have been as permeable in terms of the movement of individuals and groups as were the historic versions. It is not far-fetched to think that such permeability could have extended to small groups of people, including those of Na-Dene origin in interior Alaska—groups that might have had a strong capacity to retain their language, but that would otherwise have been inclined to make significant shifts in material culture.

It is most instructive, in this regard, to review Osgood’s (1940) *Ingalik Material Culture*, in which Deg Hit’an speaking communities are shown to have material cultures heavily influenced by Inuit neighbors, (featuring *kashim* style men’s houses through ceramics and an elaborate organic artifact assemblage). It would be a reasonable question to ask if the material culture Osgood described would be attributed to Inuit or Dene

speakers if an analyst did not know who had created it. If we take into account the “subtractive” quality of many Arctic and especially Subarctic archaeological records, where perishable and even more durable organic artifacts of bone and antler are quite frequently lost from the archaeological record, the difficulty to which I am alluding would become even more acute. This is not a unique scenario at the interface between Inuit and Dene communities along the Arctic fringe of the Dene language distribution. Le Blanc (1983, 2009), for example, describes late period assemblages from Rat Indian Creek that were without doubt created by Gwich'in ancestors but have strong Inuit overtones for harpoon heads and other aspects of the technology. Viewed from this perspective, it is a moot point as to whether we can be certain just which language might have been spoken by the makers of ancient material cultures in the vicinity of the ASTt and Northern Archaic interface, even if the former tradition is habitually associated with Eskaleutian ancestors and the latter with Dene ancestors. Note also that, in human biological terms (dentition, blood groups, and genetics), Eskaleut and Na-Dene populations are closer to each other than are other indigenous populations of the Americas (Scott and Turner 2008; Szathmary and Ossenberg 1978).

If we are granted this degree of latitude, then it is equally conceivable that ancestral Dene-Yeniseian groups strongly influenced by ASTt material culture might have become involved in another phenomenon Anthony (1990, 2007) and others have documented as characteristic of migration. This is the notion of return migration: migration is seldom a human population movement in one direction only, but rather it is generally accompanied by some individuals and populations returning to the homeland or source area. In such a fashion, it is possible that once near or across an ASTt/Northern Archaic frontier some Na-Dene populations took part in a dynamic of Bering Strait interaction that also saw movements from North America into Siberia. This suggestion should not be taken to mean that the dominant trend in human population movement at this time was anything other than from Siberia into North America, but rather to allow for a counterflow of human populations against this prevailing direction. This style of explanation is grounded in human migration theory and accords well with archaeological evidence of longstanding material culture contrasts between interior and coastal settings. It would allow the prospect for languages related to Dene to enter Siberia in the mid-Holocene time range in a way consistent with generally accepted historical linguistic understandings for temporal change in languages. It would also explain why mtDNA hg A2a typical of New World populations (and Dene in particular) has been detected at low frequencies in some northeast Asian populations.

Other linguistic and archaeological evidence suggests that there may well have been intriguing interaction at the interface between ASTt and interior peoples. Two key technological thresholds were crossed at this time: bow and arrow technology and ceramics appear for the first time in northern North American material culture assemblages in various ASTt manifestations. In this regard, the distribution of bow and arrow and pottery terms in Dene, Eyak, and Tlingit is rather unusual (Ives and Rice 2005). The evidence from melting high altitude ice patches over large regions of the putative Athapaskan homeland (i.e. interior southern Alaska and Yukon, and northern British Columbia) shows us definitively² when bow and arrow technology was actually adopted over substantial portions of the interior (Hare et al. 2004; Dixon et al. 2005). Surprisingly, this did not occur until very late in time (ca. 1150 BP). Yet bow and arrow technology is part of much earlier ASTt assemblages, and a cognate bow terminology exists throughout Athapaskan, whose speech communities must have begun diverging long before the adoption of bows and arrows. Ives and Rice (2005) have suggested that this could reflect a pattern in which there was long-term Dene awareness of bow and arrow technology among neighboring ASTt populations, without Dene adoption of that technology. The single exception to this larger pattern, a nocked, but nevertheless long, forward-weighted, dart-like shaft from 3600 years ago in the southwestern Yukon ice patches, is highly suggestive in this regard (Hare et al. 2004). It appears to confirm that interior populations likely to be within the Proto-Eyak-Athapaskan homeland were aware of

² The best statistical predictors of arrow versus dart tips based solely on projectile point size are prone to error in the 20–25% range (e.g. Shott 1997; Thomas 1978). Definitive evidence of atlatl use involves the presence of a spear-thrower itself, or “dimpled” darts to receive the atlatl hook; definitive evidence for bow and arrow use comes with the bow itself, or nocked arrows, designed for cord propulsion.

cord propulsion (and perhaps experimented with it), but that it was not in regular use.

The situation for ceramics provides a strong parallel. The earliest Arctic ceramics occur in Alaska's Denbigh components of the Arctic Small Tool tradition, in coastal and near coastal Alaska, about 4200 years ago (Stimmell 1994). Similar ceramics continue in Choris assemblages (ca. 3000 to 2500 years ago). Norton (2500 to 1600 years BP) is the first Arctic North American culture having a well-established ceramic industry. A Neoeskimo tradition of pottery then extends into the recent past (influencing neighboring Dene like the Deg Hit'an and Koyukon). None of these ancient ceramic traditions necessarily occur within regions thought to contain the Dene homeland, but they do occur adjacent to Athapaskan homeland regions. Otherwise, ceramics are simply absent over vast regions of interior northwestern North America throughout the last 4000 years, in a time range when Dene ancestors must have been widespread in the western Subarctic. Despite this absence, a clay pottery term is found throughout northern Athapaskan and Apachean (though not Pacific Athapaskan), as Sapir (1923) pointed out. Once again, it would appear that Athapaskan ancestors were aware of the technology, but they did not adopt it for their own use until Apachean ancestors took up ceramics on their southward journey (Ives 2007).

The observed pattern could mean that Dene ancestors were among those creating ASTt material culture as it entered northwestern North America. This possibility seems unlikely, but certainly cannot be dismissed in our present state of knowledge. More likely would be the notion that “frontier” interaction between ASTt and interior Northern Archaic populations could have been of fundamental importance in the genesis of the Dene-Yeniseian pattern of speech communities. Among the alternatives would be the possibility that some Dene-Yeniseian populations took part in return migration phenomena for ASTt more generally, as noted above. I would be remiss if I did not also suggest that the horizontal transmission of language might be possible among populations at this intriguing interface, such that some groups with ASTt material culture or genetic signatures nevertheless adopted Dene-Yeniseian language, and took part in return migrations across the Bering Strait.

2.0. APACHEAN MIGRATION AS AN ANALOG

However that might be, the Dene and Yeniseian branches of the family are separated by such immense distances that one or both of these groups are likely to have moved considerably, so that migration or population movements also need to be part of any prospective explanation. Although it is a decidedly more recent phenomenon, there is much to be learned from the last episode of expansion in the Dene-Yeniseian family, the Apachean departure from the Canadian Subarctic. Linguistic and genetic data are conclusive in pointing to a proto-Athapaskan homeland in northwestern North America (in the region of eastern Alaska, the southern Yukon, and northern British Columbia) (Krauss and Golla 1981; Golla 2007; Kari, this volume). As with Dene historical settings considered more broadly in western North America, two significant and opposing cultural trends appear to be at work with respect to Navajo and Apache. Even where Apachean speakers are in a distinct minority, Dene languages persist, with genuine resistance to the borrowing of terms. Despite this language conservatism, however, Apachean speakers (like Pacific Coast Athapaskans) have clearly been willing to adopt extensive suites of material and ceremonial culture from neighboring societies.

The close relationship of Apachean with Canadian Dene languages such as Tsuut'ina (Sarsi), Dunne-za (Beaver), and Dene Sųliné (Chipewyan) is well known to linguists and anthropologists, and has recently been reinforced by Golla (2008). The Apachean departure from the Subarctic is, in my view, recent and rapid. By 1200–1500 years ago, I suspect that Apachean ancestors lived adjacent to or among other Dene speakers in a zone that spread from the Peace River country of northeastern British Columbia and east across the southern Subarctic (Ives 1990, 2003; Ives et al. 2002). Ancestral Apachean populations may also have been in the western Canadian Parkland ecotone and the northern edge of the Plains region. In either case, the archaeological record for this presence is refractory and exists as subtle variability created when Apachean ancestors used material culture virtually indistinguishable from the Old Women's Phase otherwise connected

with Blackfoot prehistory (Ives et al. 2002; Ives 2003; Peck and Ives 2001).

The Apachean departure from the Subarctic involved both "pushes" and "pulls" (Anthony 1990; Ives 2003). The massive eruption that emplaced the east lobe of the White River Ash at AD 800 was a catastrophic event that saw volcanic ash dispersed over more than 500,000 square kilometers. It quite likely had a ripple effect on Dene populations in northwestern North America—one capable of detaching Apachean ancestors in southern Subarctic and Parkland settings into a fully Plains pedestrian bison hunting lifestyle (Workman 1979; Ives 1990, 2003).

If this was indeed the "push," the "pull" was the attractive nature of the Plains bison hunting lifestyle in its own right. The ethnohistoric record for the Plains region shows that every major language family adjacent to the Plains (that is, Athapaskan, Algonquian, Uto-Aztecan, Tanoan, Siouan, and Caddoan) sent multiple representatives onto the Plains in terminal prehistoric or protohistoric times, with every indication that such events have occurred repeatedly in the deeper prehistoric past. The Plains bison hunting lifestyle was inherently attractive: it was associated with a rich ceremonial life and the capacity to produce significant economic surpluses on a regular basis. Such surpluses would fuel the trade with Plains periphery societies that would ultimately propel Apachean speakers into the Southwestern and Southern Plains settings in which the Spanish first encountered them in the 16th century (trading just such products).

The historical trajectory of Apachean societies involved not only massive adoption of neighboring material and ceremonial culture as they proceeded southward, but notable population increases (as outlined in Ives et al., this volume). There is compelling linguistic and genetic evidence that founding Apachean populations were small but that by historic times, the various Apachean populations had engaged in significant interaction or alliances with other southern societies and had grown dramatically. While some of this growth may be explained directly in terms of the reproductive success of the founding population, this cannot easily account for the degree of population expansion that took place. In these circumstances, Navajo and Apache remained the dominant languages, but the biological and cultural origins of the societies that emerged were complex, leading to unique material cultures with multiple sources of heritage.

