

Morphological Typology¹

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0.1 The term ‘Morphological typology’

0.1.1 The received view of morphological typology

The term ‘Morphological typology’ has been traditionally associated with the division of languages into basic ‘holistic’ types, such as ‘inflectional’, ‘agglutinative’ and ‘isolating’ which could be used to characterize a complete language (see Croft 2003: 45-48, and Song 2001: 41-45).

In defining fundamental language types, Sapir (1921: 136-146) drew a distinction between ‘technique’ (formal process) and ‘synthesis’ (number of concepts per word). Formal processes are the following: a) isolating, where the word is the same as the root (1921: 126); b) agglutinative, involving regular affixation (1921: 129); c) fusional, where affixation may be accompanied by changes in the root (1921: 130); d) symbolic, where there are changes which alter the root itself (1921: 126). The terms ‘analytic’, ‘synthetic’ and ‘polysynthetic’ can be seen as describing the relative weight of individual words within a sentence, with analytic words being ‘minor’, in contrast to polysynthesis at the other end of the scale (1921: 128). Sapir himself pointed out that terms such as ‘analytic’, ‘synthetic’ and ‘polysynthetic’ are quantitative and relative, and cannot be used exclusively to characterize a language. This is why he developed a classification using formal process and degree of synthesis to cross-cut each other. He also pointed out the greater value of applying the classification of formal processes to ‘relational concepts’ (1921: 127), which can be interpreted as meaning that the typology must distinguish between the formal

processes (morphological operations) used for marking syntactic relations from those which are derivational. As Croft (2003: 46-7) notes, Greenberg (1954) developed this conception further by creating quantitative indices for these types, thereby overcoming the problem that a language never entirely belongs to one type or the other. This allowed for a ranking of a language relative to other languages.

Characterization of the morphological complexity of words is therefore the sense in which morphological typology has traditionally been understood.

0.1.2 Typology and the relation between syntax and morphology

Another aspect of morphology which is often subjected to typological work is the relationship between word order and the order of affixes. For instance, it has been noted that there is a preference for suffixation in languages in general (Sapir 1921: 67, Greenberg 1957, Song 2001: 119). In particular, for languages which have SOV order, and/or Noun Postposition order there is a strong preference for suffixes (Hawkins and Gilligan 1988). There are a number of possible explanations for this observation.

One account is to see similar principles at work in syntax and morphology. So under this view, morphological typology is directly associated with syntax, in that the preference for a particular affix order is related to the preference for a particular syntactic order. For instance, Hawkins and Gilligan's (1988: 227) Head Ordering Principle treated affixes as heads, and so the preference for suffixes with SOV and Noun-Postposition languages can be understood as a requirement that the head occurs to the right of a phrase or word. This is based on an assumption that the structures of syntax and morphology are similar or the same.

Another approach to the observed relationship between word order and the order of inflectional formants is one based on diachronic explanation. Under such an

account there is no obligation to assume that the ordering of affixes results from active syntactic principles, but is rather the result of historical processes. Siewierska and Bakker (1996) show that the diachronic account fares better in predicting the prevalence of prefixation and suffixation in languages belonging to the major word order types, although even the diachronic account does not cover all of the data.

While statistical relationships between word order and the order of morphological elements may be accounted for to a large extent through diachrony, there is another reason why it is problematic to compare orderings across the two components. That is, we know that there are languages where there is no basic word order (Mithun 1992). In contrast with this, although there exist potential counterexamples -- such as the variation in ordering of certain case markings relative to the possessive in the Finno-Ugric language Mari (Luutonen 1997) -- morphology typically imposes a rigid order, which, unlike ordering in syntax, does not allow for alternatives. The assumption that syntactic and morphological principles are one and the same thing fails to account for such differences.

0.1.3 Pure morphology and its implications for typology

In addition to mismatches in ordering, there is other evidence that linguistic morphology cannot be reduced entirely to the principles of other parts of grammar. Aronoff (1994) argues that there are pure morphological functions and, among other things, demonstrates with the example of the 'third stem' in Latin, used for the perfect participle and future participle. This is a purely form-based correspondence, because the meaning relation is difficult to characterize: the perfect participle is passive, but the future participle is active. The solution is to say that there is a third stem, which is an instance of a 'pure form' which can have different functions (Aronoff 1994: 37-39).