Dyen and Aberle's (1974) reconstruction of proto-Apachean kinship *did* retain zero generation crossness,³ with the distinct possibility that cross cousin marriage may have existed in the founding population (an attribute that would be consistent with fission leading to a small groups—see Ives 1990). Daughter Apachean systems nonetheless shifted away from such precepts. Navajo and Western Apache society featured strong clan and co-residential exogamy, in conjunction with weak intergenerational skewing of the kin terminology. Other Apacheans eliminated zero generation crossness: in the Plains Apache case, for example, there is a Mackenzie Basin terminological structure, though the crossness is of Type B form. It would appear, then, that at its inception, the kin system in the founding Apachean population featured full cross/parallel distinctions that may have allowed endogamy. Through time, however, the daughter Apachean systems all shifted in directions that required local group exogamy. This would, of course, have opened Apachean communities outward, very much in accord with the genetic, oral tradition and material culture indications that there were important influxes of neighboring peoples entering early Apachean society.

Thus, for Apachean expansion from the Subarctic, we would suggest that:

1. There was a small founding population, with potentially endogamous marriage precepts;
2. This small founding population experienced successful growth, presumably internally, but more importantly, through extensive incorporation of neighboring peoples, particularly women;
3. Apachean ancestors adopted many aspects of neighboring material and ceremonial culture, once they were exposed to radically different physical and cultural environments;
4. Despite these far-reaching changes, Apachean languages were maintained in a conservative fashion, leaving no doubt about their close historical relationship with Canadian Dene languages.

³ Even with emendations arising from Krauss (n.d.).

If we transpose these deep-seated Dene characteristics to settings in which Yeniseian might be expected to emerge, some interesting contrasts and parallels arise. While there are differences, the Subarctic environment in which Yeniseian ancestors eventually found themselves has many related or identical species to the North American Subarctic, along with conditions requiring familiar technology and material culture. Unlike founding Apachean populations (or for that matter, Pacific Coast Dene), Yeniseian ancestors dealt with environments quite similar to those of the proto-Athapaskan homeland—it is not surprising that key elements of vocabulary were retained.

Yeniseians were eventually surrounded, however, by a variety of powerful pastoral neighbors in ways that clearly could have had important impacts on proto-Yeniseian society. If Ives et al. (this volume) are correct in their preferred option for the processes leading to Yeniseian terminologies such as for the Ket, then we may say that along with historical influences from pastoral neighbors (the periphrastic descriptive usages and possible Uralic borrowings), strong forces concerning exogamy acted to shift the core proto-Yeniseian terminology away from cross/parallel distinctions. One is led to ask, then, what would happen if a prototypical Yeniseian population with these characteristics were to be separated from other Dene, Eyak, and Tlingit speech communities for a lengthy period of time? We propose that the inherently conservative nature of the languages in question would result in the retention of core vocabulary and syntactic features such that a linguistic connection could still be clearly recognized, even at considerable time depths. For circumstances in which we suspect strong forces of exogamy were at work over long periods of time, the human genetic consequences might well be quite different. Should members of linguistically and genetically unrelated communities regularly be incorporated within a conservative speech community, the linguistic identity would tend to survive, but the genetic signature would be steadily altered.

With respect to rates of change, then, the Apachean example we have reviewed would suggest that sweeping material culture change can occur within a very few centuries, and perhaps just decades (as with Tsut'ina). mtDNA haplogroup A frequencies in Apachean populations have apparently diminished substantially in the several centuries since their Subarctic departure. Malhi et al.'s (2003) figures for the Navajo, for example, show mtDNA haplogroup A frequencies have plunged to 51.6%, in marked contrast to high northern Dene values. Correspondingly, mtDNA haplogroup B frequencies, unknown in northern Dene populations but common in Puebloan populations that neighbor the Navajo, register at 40.6%. Although such comparisons are difficult to quantify, Apachean is widely regarded to have diverged less from Canadian Dene languages than from Pacific Coast Dene or other Alaskan and Yukon Dene speech communities. Ives (1990) has pointed out the pitfalls of making statistical comparisons of kin rosters without a clear understanding of the internal logics of the individual kin terminologies involved. Overlooking that shortcoming, Dyen and Aberle's (1974:12) matrix provides a rough indication that Navajo and Canadian Dene kin rosters share 70–76% of their terms. It is fair to say in the Apachean case that change away from a northern Dene genetic signature significantly outpaced linguistic differentiation of the kin terminology. Intriguingly, in that trilogy of language, culture and genes, the Apachean evidence would suggest that Dene language may very well be the most resistant to change.

Thus, at least some Dene population movements can be characterized as rapid, as prone to creation of substantial distributional gaps between homeland and migrant daughter populations, and as accompanied by significant rates of exogamy with virtually instantaneous material culture change. The upshot of these processes, coupled with differential rates of genetic and linguistic change left to proceed over 4000–5000 years (for ancestral Yeniseians surrounded by decidedly different cultures and languages) might very well leave detectable linguistic traces, but radically different genetic signatures in populations that were once both genetically and linguistically closely related, as we see in Dene-Yeniseian.

Just as Moore (1994) predicted, we have entered an era in which "grand syntheses" of biological anthropological, linguistic and archaeological data have returned to prominence. For Dene-Yeniseian, we are still a considerable distance from meeting Trigger's (2008) guideline, in which a convergence in disparate lines of evidence would strengthen our perception that we are achieving an accurate idea of the past. Under circumstances lacking such resolution, apparent discrepancies between different forms of evidence may spur

us to pronounce too quickly that one proposition or another is simply not possible. Despite such temptations, these can also be the very circumstances in which scholars interested in interdisciplinary discourse can take the opportunity to probe more deeply into the nature of the disparities among various lines of evidence, challenging received wisdoms in productive ways. At least in North America, much more could be done by way of interdisciplinary collaboration among scholars, and particularly between linguists and archaeologists. Archaeologists are constantly engaged in the recovery of real objects from the past, and have considerable success in developing objective temporal frameworks for technological thresholds concerning those objects. Yet, the techniques of historical linguistics can provide high quality hypotheses about what these objects may have been named, and invaluable semantic dimensions through which we can better contextualize the prehistoric past. Dene-Yeniseian could be a most profitable avenue for pursuing such undertakings. Such approaches might yet give us a more refined understanding of this extraordinary language distribution, which is sure to continue evoking both scholarly and community curiosity of the highest order.

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THE DENE ARRIVAL IN ALASKA

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1.0. INTRODUCTION

It seems clear that commentators in these pages are inclined to agree that Vajda submits fairly robust evidence in support of his hypothesized linguistic connection between the languages Ket of central Siberia and Athabaskan of North America, and by slight extension of the families Siberian Yeneseian and American Na-Dene, and agreement that the connection is probably “genetic” (or “genealogical,” in Comrie’s preferred terminology) More specifically in some cases, Comrie finds “prima facie evidence in favor,” Kibrik receives an “impression of credibility,” Fortescue sees it as “not proven, but with a strong indication,” whereas Nichols declares the hypothesis can be accepted “at least provisionally and perhaps firmly.”

Others comment toward Vajda’s contribution less directly. Leer, while not juxtaposing Yeneseian to Na-Dene, further enlightens understanding of Na-Dene itself as a grouping of Tlingit, Eyak, and Athabaskan. Chapters on genetic comparison (Scott and O’Rourke) and distribution of related folkloric materials (Berezkin) combine in underlining the likelihood of a south-central Siberian origin for American natives in general, including Na-Dene. Chapters on Yeneseian and Dene kinship matters (Ives et al.) and a look at certain myths associated with both groups (Kim-Maloney), although not directly supportive of a Yeneseian-Dene relationship, are certainly permissive of it. Thus, the overall prognosis for the Vajda hypothesis is entirely positive, but the questions of contact and mutual parentage remain: When? and How?

Looking more specifically at archaeological indications, Potter’s careful examination of indications of continuity and discontinuity from west-central Siberia to eastern Beringia allows him to present six relevant hypotheses, varying by dates and also by direction of possible movements. In accord with his own stated preference, his and others’ discussions concentrate especially on a period somewhat more than 10,000 years ago. And with this there is at least the implied possibility of a linguistic horizon that once extended from somewhere around the Angara River in Siberia (the presumed homeland of Yeneseian speakers before a couple of thousand years ago) to Alaska. Kari, in overall support, provides arguments for an extreme conservatism within lingual Athabaskan (and by extension Eyak and Tlingit) that serves to retain features for a much longer time than is expectable by most linguists.

All in all, there is no question that Vajda’s substantive linguistic paper, together with the supplementary chapters in this collection, constitutes a most significant breakthrough in terms of certain New World-Old World relationships. Nevertheless, room is left in the discussion for differences of opinion with regard both to timing and direction of any population movement the data may represent, a freedom of which some commentators have taken advantage — including the present one.

Both Vajda and Kari (this collection) cite an off-the-cuff (i.e., top-of-the-head) statement of my own, uttered at the session of the Alaska Anthropological Association in 2008, that according to immediately available evidence any population movement into Alaska from Siberia that can be perceived through archaeological data must indeed have occurred 10,000 or more radiocarbon-years in the past. What I might

have said more fully, however, is something like the following:

There appear to be three separate times in which prehistoric movements into Alaska from the adjacent Asian mainland can be proposed on archaeological grounds without calling for serious mental gymnastics. The third and last of these occurs sometime in the later part of the first millennium AD, and without any serious doubt represents an expansion of ancestral Eskimoan speakers out of the Bering Strait region that shortly led to the Thule movement across northern North America to Greenland; this can be ruled out of the present discussion regarding Dene-Yeneseian.

Of the two major periods still up for grabs, as Potter (this volume) notes, the later is that of the Arctic Small Tool tradition (or horizon), of which the earliest manifestations now known are presumably those from very little after 5000 radiocarbon years ago reported on the Seward Peninsula (e.g., Harritt 1994:214-229). The overall distribution of remains commonly assigned to this tradition accords fairly generally with that of historic Eskimos (e.g., Dumond 1965), and it is in part on this basis that its people are so often seen as direct cultural and linguistic Eskimoan ancestors (e.g., Dumond 1977; see also Fortescue 1998); indeed, in Canada in particular the bearers of the tradition are commonly referred to as "Paleo-Eskimo." Finally, the third and earliest of the available periods is that already referred to as Potter's preference (this volume), in which before and after 10,000 radiocarbon years ago a Siberia-spawned microblade industry becomes evident in eastern Beringia; it is particularly well represented in the early archaeological sequence being demonstrated in the drainage basin of the Tanana River—by Potter, among others. The notion of this as the time of arrival of Na-Dene in America matched my own long-term preconceptions (e.g., Dumond 1969). But now, and somewhat against my inclination, I am led to question these same preconceptions.

2.0. A MATTER OF TEMPORAL PRIORITY

Vajda's hypothesis under discussion, of course, is linguistically based, and that it should be considered in a language framework is certainly to be expected. In this connection, if one takes the Eskimo-Aleut and the Na-Dene language families as the two groups best represented in the farthest north of North America and who with reasonable likelihood represent the two most recent immigrant families to the New World, one might say that the first question is how these two should be allocated between the two archaeological indications of earlier entry. One must note, then, that Vajda himself ("Yeneseian, Na-Dene, and Historical Linguistics," this volume) remarks that his data "would seem to suggest a separation younger than 10,000 years," while Fortescue (this volume) opines that "Eskimo-Aleut . . . has a somewhat less transparent relationship with its probable nearest neighbors, Yukagir and the Uralic languages, than Na-Dene has with Yeneseian," and he wonders if the Yeneseian presence in Siberia could represent a later intrusion from America; still, he favors Eskimo-Aleut as having been later than Na-Dene in arriving in America. Nevertheless, if one looks with attention at details in his work (Fortescue 1998), one must note that his assignment of the Eskimo-Aleut family to a broad Uralo-Siberian mesh (or super-stock) involves an enumeration of Eskimo-Aleut typological features that appear to be decidedly (and perhaps thinly) scattered among the Siberian candidates for inclusion in the Uralo-Siberian entity. As this present non-linguist interprets the matter, that is, these comparison features are relatively attenuated between Eskimo-Aleut and any single subgroup of Siberian languages, even of the the nearby Chukotko-Kamchatkan unit. Thus, the situation appears to me to contrast with the more specific features elucidated by Vajda (this volume) and evidently agreed by linguist-comentators to constitute significant evidence of specific relatedness of Athabaskan, representing Na-Dene, and Ket, representing Yeneseian.

Given these comparisons, it seems highly suggestive to me that of the two sets of immigrants to the New World, the Eskimo-Aleut should by rights have been earlier, Na-Dene later. And, given the two archaeological periods of apparent entry, this would place Eskimo-Aleuts shortly after the close of the Pleistocene, and Na-Dene at the time of the ASTt appearance several millennia later. Whatever one's preconceptions, it seems only reasonable to look at this alternate possibility—or, rather, these possibilities, for Eskimo-Aleut must be seen to be just as suitable as an entrant around 10,000 years ago, as Na-Dene is as an entrant some 5000

years later. I approach this double question by providing some personal background that relates to each part of it.

3.0. ESKIMO-ALEUT AS EARLIER

For quite a number of years I conducted classes at the University of Oregon in a room in which the North American linguistic map of the Voegelins (1966) occupied a part of one wall. Looking at it day after day, it came to say to me that nearly all of those languages on the Northwest Coast—Tlingit, Haida, Wakashan, and Salish—were so clumped together in the northwest and apparently so turned in on themselves linguistically that each of them must represent a people who arrived in the New World after the close of the last glacial epoch at somewhat before 10,000 radiocarbon years ago. The sole possible exception might be the Tsimshian, with putative (and earlier?) connections to more southerly Penutians. Further, I saw no reason to think any of these groups might represent the earliest Americans, descendants of whom were located farther to the south and east.

In general, I was also inclined to include ancestral Eskimo-Aleut in this early post-Pleistocene clot of peoples, as I did in a first attempt to align my own view of Eskimo-Aleut archaeology with what I understood to be the distribution of the pertinent languages (Dumond 1965; see present Figure 1a). At that time I conceptualized the Anangula-blade culture of the eastern Aleutians (at least 8000 radiocarbon years old) as the first American Eskimo-Aleut, or Aleut-Eskimo, and as the direct archaeological parent of the Alaskan Arctic Small Tool tradition (ASTt), providing for an entirely hypothetical birth of the latter on the Alaska Peninsula around 6000 years ago, then leading to the clearly demonstrable presence of ASTt representatives on the Alaska Peninsula around 4000 years ago—this being also about the time they were known much more widely in north Alaska, Canada, and even Greenland. Nevertheless, I was then forced to conclude that if one simply traced the language tree upward in time from this Anangula beginning, there was no need for an Eskimo-speaking Arctic Small Tool group to be there in order to get recent speech to the languages Eskimoan and Aleut. That is, with a connection at any early date of ancestral Aleuts with ancestral Eskimos (a connection not then recognized archaeologically), the expansion of people of Thule culture in the second millennium AD took entire care of all of the necessary spread of Eskimoan (see Figure 1a).

In the very year that attempt appeared in print (Dumond 1965), archaeological finds on the Alaska Peninsula by the University of Oregon made it clear that the local culture of 6000 years ago was not at all a reasonable candidate for an ASTt hatching from an Anangulan egg, but rather was part of a drastically different-looking but presumably Anangula-derivative development that appeared a close relative of what was in the very same years being announced for Kodiak Island as the early Ocean Bay tradition (Clark 1966). Implication? Kodiak and the Aleutians possibly connected linguistically at 6000 BP, with ASTt people arriving as strangers from the north two millennia later. Not long after this (Dumond 1968), I diagrammed the archaeologically derived language connections as I saw them, with the connection between Aleut and Eskimo not shown (Figure 1b).

I did not for a while abandon the notion of an ancestral Aleut arrival in the New World more than 8,000 years ago, but I was prepared to admit that the actual division between ancestors of Aleuts and Eskimos might have occurred in Asia rather than America (e.g., Dumond 1977:158), with Aleuts arriving earlier, Eskimos later, their linguistic division some millennia in the past. This conclusion was in turn trounced by conversations with linguists, who assured me in no uncertain terms that the basic Aleut-Eskimo divide could not possibly be 8000 or even 6000 years old (I recall Michael Krauss using Russian and English phrases for "my nose" to illustrate the magnitude of difference between Aleut and Eskimo). I had also by now internalized the recognition of what seemed an intractable gap in the eastern Aleutian Island archaeological sequence between the Anangula period ending around 8000 years ago, and the recognizable prehistoric Aleut sequence beginning some 4000 years later, which meant that Anangula might have had nothing to do with later occupants of the Aleutian Islands. With all this, and still pondering the possibility of an archaeological connection between the acceptable and unbroken later Aleut sequence (after ~4000 BP) and the presumed

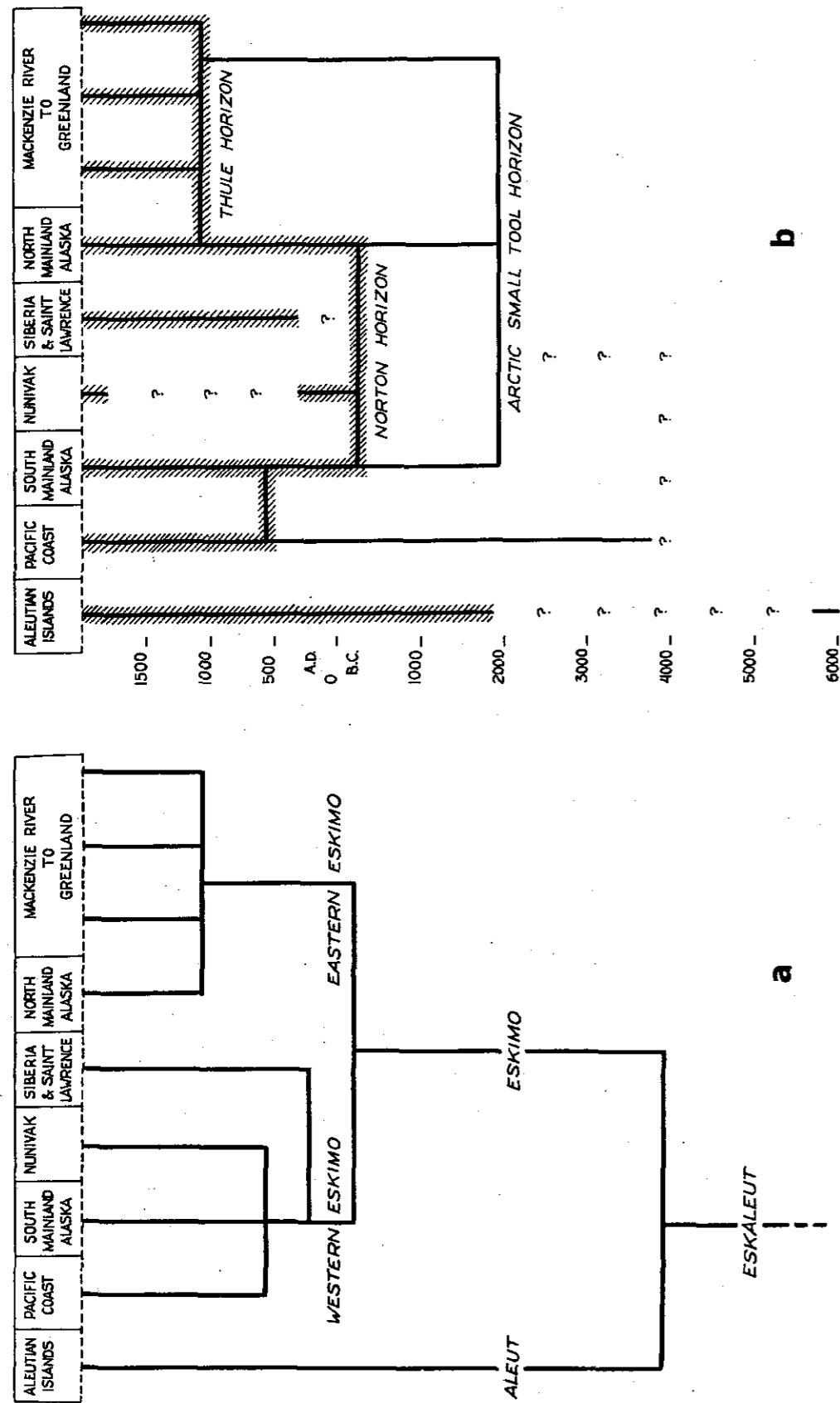


FIGURE 1. a. Family tree of Eskimo-Aleut languages as viewed in 1965; after Dumond (1968:Figure 2), based on Dumond (1965:Fig. 1), with references cited. b. Archaeological relationships in the Eskimo-Aleut area as viewed in 1965, with shaded areas representing connections then most nearly in accord with linguistic evidence; after Dumond (1968:Fig. 3), based on Dumond (1965:Fig. 2), with references cited.

ancestral Eskimo sequence, I would concoct the idea of an ancestral Eskimo-Aleut arrival from the north in a slightly pre-ASTt migration from Siberia for which I fear there is not now, and never has been, significant archaeological evidence (Dumond 1987:51).