There are other phenomena which speak for the existence of morphological principles. These include inflectional classes, where different lexical items use different forms to realize the same morphosyntactic features. For instance, in Russian there are four inflectional classes:

[Table 0.1 here]

Nouns belonging to inflectional class I are typically of masculine gender (i.e. take masculine agreement). Those which belong to class II are typically feminine (i.e. take feminine agreement), with the exception of a group of nouns which denote male human beings and therefore assign masculine gender, because semantics takes precedence. Nouns in inflectional class III are also feminine gender. Those in inflectional class IV are neuter gender. Consideration of inflectional classes II and III demonstrates that there is a degree of autonomy for morphology. Nouns belonging to these classes typically take feminine agreement, so that the differences between them in terms of inflectional endings is irrelevant for syntax. Furthermore, because there are lexical items with semantically assigned masculine agreement belonging to inflectional class II, which typically assigns feminine gender, this shows that gender and inflectional class do not necessarily line up: one class may contain nouns of different genders, and conversely one gender may correspond to different inflectional classes. The most natural account of this is to treat inflectional classes as morphological entities. It should also be borne in mind that for Russian once we progress beyond the assignment of gender on the basis of biological sex, it is difficult to isolate semantic principles of assignment, as illustrated by the examples of nouns with different genders but related semantics given in Corbett (1994: 1349-1350). While the gender agreement properties of nouns which are not accounted for by biological sex are predictable on the basis of their inflection class membership,

belonging to an inflection class is itself not exhaustively determinable by semantics. We are left with the conclusion that there are pure morphological entities such as inflection classes.

Other examples of autonomous morphology can be found when looking at syncretism, where an inflected form corresponds to two or more morphosyntactic functions. There are at least two different types of syncretism: a) syncretism which appears to line up with feature structure; b) syncretism which does not line up with feature structure. The data in Table 0.2, showing the singular paradigm of Russian long-form adjectives, could be accounted for by assuming that a gender feature is underspecified in the oblique cases.

[Table 0.2 here]

In contrast, the syncretisms in the paradigm of the Dhaasanac verb in Tables 0.3 and 0.4 do not readily line up with feature structure.

[Table 0.3 here]

[Table 0.4 here]

For any verb the B form is used for the second person singular, third person feminine singular, first person plural and second person plural of the positive perfect and imperfect. The A form is used for the other person and number combinations. That the syncretism involved is systematic is indicated by the fact that verbs of different types have different A and B forms, as shown by the examples of stem alternations in Table 0.4 (from Tosco 2001: 123-206). Hence, these are systematic examples which cannot be tied directly to a specific feature structure. Examples such

as this argue for an autonomous morphological structure (Baerman, Brown and Corbett 2005: 169-70, 183-6).

Morphology's role is to interface between phonology and syntax. It can do this in a trivially straightforward manner by directly mapping between function and form, or there can be morphological rules which make this mapping less direct. This status of morphology has implications for typology. It is another way in which the world's languages can be typologized: in terms of how direct the mapping is between function and form, and what role, if any, pure morphological functions play.

We now go on to consider the variety of means by which morphology can perform the role of realizing morphosyntactic features.

0.2 Morphology as interface component

Morphology is the interface component of grammar par excellence, and as such the challenge which morphology presents for typology is at least two-fold: i) to account for the different ways in which languages realize syntactically relevant features; ii) the extent to which morphology may have a life of its own, rather than being reduced to principles of other areas of grammar.

Affixation, and therefore concatenation, is a standard operation of morphology, and because of this it is easy to draw parallels with syntax, which also involves the linear ordering of linguistic material. While affixation may be the norm (Zwicky 1992: 346), there are other operations by which morphology realizes syntactic features.

Hoeksema and Janda (1988) divide the universe of morphological operations up into four types: addition, metathesis, replacement and subtraction. They treat affixation, infixation, circumfixation and reduplication as sub-types of addition. Addition itself is either sensitive or not sensitive to phonological or morphological

context. As Hoeksema and Janda (1988: 204) indicate, under many morphological models addition which is not sensitive to context is taken as the normal case.²

Because it may attach productively to verb stems, the English marker *-ing* is given as an example of this type. Although the syntactic category is relevant here, the affix is not sensitive to the morphological, phonological or other properties of the lexical item in question.

Addition which is sensitive to context covers affixation, infixation, circumfixation and reduplication. Affixation itself can be sensitive to the phonological properties of the stems to which it is attaching. For example, in Russian, nouns which would otherwise belong to the same declension will use different inflections for the genitive plural, depending on whether the noun stem is either non-palatalized/non-palatoalveolar (hard), or palatalized/palatoalveolar (soft). This is illustrated in (1) and (2).

(1)	Nominative Singular	Genitive Plural
	<i>stol</i>	<i>stol-ov</i>
	table[NOM.SG]	table-GEN.PL
	‘table’	‘of (the) tables’
(2)	Nominative Singular	Genitive Plural
	<i>žitel’</i>	<i>žitel-ej</i>
	inhabitant[NOM.SG]	inhabitant-GEN.PL
	‘inhabitant’	‘of (the) inhabitants’

The nouns *stol* ‘table’ in (1) and *žitel’* ‘inhabitant’ in (2) both belong to the same declension, with the exception that their forms for the genitive plural differ. As *žitel’* has a soft stem, its genitive plural inflection is *–ej*. In contrast, the genitive plural inflection for *stol*, which has a hard stem, is *–ov*. Phonological sensitivity is easy to spot. But affixation can be sensitive to other information associated with a lexical item. For example, as is well known, the form of the accusative in Russian depends, in part, on whether nouns are animate or inanimate.