But the intractable gap in the Aleutian Island archaeological sequence began to be filled in the later 1990s (e.g. Knecht and Davis 2001), with the coup de grâce administered almost yesterday (Rogers et al. 2009). As that gap was filled, it became evident that in a long cold snap of around 4000 to 3500 years ago an approach of maximal winter sea ice to the Aleutian Islands brought a rich ice-edge fauna into the range of the ocean-wise local people (Crockford et al. 2004; Davis 2001). As a result, the subsequent shrinking of the southern reach of the annual ice and its withdrawal by 3,000 years ago presented a subsistence incentive for some coastal-adept ancestral Aleut-Eskimo to shift northward. This is at about the time now thought to be that of the Aleut and Eskimo linguistic divide (e.g. Fortescue 1998:188), and it is precisely the time in which an increased focus on coastal resources appears in archaeological sites around and north of Bering Strait—this as “Old Whaling” and Choris cultures, with the ancestral-Eskimoan Norton culture emerging shortly thereafter (e.g. Dumond 2000). Of these, Choris and Norton sites contain pottery, clearly derived from contemporary Asians, with Norton also manifesting a number of chipped-stone artifact types strongly reminiscent of those of the ASTt; one concludes that this northern push would have involved linguistic aggression toward, not to mention amalgamation with, people already present around Bering Strait, whose language(s) may then have contributed some elements to ancestral Eskimoan. Nevertheless, the arrival of the ASTt people by crossing the Bering Strait to the Seward Peninsula not long after 5000 years ago still seems plausible—whatever their linguistic affiliation may have been.

Backtracking a bit, the confessional diagram of Figure 1b dates from the time I was also attempting to say something about the archaeological and linguistic situation of the Alaska interior, diagramming my understanding of the Na-Dene language tree (including Haida, rightly or wrongly), derived largely from statements based on glottochronology (Dumond 1968). This diagram (Figure 2), with the earliest branching in the south, carries the clear indication that the family as a whole had first expanded from south to north in northwest America before they engaged in any wilder campaigns to the more southerly Pacific coast or the U.S. Southwest. My stage was thus set to see all ancestral northerners—i.e. Eskimo-Aleut and Na-Dene—as having arrived in the New World at the end of the Pleistocene glaciations. These are basic to the preconceptions I mentioned at the outset of this comment.

This takes care of placing the Eskimo-Aleut in the New World 8000 years or more ago. But we must turn to the still more immediate problem facing us here.

4.0. ARCTIC SMALL TOOL PEOPLE AS ANCESTRAL NA-DENE

First of all, we discard references to ASTt and its derivatives of the eastern American Arctic as “Paleo-Eskimo,” except when the purposeful use of quotation marks signifies the term to be of doubtful appropriateness. This at least helps level the semantic playing field.

More than thirty years ago, the Canadian archaeologist Robert McGhee (1976) argued that there was no reason to conclude that ASTt people (or “Paleo-Eskimo”) were speakers of a specifically Eskimoan language. He has continued this suggestion in later writings (e.g. McGhee 1996), in which he opines (based on the scanty evidence from the very modest numbers of apparent Dorset physical remains that have been recovered) that the ASTt people were some variety of Arctic Mongoloids, and suggests the possibility of their being a Chukchi-related group. That this non-Eskimoan ASTt identification would not implicate the Na-Dene, however, is indicated in the same source (McGhee 1996:78, and passim), where he refers specifically to non-ASTt Indian groups of the northern interior as Dene.

The notion of the Arctic Small Tool tradition had been originally introduced in the late 1950s by the archaeologist William Irving (1957, 1962), who was attempting to bring together the Denbigh Flint complex of Alaska and the Pre-Dorset of Canada and Greenland with what he perceived to be ancestral Siberian assemblages. In his more fully developed discussions (Irving 1964, 1969-70), he granted that although he

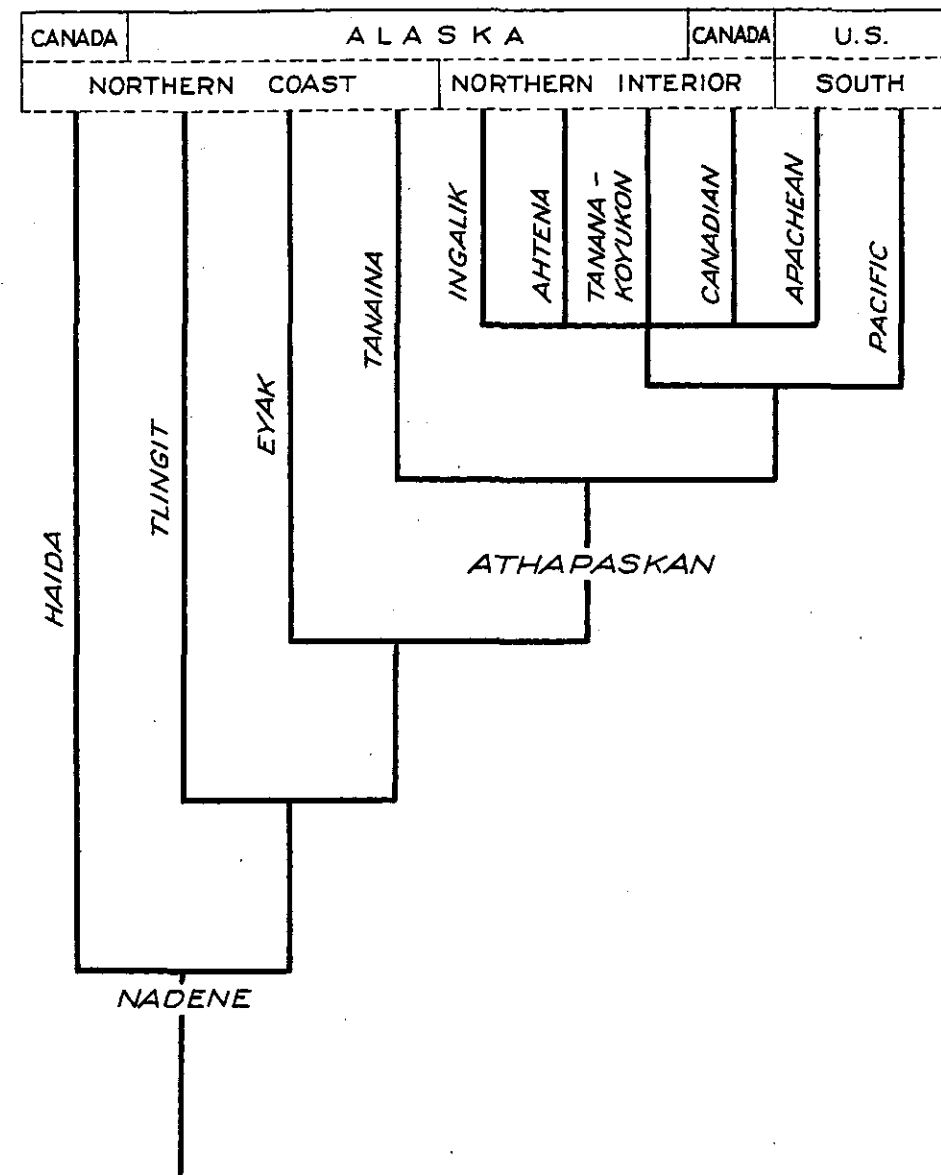


FIGURE 2. Simplified family tree of Na-Dene languages as conceived in the late 1960s; after Dumond (1968:Fig. 3), based on Hoijer 1956, 1962, 1963; Krauss 1964, 1965; Pinnow 1964)

had identified no single Siberian cultural manifestation (i.e., no single assemblage) that provided a complete match to the American ASTt, all individual traits of those American finds had predecessors in Siberia. He therefore concluded that the actual coalescence of these characteristics had occurred after, or at the time of, the arrival of the Siberian bearers in the New World.

Certain later commentators went considerably farther, although through discussions located on a somewhat more abstract plane than that from which Irving had spoken. Powers and Jordan (1990), for instance, saw the origin of the ASTt in the middle Neolithic Bel'kachi culture centered in the middle Lena River basin, but with aspects spread among caribou hunters at least as far west as the Taimyr Peninsula (see, for instance, Khlobystin 2005:55 for summary of Taimyr-area Bel'kachi relationships), and eastward to the Bering Sea. By 4500 BP, in the Powers-Jordan view, it was an aceramic Bel'kachi offshoot that then expanded across Bering Strait and over northernmost North America to arctic Greenland as bearers of the Arctic

Small Tool tradition. These early ASTt immigrants into the American High Arctic, despite their near-coastal distribution, were heavily subsistence-oriented toward land mammals, especially musk oxen and caribou, advancing over a route that Knuth (1967) referred to as "the musk-ox way," although possessed of a flexibility that did permit a reliance on sea mammals and fish when necessary (see, for instance, McGhee 1996). That is, the east-west expansion that Powers and Jordan accord to the ASTt (in which they include the Bel'kachi Neolithic of Siberia) would evidently serve to link realms of both the Yeneseian and Na-Dene language families. And so the broad Siberian background is at least pointed to, if not treated entirely definitively.

And what of the situation in America? With regard to Alaska, I long ago pointed out (Dumond 1977:93) that the end of the ASTt as known there appears to coincide with at least a brief hiatus in local sequences, saying that it was as though the entire subsistence base had been suddenly removed, with the hiatus followed in each local area by reoccupations of significantly differing groups (including Norton). Although the position was slightly modified later (Dumond 2000:91), it still seemed (and seems) probably true. With regard to Canada and Greenland, one is confronted with a major puzzle that looms in the prehistory of the eastern American Arctic: although occupations of Pre-Dorset and Dorset "Paleo-Eskimo" are now fairly well documented archaeologically, and although occupation of the succeeding Thule culture is unmistakable in essentially the same regions, there is no substantial information regarding relationships between them. Indeed, although some archaeologists have adduced some Dorset practices as models taken up by later Thule people (as, sealing through the ice, the use of the snow-block house, etc.), others have denied any direct contact at all, arguing that the Paleo-Eskimo may well have been extinct at the time of arrival of Thule folk (e.g., Park 1993, 2000; McGhee 1996; see Fortescue 1998:26 for a comment on Greenland), or if not, social as well as economic factors inhibited almost all contact (e.g., Friesen 2000).

As noted above, it is the comparability of the overall geographic spread in the same inhospitable region of the two peoples, AST and Thule Eskimo, that has chiefly supported the idea of their relationship. Could the AST folk have been distinctly different ethnically? Insofar as archaeology is concerned, the answer must be yes. Insofar as biological anthropology is concerned, the sample of eastern Paleo-Eskimo remains is next to nonexistent, with doubts as to the correct attributions of most of the few remains assigned to that category, and hence doubt as to whether any sample is available and adequate for determination. One must await further developments here.

That the ASTt distribution across northern America overlaps with that of later Athabaskan members of the Na-Dene is clear enough. But whether ASTt sites are recorded far enough south to touch territory of later Tlingit or Eyak—a condition expectable if, in fact, the Na-Dene were earlier in the south as the presumed age of the Tlingit-Eyak division seems to indicate—is not so clear. At the same time, it would appear essentially impossible to simply rule it out in terms of present information, as will be indicated.

In what is now certain, there is evidence of ASTt presence immediately north of and on the Alaska Peninsula by 4,000 radiocarbon years ago (Dumond 2005, 2009) and also on upper Kachemak Bay a century or two earlier (Workman and Zollars 2002). And there is another probable if not-quite-so-certain example in the upper Susitna River drainage; it was with this discovery that Irving (1957) made his original remark about an Arctic Small Tool tradition that culminated in his later definitions (Irving 1962, 1964, 1969–70).

On the Northwest Coast itself, 5000 BP is the radiocarbon age commonly assigned to the time in which Northwest Coast culture in its developed ethnographic aspect begins to be visible (e.g. Carlson 1996). Nevertheless, a recent careful assessment by Moss et al. (2007) concludes that the period of visible sedentism growth, increase in site numbers, and major technological change was a number of centuries—possibly even a millennium—later than that date, although determination is difficult because of a paucity of archaeological evidence there from the mid-Holocene. That is, it would appear that insofar as the coast is concerned, really specific evidence for the crucial period is not yet in, with uncertainty existing with regard to the period in which one might expect a beginning ASTt presence.

On another hand, given the apparent terrestrial focus of most ASTt subsistence emphasis, one might expect evidence of the AST horizon to appear not on the coast but in the interior, in this case possibly in the south or southwest area of Yukon Territory. Here, the information available is similarly scanty. As

to the southern Yukon and for the more or less generally accepted sequence before the late prehistoric period, I here follow Hare (1995:105-124), who bases himself on work by Clark (1983), MacNeish (1964), and Workman (1978), among others. This succession begins with a non-microblade Northern Cordilleran tradition or horizon that includes lanceolate weapon points, and dates before about 7000 BP. This is followed by a Little Arm phase of heavy microblade production, seen by some specialists as a reflection of the Paleo-Arctic or Denali of Alaska, called by others of more local inclination the Northwest Microblade tradition, which lasted until 4500 or 5000 BP. This is then followed by a long-lasting Teye Lake phase, an aspect of the Northern Archaic tradition, that persisted into the first millennium AD. Somewhere here at some uncertain time between about 7000 and 3000 BP, is a possibly short and intrusive Annie Lake complex characterized by small concave-based projectile points. None of these can be taken to point particularly toward the Arctic Small Tool tradition as it has been described. At the same time, the relevant excavated sites are relatively few and are scattered over a substantial territory. That is, there is room here for many new discoveries.

Although the finds from the far upper Susitna River described by Irving (1957), mentioned above, do not lead quite into southern Yukon Territory, only some forty kilometers to the east is the Copper River, embedded within historic Ahtna territory, its mouth in Eyak grounds. For ASTt people rendered fishing-adept in their move to the south, this would have been a most attractive road to the coast. Unfortunately, archaeological explorations of the area have been few. Surveys of the middle and lower course of the river in oil-pipeline days reported only sites of the historic and proto-historic periods (e.g., Workman 1977), and that the situation remains unchanged is suggested by an absence of sites of reasonable antiquity now registered in Alaska Heritage files (R. Joan Dale, personal communications, 2009). Here, too, then, the simple absence of information blocks further discussion.

In short, the probable presence of archaeological manifestations that link the general Yenesei River region with the North American Arctic through the Arctic Small Tool tradition of around 5,000 radiocarbon years ago is more than hinted at in the archaeological literature. A related linkage within North America to what may be construed as the Na-Dene heartland is not similarly indicated, although the data available are evidently insufficient to rule the possibility out. Discovery may await.

5.0. CONCLUDING REMARKS

I do not intend that anything said here should be taken as an argument that the ASTt does, in fact, represent speakers of ancestral Dene-Yeneseian. What I have hoped to do is simply point out that such a linkage on that time level is by no means impossible in terms of present information. Briefly, the strengths and weaknesses of such a linkage, as compared with that preferred by Potter, seem to me to be the following.

For ASTt as representing that particular Yeneseian-Na-Dene Siberian-American link the strength appears to lie in its later date, which appears to mean that special arguments regarding the uniqueness of the speakers' resistance to language change are less necessary. As noted above, the later time also appears to fit better with an apparently "less transparent" connection of Aleut-Eskimo with Siberian linguistic relatives. Evidence regarding Asian and eastern Arctic identifications appear generally permissive. One weakness lies in the absence of any immediate indication that within America the ASTt sphere was extended far enough to the south to incorporate presumed territory of ancestral Na-Dene, where data are lacking. In a practical sense weaknesses may also lie in the preconceptions of so many of us that the ASTt is, or certainly should be, representative of ancestral Eskimoans.

For the linkage preferred by Potter, strength lies in the general acceptance at present of the connection of the immediately post-Pleistocene Siberian microblade horizon with the earliest widespread archaeological manifestation in Alaska. The weakness lies in the need to demonstrate extreme and ancient continuity of this connection across Siberia, possibly an unbroken continuity in the early occupation sequence in interior Alaska, and in the evident requirement that special arguments need to be phrased to defend the unexpected slowness of linguistic change within Na-Dene and Ket.

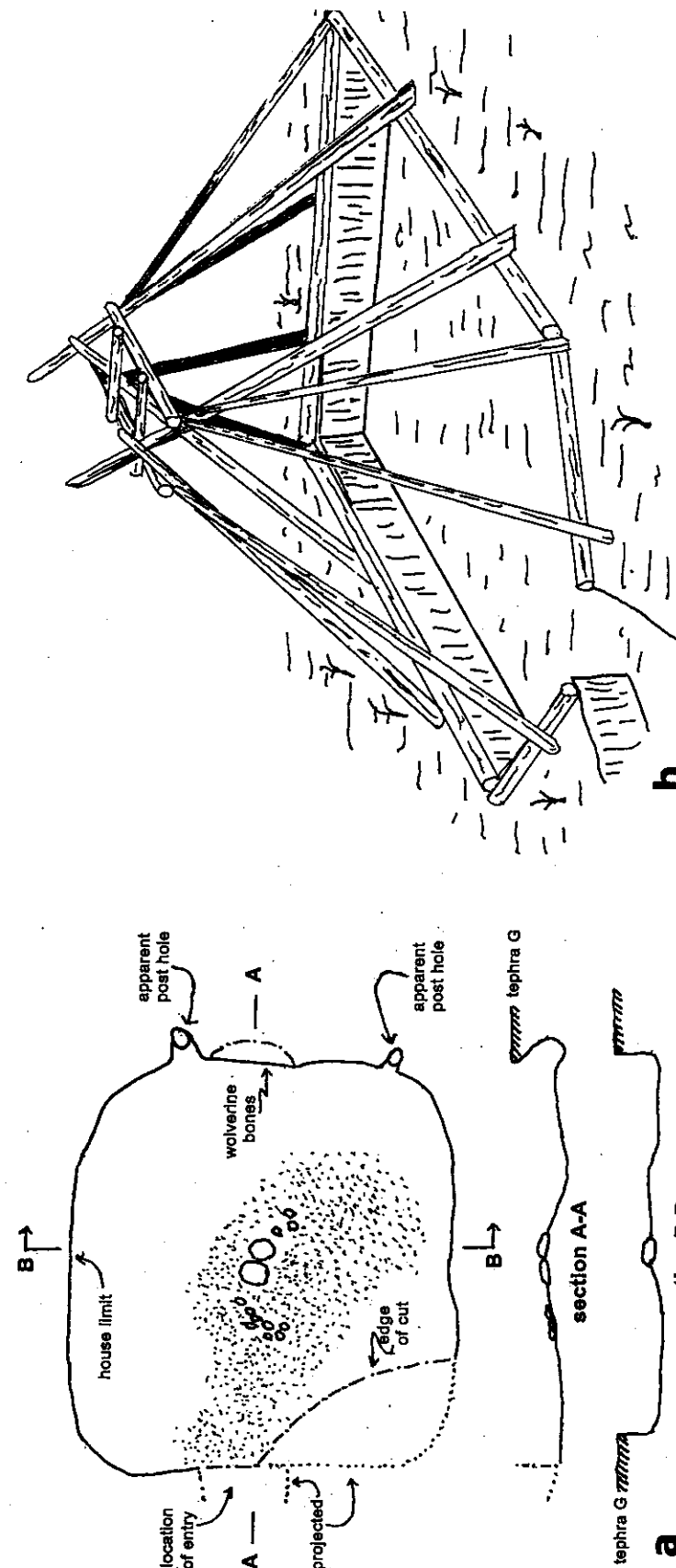


FIGURE 3. a, House floor of Brooks River Gravels cultural phase (ASTt), locality BR15-3. Shown are fire-stained floor, location of entry and of external post holes; width across floor, 3.3 m (entry was left unexcavated to spare two grown spruce trees); simplified from Dumond (1981:Fig. 6.10). b, Framework of north Siberian house of the ethnographic period (some cross-members are eliminated to allow view of internal detail); redrawn from Levin and Potapov (1961:Plate XII, fig. 8, Plate XXVI, fig. 2).

6.0. POSTSCRIPT

As one final note, intended now as a simple bit of irony that I find amusing, I turn to a limited observation regarding not language or portable artifacts like points or microblades, but rather to certain characteristics of houses. The first to be mentioned is from the northern Alaska Peninsula.

Around the short Brooks River, a tributary of the Naknek River drainage system, University of Oregon parties have excavated all or parts of 13 separate ASTt houses. These are consistently square or squarish in plan and about 3.5 to 4 m on a side, excavated a short distance (20 to 50 cm) into beach sands below the contemporaneous surface—a surface the former sod of which embeds a 4 cm-thick layer of distinctive yellow volcanic ash. Each house was entered by a simple sloping channel or passage on one side, had evidence of a centrally located fire-hearth, and overlying fill contained scattered clumps of the yellow volcanic ash (formerly of the surface sod layer) making it clear that at least some turf had been placed on the roofs. To our discomfort, the floors have shown a consistent lack of evidence of central posts to support the roof, except in the one case in which a graduate student assistant insisted on digging out four areas of organic stain around the fireplace and labeling them “post molds” (see Dumond 1981:Fig. 6.8). Unfortunately, all floors of all houses were heavily mottled overall with brown organic staining in the underlying sand, and additional repeated attempts to locate among them spots that could reasonably qualify as interior post remnants met with no believable success at all. I therefore now consider the student-introduced holes to be spurious as indicators of posts.

Other than this, among the several houses excavated to near completion there was a single exception to the lack of indications of supports. This (shown here as Figure 3a) had one unmistakable post indicated and a second probable—not in the center, but at the edge opposite the entrance. So, I puzzled for years: if roofs were supported that way, how were they made strong enough to bear a sod covering and accommodate a central hearth area with its need for a smoke outlet? It finally was in reading Khlobystin (2005:175) that I was led to the appropriate place in the atlas of Levin and Potopov (1961:Pl. XII, fig. 8; Pl. XXVI, fig. 2). There I discovered a convincing answer (see Figure 3b). Further, the same framework in Siberia was covered with turf to provide a winter dwelling (Levin and Potopov 1961:Pl. 6, fig. 2).

And where is this Siberian example from? Ironically enough, from the ethnographic Ket.

As I said, I do not consider this to be part of an argument for direct linkage: Siberian geography is extensive, much time has passed, the Ket moved north after 5000 BP, and many peoples have lain between central Siberia and Brooks River. But it seems a fitting note of irony on which to end this confession of a knowing violation of my own preconceptions.

ACKNOWLEDGMENT

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Appendix A

ORTHOGRAPHIC CONVENTIONS FOR YENISEIAN AND NA-DENE

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1.0. INTRODUCTION

This appendix is intended to help the reader of these articles and scholars interested in Dene-Yeniseian to navigate the technical alphabets used in the present volume and in some key earlier publications on Na-Dene (a.k.a Athabaskan-Eyak-Tlingit) or Yeniseian languages. Section 2 presents the technical alphabets used for specific Yeniseian languages or for Vajda's or Starostin's Proto-Yeniseian forms. Section 3 presents two early writing systems used for Navajo, and three systems used in the sources that contain the majority of published reconstructed forms for AET: Krauss and Leer 1981, Leer 1987, Krauss 2005, and Leer 2005. These are then juxtaposed with the two different technical alphabets that are used in this volume for Na-Dene (Leer's and Vajda's). Throughout the appendix we indicate some of the equivalent symbols in the International Phonetic Alphabet (IPA 1999). Another source we have consulted is Pullum and Ladusaw 1986.

2.0. KET/YUGH AND YENISEIAN ORTHOGRAPHIC CONVENTIONS

TABLE 1. Ket/Yugh consonants

	bilabial	alveolar	palatalized	palato-alveolar	velar	uvular	IPA
voiced stops	b	d	ɖ		g	g	č=tʃʰ j=dʒ
voiceless stops, affricate	p	t		č	k	q	
voiced fricatives		l	ɭ	j	ɣ	ʁ	
voiceless fricatives		s					
nasals		n	nʲ				

The phonetic symbols used by Vajda in the present volume for Modern Ket and Yugh vowels follow those used in Vajda (2004). The historiography of the discovery of Ket tones by Heinrich Werner during the 1970s, along with a discussion of the varying orthographic conventions used to express them can be found in Vajda (2000 and 2003). Georg (2007) follows basically the same orthography as that used in Vajda (2004) as well as this volume, though his transcription is intended to be phonemic, rather than more narrowly phonetic.

James Kari

TABLE 2. Basic vowels in Ket and Yugh

	front	mid	back	
high	i		u	high back unrounded
			u	high back rounded
mid-high	e		ɤ	mid-high back rounded
			o	mid-high back unrounded
mid-low	ɛ		ʌ	mid-low back unrounded
			ɔ	mid-low back rounded
low		a		

The distinction between mid-high and mid-low vowels is predictable based on the syllable tone. The mid-high vowels appear in a high-even tone, while mid-low vowels appear in all other tonal environments. Importantly, Vajda 2000 shows that tonal contrasts in Ket are found only in monosyllabic words. "Unlike the situation with the seven vowel phonemes, which remain distinctive in polysyllabic words, differences between the four mono-syllabic tones generally disappear in polysyllabic words. Instead of a tone on each syllable, the two leftmost syllables of the word contain one of two disyllabic pitch contours, which Werner calls accent types five and six" (ibid.:10–11).

Tables 3 through 6 present the distinctions that occur only in Ket monosyllables between mid-high and mid-low vowels—distinctions that are predictable based on this array of syllable tones. The mid-high vowels appear in a high-even tone, while mid-low vowels appear in all other tonal environments.

TABLE 3. High tone, half long in Ket and Yugh

	front	mid	back	IPA
high	ī̄		ū̄	ī̄ = í̄ ē̄ = é̄, etc.
			ū̄	
mid-high	ē̄		ṽ̄	
			ō̄	
low		ā̄		

Note: There are no mid-low vowels such as [ɛ] with high tone.

TABLE 4. Vowels with abrupt tone in Ket and Yugh

	front	mid	back
high	i'		u'
			u'
mid-low	ɛ'		ʌ'
			ɔ'
low		a'	

TABLE 5. Vowels rising-falling on geminates in Ket and Yugh
In Ket and Yugh, geminate vowels are written without diacritics.

	front	mid	back	IPA
high	ii		uuu	aa = áà
			uu	
mid-low	εε		ʌʌ	
			ɔɔ	
low		aa		

Vajda (p.c.) notes for geminate Ket vowels:

Historically these vowels were derived from two syllables through loss of an intervocalic fricative. But in Modern Ket the vowel quality is unchanged through the duration of the two morae, and since there are no diphthongs, it is more economical to regard them as single vowel nuclei rather than combinations of two (identical) vowels.

Falling tone, with different forms in different dialects (shown with 'feather')

- a. Southern Ket simple falling tone on short vowel: às
- b. Central or Northern Ket simple falling tone on geminate vowel: à:s
- c. Yugh falling tone on geminate vowel with pharyngealized second phase: à:^hs

TABLE 6. Falling-tone vowels in three Ket dialects and in Yugh

Language/dialect order: SK, CK and NK, Y

	front	mid	back
high	ì, ì:, ì: ^h		ù, ù:, ù: ^h
			ù, ù:, ù: ^h
mid-low	è, è:, è: ^h		ʌ, ʌ:, ʌ: ^h
			ɔ, ɔ:, ɔ: ^h
low		à, à:, à: ^h	

Both Hamp and Leer have observed that Yugh is in effect the Ketic analog of the Tongass dialect of Tlingit as far as the vowel system goes: Yugh is more conservative than Ket. It has most clearly preserved the phonational (or perhaps rather the stigmatic) nature of the Proto-Ketic vowel system. To this Vajda adds that Ket/Yugh falling tone is not cognate with any kind of Tongass Tlingit tone, but rather with elided consonant segments.

Proto-Yeniseian (PY) forms generally follow reconstructions first worked out by Moscow linguist Sergei Starostin (1982), republished with additions in 1995 (S. Starostin 1995), and later updated online by his son, George Starostin (cf. S. Starostin 2005). Unless stated otherwise, the PY forms cited in section 3.5 derive from these publications, while any suggested Pre-Proto-Yeniseian (PPY) forms are more speculative and belong entirely to Vajda. Vajda generally cites actual forms from the Yeniseian daughter languages, while extensive citations of S. Starostin's PY reconstructions appear only in Vajda's section 3.5.

3.0. ALTERNATE TECHNICAL ORTHOGRAPHIES FOR COMPARATIVE NA-DENE, ATHABASCAN, AND EYAK

Specialists in the larger language families such as Indo-European or Austronesian routinely make adjustments between the various orthographies employed by different scholars. Eric Hamp comments that

when Indo-Europeanists consider alternate technical alphabets and character sets (Cyrillic, Greek, many national writing systems, differing comparative writing systems) “they just learn them all.” The various sources can include handwritten field notes that employ wide-ranging spellings of varying consistency (naive, phonetic, technical or practical), to linguistic publications that cite multiple languages in disparate standardized systems, to practical orthographies with distinct conventions for specific languages.

Several influential publications with reconstructed proto-forms for Athabascan-Eyak-Tlingit employ different conventions. In addition, new advances in the understanding of a proto-language (as with Leer’s discovery of the Na-Dene palatal series presented in this volume) may make some previous reconstructions obsolete. Some of the editorial and typographical issues for standardized citation of Athabascan are discussed in Krauss and Leer 1981:174–176 and in Krauss 2005:75–76. The wide range of vowel qualities in different Northern Athabascan languages, as illustrated in Leer 2005:286, shows the highly complex typographical issues that are involved if standardization of forms is attempted. The approach taken by Rice (2000), the most extensive study of comparative Athabascan verbal morphology, is to cite all forms in the practical orthographies used in her sources. This approach places the burden on the reader to mentally convert symbol values in the more than 20 languages that are cited.

The following survey of technical alphabets for Navajo or for comparative citation and for reconstruction for Athabascan or Na-Dene (= Proto-Athabascan-Eyak-Tlingit) can help us recognize the equations between these previous sources, and the technical alphabets used in Vajda’s and Leer’s papers in this volume. This survey can assist the readers of the papers in this volume as well as future scholars of Dene-Yeniseian to make the mental conversions that are presented in the wide array of sources on these languages.

The Na-Dene and Athabascan systems are in what Pullum and Ladusaw refer as the “Americanist Tradition.” The Americanist technical transcription conventions were established in publications such as *Handbook of North American Indian Languages* (Boas 1911) and continue to be employed in the 20-volume series *Handbook of North American Indians*. See esp. Goddard 1981:x–xi and Goddard 1996. Many of the consonant conventions differ markedly from IPA conventions. Some history and rationales for these conventions are summarized in Pullum and Ladusaw 1986:xx–xxii. Also many of the Americanist Tradition characters have been difficult to obtain or to type.

3.1. Sapir and Hoijer’s Athabascan technical alphabets

The most influential early sources on Athabascan languages are by Edward Sapir and his students Fang-Kuei Li and Harry Hoijer. A convention for writing plain stops as *d*, for Na-Dene languages dates at least since Sapir 1915. As noted by Goddard (1981:x) in “One deviation from the standard values that is found in the transcriptions of all Athapaskan languages is the use of the voiceless stop and affricate symbols for voiceless aspirates, and the voiced symbols for the corresponding plain (unaspirated) stops and affricates. For example in these languages *t* represents phonetic [t^h] and *d* represents [t].” Illustrated in Table 7A are the consonants for Navajo used by Hoijer 1945 and in Sapir and Hoijer 1967 as well as for Apachean in several publications by Hoijer. In Table 7B are noted the vowel systems between these sources.

TABLE 7A. Navajo consonants in Hoijer 1945, Sapir and Hoijer 1967

	labial	alveolar	lateral	sibilant	shibilant	velar	rounded velar	glottal	IPA
plain stops	b	d	L	j	ʒ	g			d=t t=t ^h L=t ^h ʒ=t ^h j=d ₃ č=t ^h
aspirated stops		t	ʔ	c	č	k	k ^w	ʔ	
glottalized stops		t̚	ʔ̚	č̚	č̚	k̚			
voiced fricatives			l	z	ž	ɣ	ɣ ^w		
voiceless fricatives			ʎ	s	š	x	x ^w , h ^w	h	
sonorants	m	n				y			
nasals	m̃	ñ				ý			

Difficult to read and to type are the superscript apostrophes in the glottalized stops. Also, the capital *L* convention for the laterals was unique to several of Hoijer’s publications.

TABLE 7B. Vowels from Hoijer 1945, Sapir and Hoijer 1967

	high	central	back	IPA
high	i			i [˙] , ij = iː
mid	e		o	
low		a		

Vowel length is indicated by raised dot following the vowel in Hoijer 1945 (*i*, *a*), but by doubling the vowel in Sapir and Hoijer 1967 (e.g. *ii*, *oo*). In both Hoijer 1945 and Sapir and Hoijer 1967 all vowels, long and short, are written with high and low tone marks, *é*, *è*, *á*, *à*, etc. Note also that Hoijer 1945 for nasalized vowels uses *Vⁿ*, switching to nasal hook *Ṽ* in 1967, as in the Young and Morgan Navajo practical orthography.

3.2. Navajo practical orthography in Young and Morgan 1943, 1987, 1992

The Navajo practical alphabet was first developed in the early 1940s by Robert W. Young and John P. Harrington and was widely promulgated in Young and Morgan 1943, the classic grammar and dictionary that has been reprinted numerous times. Navajo is the largest Athabascan language in population, and has had a literacy tradition for over 70 years. There is an abundance of materials, almost all of which are in this Navajo practical alphabet. The Navajo orthography has influenced various practical orthographies used in other Athabascan languages. Many languages employ the same conventions, such as *ʔ* for glottal stop, and digraphs and trigraphs such as *ts* and *tsʔ* (for aspirated and glottalized affricates) and *gh* (for the voiced uvular fricative), as well as the use of *d* and *t* for plain and aspirated stops.

TABLE 8A. Navajo consonants in Young and Morgan 1943, 1988, 1992

	labial	alveolar	lateral	sibilant	shibilant	velar	rounded velar	glottal	IPA
plain stops	b	d	dl	dz	j	g			V' = V? C' = ejective w = ghw = g ^w
aspirated stops		t	tl	ts	ch	k	kw	'	
glottalized stops		t'	tl'	ts'	ch'	k'			
voiced fricatives			l	z	zh	gh	w		
voiceless fricatives			l̥	s	sh	h	hw	h	
sonorants	w					y			
nasals	m	n							

Comparing this with the Sapir-Hoijer system, note that Young and Morgan consider /x/ vs. /h/ to be the same sound and that y^w = w.

TABLE 8B. Navajo vowels in Young and Morgan 1943, 1988, 1992

	high	central	back
high	i		
mid	e		o
low		a	

In the YM system all Navajo low tones are unmarked for tone, although historically Navajo is a low-marked language but high tones are marked with acute accents: *í, é*. Doubled vowels indicate long vowels: *ii, íí*, etc. Young and Morgan's conventions for rising tones and falling tones are as follows: *íí* and *íi*. Nasalization is marked with nasal hooks: *j̣, ẹ́, q̣*, etc.

3.3. Athabascan-Americanist technical alphabet: Krauss and Golla 1981, Krauss and Leer 1981, and Krauss 2005

Three publications that cite a wide range of language-specific sources for Athabascan are Krauss and Leer 1981, Krauss 2005, and Leer 2005. These sources provide many reconstructions for PA, PAE, or PAET in slightly differing technical alphabets. These systems are similar to the Americanist technical alphabets that have been fostered by the 20-volume series *Handbook of North American Indians*. See especially Goddard 1981:x-xi and Goddard 1996.

Many of these characters have been difficult to obtain or to type. The *Handbook* use of both an overstrike and understrike in characters like *k̄* are difficult to typeset, to photocopy, or to read. These facts have led to experimentation with more practical comparative alphabets for Na-Dene languages.

TABLE 9A. PA consonants in Krauss 2005, also in Krauss and Golla 1981, Krauss and Leer 1981

	labial	alveolar	lateral	interdental	sibilant	shibilant	rounded shibilant	velar	rounded velar	uvular	rounded uvular	glottal	IPA
plain stops		d	λ	ð̂	ʒ	ʒ̣	ʒ̣ ^w	ĝ	g ^w	ɢ	ɢ ^w		c = ts t = t ^h ð̂ = tθ ^h ð̂ = tθ x̣ = ç ỵ = y x̣ = x ỵ = ɣ
aspirated stops		t	λ̣	ð̣̂	c	ç	ç ^w	ḳ	ḳ ^w	q	q ^w	ʔ	
glottalized stops		t'	λ'	ð̂'	c'	ç'	ç' ^w	ḳ'	ḳ' ^w	q'	q' ^w		
voiced fricatives			l	ð̂	z	ž	ž ^w	ỵ	ỵ ^w	ɣ	ɣ ^w		
voiceless fricatives			l̥	θ	s	š	š ^w	x̣	x̣ ^w	x̣	x̣ ^w	h	
sonorants	w							y	y ^w				
nasals	ẉ	n						ỵ					

Note: cf. Krauss and Golla 1981 where *k'* = *ḳ*, *q'* = *q̣*, *y* = *ỵ*, *y* = *ỵ*
Also cf. Krauss and Leer 1981 where *ẉ* = *m*, *ĝ* = *g̣*, *ỵ* = *ɣ̣* and *ỵ^w* = *ɣ̣^w*

TABLE 9B. Full vowels in Krauss 2005 and Leer 2005 and in Leer 1979

Order: short, long, long-constricted, long-constricted-nasalized

	high	central	back
high	i		
mid	e		o
low		a	

TABLE 9C. Reduced vowels in Krauss 2005 and Leer 2005 and in Leer 1979

	front	central	back
mid-high	ə		u
low		α	

PA reduced vowels are always short. PA nasalized vowels are indicated with nasal hook (*ỵ*) below the vowel. PA constricted vowels, whether full or reduced, are indicated with a curved apostrophe above the vowel: *ẹ́, ụ́*. However, Leer does not indicate predictable constriction when the vowel is followed by glottal stigma or a glottalized sonorant, e.g. **-ta'* 'father', **-təñ'* 'handle', and **q'ay'* 'willow', all of which had constricted vowels in PA. Leer adds:

PA vowel length is redundantly indicated in all Leer's publications except Leer 1987 (see below under Table 10B). According to Leer's PA reconstructions, full vowels were long everywhere except immediately preceding glottal stigma. Thus, for example, Leer reconstructs **Xe*: 'oil/grease' on one hand but **wE-GHe* 'its oil/grease' on the other; compare Eyak *Xe*: 'oil/grease' but *ʔu-Xe* 'its oil/grease'. Leer considers this redundant marking of vowel length indispensable to comparative Athabascan and AET studies for several reasons. First, this redundancy is a failsafe mechanism that helps ensure accurate replication of information. Second, it aids the student by overtly showing the length of full vowels as seen in such diverse languages as Mattole, Navajo, and Ahtna. Third, it obviates the potential trompe l'oeille that could all too easily lead the observer falsely to

equate Eyak and Tlingit short vowels with PA full vowels. For example, Tlingit *s'ix'* 'dish, bowl' was borrowed as Eyak *ts'ik'* 'dish, plate', both with short vowels; whereas PA **sE-l-ts'i:k'y* 'it stings, smarts' has a long full vowel. If the stem of the latter were written **ts'ik'y*, the reader would be visually tempted to make the mistake of equating its vowel with that of Eyak *ts'ik'*.

3.4. Leer 1987, Leer's first practical system for Proto-Athabascan

Leer's chapter in the Young and Morgan (1987:264-301) Navajo dictionary and grammar in the largest published corpus of reconstructed PA verb roots with about 500 entries, about 400 of which are shown with PA forms or specific comparative citations. The system for PA that Leer employs is tailored to the Navajo readership, and follows (with some exceptions) many of the conventions of the Navajo writing system. These include the use of *i* for schwa (*i* in the Navajo orthography) and capital *K* for the PA uvulars (*k* in Navajo but *q* in PA). With the demonstration of Dene-Yeniseian we anticipate there will be more interest in comparative sources. There are pedagogical arguments for a type of practical system for the citation of forms for Proto-Athabascan, Na-Dene, and Dene-Yeniseian.

TABLE 10A. PA consonants in Leer 1987 and Young and Morgan 1992

	labial	alveolar	lateral	sibilant	shibilant	rounded shibilant	velar	uvular	rounded uvular	glottal
plain stops		d	dl	dz	dzh	dzh ^w	g ^y	G	G ^w	
aspirated stops		t	tł	ts	tsh	tsh ^w	k ^y	K	K ^w	'
glottalized stops		t'	tł'	ts'	tsh'	tsh' ^w	k ^y '	K'	K ^w '	
voiced fricatives			l	z	zh	zh ^w	gh ^y	gh	gh ^w	
voiceless fricatives			ł	s	sh	sh ^w	x ^y	x̣	x̣ ^w	h
sonorants	w						y			
nasals	m	n					n ^y			

Please note that the velar series noted in Leer 1987 as *g^y*, *k^y*, etc. is equivalent to the velar series written as *g*, *k* etc. in Leer and Vajda, this volume. The newly reconstructed Na-Dene palatal series is written as *g^y*, *k^y* by Vajda (or as *gy*, *ky*) by Leer.

TABLE 10B. PA vowels in Leer 1987 and Young and Morgan 1992

Order: basic, constricted, nasalized

	front	central	back
high	i, ị, ị̃		u, ụ, ụ̃
mid	ɨ, ɨ̣, ɨ̣̃		ʉ, ʉ̣, ʉ̣̃
low	e, ẹ, ẹ̃	ə, ə̣, ə̣̃	a, ạ, ạ̃

Leer comments that in both YM 1987 and 1992 there were problems with (1) the use of overstrike *a* (*ḁ*) for PA alpha, as it was not applied consistently by YM. and it has frequently been misread when forms have been cited by others. Also that (2) YM omitted Leer's redundant marking for length (colon :) after long vowels. See his comment above after Tables 9A and 9B.

3.5. Leer 2005

Leer's article in the 2005 volume *Athabaskan Prosody* employs a system for proto-Athabascan different from that of Krauss's in the same volume. See Leer 2005:284. Hargus 2007:737-755 makes extensive use of

sources on comparative Athabascan and employs the system used in Leer 2005. A substantive change in Leer 2005 is his use of the vowel *e* in the very commonly used possessive suffix, *-eʔ* instead of *-əʔ*. In fact, this 2005 system is similar to the one Leer used in his important 1979 study of Proto-Athabascan verb stem phonology. The feature of retroflexion rather than labialization is used for the so-called CHW-series, and this has been adopted by Vajda.

TABLE 11. PA consonants in Leer 2005 and Leer 1979 (vowels are the same as in Krauss 2005)

	labial	alveolar	lateral	sibilant	shibilant	rounded shibilant	velar	uvular	rounded uvular	glottal	IPA
plain stops		d	dl	dz	dž	dž ^r	g ^y	q	q ^w		dž ^r = tʃ tš ^r = tʃ ^h
aspirated stops		t	tł	ts	tš	tš ^r	k ^y	q	q ^w	ʔ	
glottalized stops		t'	tł'	ts'	tš'	tš' ^r	k ^y '	q'	q' ^w		
voiced fricatives			l	z	ž		y	ɣ	ɣ ^w		
voiceless fricatives			ł	s	š		x ^y	x̣	x̣ ^w	h	
sonorants	w						y				
nasals	m	n					n ^y				

However, in Leer 1979: *dž^r* = *dž^w*, *g^y* = *ḡ*, *k^y* = *ḳ*, and *n^y* = *ṅ*.

3.6. Leer's practical Na-Dene and comparative Athabascan-Eyak (this volume)

First proposed in Leer 2008 and employed in this volume is an orthography that is "practical" in that it can be shared across any computer platform. It uses characters available on any keyboard with lower-case and capital letter conventions. In addition the vowels have acute, grave, and circumflex accents. Note that Leer does use these special symbols: *ł*, *ñ*, *ŋ*, and *ÿ*. Unlike Tables 9A, 10A, and 11A, which show only the consonants reconstructed for PA, Table 12A includes all symbols that are used in Leer's comparative AET work, not only PA but also the individual Athabascan languages as well as Eyak and Tlingit and all intermediate stages such as Pre-PA, Pre-Eyak, and Pre-Tlingit.

One suggestion by Eric Hamp (November 2009) resulted in the treatment of glottal stop and preglottalized glides as a manner of articulation instead of position of articulation. This has served to highlight two rare PND phonemes, preglottalized glides: *ʔ^y* = *ʔy* and *ʔ^w* = *ʔw*. Just since 2008 there are six newly recognized consonants in the palatal series and one newly recognized sonorant.

TABLE 12A. Consonants in Leer, this volume

	labial	alveolar	lateral	interdental	post-dental	sibilants	shibilants	retroflex	palatal	velar	rounded velar	uvular	rounded uvular	IPA
plain stops	b	d	dl	ddh	dz	dz	dzh	dzhr	gy	g	gw	G	Gw	
aspirated stops	p	t	tł	tth	ts	ts	tsh	tshr	ky	k	kw	q	qw	
glottalized stops	p'	t'	tł'	tth'	ts'	ts'	tsh'	tshr'	k'y	k'	k'w	q'	q'w	
voiced fricatives	f		l	dh	z	z	zh	zhr	ghy	gh	ghw	GH	GHw	
voiceless fricatives	v		ł	th	s	s	sh	shr	xy	x	xw	X	Xw	
glottalized fricatives			ł'		s'					x'	x'w	X'	X'w	
glottal stops									7y	7	7w			7=ʔ gy=ʔ ky=c k'y=c'
glottal fricatives									hy	h	hw			xy=ç ÿ = uł G=G X=x
voiced sonorants			l					r	y	ÿ	w			
preglottalized voiced sonorants			ł						'y		'w			
voiceless sonorants			lh					rh	yh		wh			
preglottalized voiced nasals	'm	'n								7ŋ				
voiced nasals	m	n							ñ	ŋ	ŋw			
voiceless nasals	mh	nh								ŋh				
prenasalized voiced stops	mB	nD												

Leer writes:

Vocally modified glottal fricatives (such as *hw*) are restricted to onset position in AET and Tlingit, whereas the voiceless sonorants are usually restricted to coda position, although *yh* (e.g. in Sekani) and *wh* (e.g. in Hupa) are also found in onset position. The choice e.g. between *hw* and *wh* is of course a matter of perspective, based on which fits best in the overall phonological picture.

TABLE 12B. Full vowels in Leer, this volume

	front	central	back
high	i	ĩ	u
mid	e	ẽ	o
low		a	o

Note in particular that in Koyukon, Lower Tanana, and Tsuut'ina, *a* and *o* represent low vowels that are closer to /æ/ and /ɔ/, respectively; these reflect PA **e* and **a*. Leer's usage here is based on traditional orthographic practice and convenience.

Phonemic vowel length is usually indicated by a semicolon (;) after the vowel, e.g. *i;*, *e;*, *a;*, *u;*. But in languages with kinetic tone in long syllables, such as Navajo, Slave, and Gwich'in (or where it can be demonstrated that contiguous vowels must belong to separate syllables), long vowels are written with two identical vowels, either of which may be marked for tone.

Vowel length was not phonemic for PA full vowels, which were long everywhere except before glottal stop and probably also at the end of a word, but Leer nevertheless marks PA vowel length. He considers it a useful, indeed a vital redundancy that serves to minimize confusion in comparative Athabascan and AET studies.

TABLE 12C. Reduced vowels in Leer, this volume

	front	central	back
mid-high	E		U
low		A	O

Koyukon *O* (which is orthographic *u* in the Koyukon practical alphabet) is a slightly back-rounded vowel, the reduced version of *o*, which comes from PA **A* or **U*.

Nasalization is indicated with the letter *N* placed after the vowel, long vowel, or vowel sequence in the syllable nucleus. Vowel length (:); thus always precedes *N*, which in turn is followed by the stigma (´ or *h*), as in in Eyak *O-l-ku:N'd* 'to seize O', *łiNłG-ih* 'one'; Western Gwich'in *łaiiN* 'trail', *łiliN gaiNł* 'dry meat'; Navajo *-deéN* 'from'.

Finally, high and low marked tone are indicated with acute (´) and grave (`) accents, respectively. But note that the circumflex (ˆ) accent is used in citing PA forms to indicate vowel constriction (glottalic phonation), precursor to the marked tone in the daughter languages—the marked tone may appear as either high or low tone in those Athabascan languages that have retained tone.

3.7. Vajda's system for Proto-Na-Dene and the citation of comparative Athabascan, this volume

Vajda has settled on a system that is most like that of Leer 2005 but is nevertheless unique. He employs the practical conventions for Athabascan such as *dl* and *tl* and for the laterals, the use of caron (or hachek) (ˇ) in two palatal series. He recognizes the retroflex-palatal series. Also Vajda employs a few IPA (International Phonetic Alphabet) characters: *ɣ* and *χ* for back velar fricatives. Reviewing this appendix, Vajda agreed to standardize the use of *dz* and *gʷ* (instead of IPA *ʒ* and *ʒ*). These differences between Leer and Vajda are notational variants for the same sounds: *k'w* vs. *kʷ*, *k'y*, vs. *kʷ*. Another variation in usage in this volume, Eric Hamp prefers to write the palatal series with overstrike ´ as in *ǵ*, *Ƕ*, etc.

TABLE 13A. Na-Dene (or AET) consonants in Vajda, this volume

	labial	alveolar	lateral	sibilant	sibilant	retroflex-sibilant	palatal	velar	rounded velar	uvular	rounded uvular	glottal
plain stops	w	d	dl	dz	dž	džʳ	gʲ	g	gʷ	ɢ	ɢʷ	
aspirated stops		t	tl	ts	tš	tšʳ	kʲ	k	kʷ	q	qʷ	ʔ
glottalized stops		tʰ	tlʰ	tsʰ	tšʰ	tšʰʳ	kʲʰ	k	kʷʰ	qʰ	qʷʰ	
voiced fricatives			l	z	ž	žʳ	ɣʲ	ɣ	ɣʷ	ʁ	ʁʷ	
voiceless fricatives			l̥	s	š	šʳ	xʲ	x	xʷ	χ	χʷ	h
sonorants and nasals	m~w̃	n					y	ŋ~ŋ̃	ŋʷ			

Added in a few instances to Vajda's paper are glides ʔʲ and ʔʷ.

TABLE 13B. Vowels in Vajda, this volume

Order: short, long, long-nasalized, constricted, long-constricted, long-constricted-nasalized

	front	central	back	IPA
high	i, iː, iː˱, î, î˱		u, uː, uː˱, û, û˱	iː = i:, etc.
mid		ə, ə˱, ə˱˱	ɔ, ɔ˱, ɔ˱˱	
low	e, eː, eː˱, ê, ê˱	a, â, â˱, â˱˱	aː, aː˱, â, â˱	

Thus the array of reduced vowel conventions in this appendix are: schwa: ə = i = E; alpha: α = a = A; epsilon: ε = e = U. Vajda follows Leer in the use of Vː (the half-long symbol) for vowel length in Athabaskan and Eyak, but V: (the long symbol) for Tlingit and Na-Dene. Vː and V: can be considered equivalent.

TABLE 13C. PAET obstruent series citation conventions (following the use by Leer)

T-series	=	dental or apical
TL-series	=	lateral
TS-series	=	alveolar
Kʲ-series	=	palatal
K-series	=	velar unrounded
Kʷ-series	=	velar rounded or retroflex
Q-series	=	uvular unrounded
Qʷ-series	=	uvular rounded

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Appendix B

SYMBOLS AND ABBREVIATIONS

See also Appendix A, Orthographic Conventions for Yeniseian and Na-Dene. For kinship abbreviations and conventions, see Ives et al. (Table 1, p. 225). Use of Athabascan~Athabaskan~Athapaskan follows author's preference.

1. Symbols and special conventions

<i>italics</i>	forms in Yeniseian, Na-Dene, or other languages
-	hyphen = bound form, morpheme boundary
-	en-dash in noun or postposition = possessed form
*	reconstructed form, proto-form
~*	approximate reconstructed form
~6000 BP	approximate years before present
()	optional feature
[...]	phonetic representation
/.../	morphophonemic representation
[...]	phrasing added by author
<...>	as written/transcribed in the source but otherwise unverified
>	becomes
<	from
≈	similar to

2. Abbreviations

act.	active	O	direct object
AET	Athabascan-Eyak-Tlingit (equivalent to Na-Dene and excluding Haida)	Pump.	Pumpokol
ASTt	Arctic Small Tool Tradition	PA	proto-Athabascan
AUX	auxiliary	PIE	proto-Indo-European
BP	radiocarbon years before present (AD 1950)	PPA	pre-Proto-Athabascan
C	consonant, any consonant	PAE	proto-Athabascan-Eyak
cal BP	calibrated years before present (i.e. calendar years ago)	PAET	proto-Athabascan-Eyak-Tlingit
CK	Central Ket	PCA	Pacific Coast Athabascan
du.	dual	pl.	plural
DY	Dene-Yeniseian	PND	proto-Na-Dene
mom.	momentaneous	prog.	progressive
ND	Na-Dene (equivalent to AET and excluding Haida)	PY	proto-Yeniseian
NK	Northern Ket	PPY	pre-Proto-Yeniseian
		sg.	singular
		SK	Southern Ket
		TAM	tense-aspect-mood prefixes
		V	vowel, any vowel
		Y	Yugh

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Some attendees gather after the
Anchorage session of the Dene-
Yeniseian Symposium, February
29, 2008.

Photo by Patrick Maloney