Infixation is a well known phenomenon in languages such as Chamorro, where the exponent *um* has a number of morphosyntactic functions, including marking singular agreement. In (3) the verb is singular, and the *um* is infixated after the initial consonant. In (4) we see the root prefixed by the plural marker *man*.

(3) *g<um>upu yo’*

<SBJ.SG>fly 1SG.ABS

‘I flew’ (based on Topping 1973: 83)

(4) *mang-gupu siha*

SBJ.PL-fly 3PL.ABS

‘they flew’ (based on Topping 1973: 83)³

The status of infixes as basic morphological entities is disputed. Prosodic Morphology work within Optimality Theory, for instance, has treated infixation as an example of the interaction between alignment and prosodic constraints (McCarthy and Prince 1993), the claim being that infixation is the by-product of this interaction. In Chamorro, for example, the constraint which requires syllable onsets, i.e. ‘ONSET’, is

highly ranked, and this means that typically the affix *um* must be infix (Klein 2005: 975-83). Klein (2005) argues that segmental phonology must also play a role.

Irrespective of this, constraints formulated to account for phenomena of this type make use of some theoretical construct involving the edge of the word. For instance, within the categorial grammar tradition Hoeksema and Janda (1988) applied Bach's (1984) wrapping rules to morphological phenomena of this type, as they can handle infixation in post-initial or pre-final position, which it is claimed can almost always be defined in direct relation to the marginal elements of a stem (Ultan 1975).

Circumfixation is another morphological operation which it has been argued is not basic. However, as Hoeksema and Janda (1988: 217) indicate, where there is a separation between the rules of morphology and the operations which realize morphosyntactic features, then circumfixation is merely the association of one morphological rule with multiple morphological operations (prefixation and suffixation). Crucially, this argument actually relies upon a degree of separation of morphosyntax and its realization. This is a different view from one which tries to motivate each element as contributing discrete featural information (termed 'incremental' approaches by Stump 2001: 17-27). As a purely surface phenomenon, circumfixation can be found in Russian, for example, although it is limited there to word-formation, as it is used to form new lexemes. Certain Russian verbs have a combination of some prefix and the so-called reflexive suffix *-sja*, where the combination without the suffix is unacceptable. This is illustrated in (5) and (6).

- (5) a *spat'*
sleep.INF
'to sleep'

- b *vy-spat'-sja*
 OUT- sleep.INF-REFL
 'to sleep thoroughly'
- c **vy-spat'*
 *OUT- sleep.INF
- d *spat'-sja*
 sleep.INF-REFL
 'to sleep' (impersonal verb)
- (6) a *ždat'*
 wait.INF
 'to wait'
- b *do-ždat'-sja*
 UPTO-wait.INF-REFL
 'to wait for a long time (with success)'
- c **do-ždat'*
 *UPTO-wait.INF
- d **ždat'-sja*
 *wait.INF-REFL

In (5) there is a verb *spat'-sja*, used as an impersonal verb with dative subject. It would therefore be possible to construct an argument that the prefix *vy-* is attached after the reflexive suffix. Note, however, that we run into a problem with the verb *do-ždat'-sja* (6b), as both intermediate stages in (6c) and (6d) are ruled out. Instead, the most reasonable interpretation is that the suffix and prefix contribute simultaneously to the formation of a new lexeme.

Reduplication usually involves addition of a form based on part of the unreduplicated stem. There are many interesting examples from the literature (see Spencer 1991: 13 and 150-156, and Inkelas and Zoll 2005). Morphology allows in principle for operations sensitive to the phonology of the various elements involved, a characteristic which distinguishes it from syntax in general, and one which makes it attractive for dealing with reduplication. Indeed, if one treats morphology as a grammatical component in its own right, then this allows one to maintain a principle of phonology-free syntax.

The status of metathesis as a morphological operation is disputed. For instance, Stonham (1994) argues that metathesis does not mark grammatical features directly, and that it is therefore not part of morphology. Examples from Rotuman and Straits Salish come close, because metathesis appears to realize grammatical distinctions directly: the formation of the incomplete phase from the complete phase in Rotuman, and the formation of ‘actual’ aspect in Straits Salish. Blevins and Garrett (1998: 551) note that, ‘Synchronic metathesis continues to resist a unified and constrained theoretical account.’ (For further information on metathesis, see Hume 2000.)

Replacement, such as vowel ablaut or gradation, comes about where the motivation for a phonological rule has been lost (Hoeksema and Janda 1988: 234-235). For instance, the forms *ring-rang-rung* involve replacement of the vowel depending on tense. There is no obvious synchronic phonological basis for this alternation, and so direct reference needs to be made to the grammatical feature values involved.

Subtraction is another potential operation associated with morphology, but its status depends very much on determining the base of the operation. In Russian, for

example, adjectival formation using *-sk* might be analyzed as involving subtraction, if there would be a repetition of the form *-sk*.

- (7) *Leningrád* ? *leningrád-sk-ij* (adjective)
 leningrad leningrad-ADJ-SG.NOM.MASC
 ‘Leningrad’ (noun) ‘Leningrad’ (adjective)

(Isacenko 1972; Aronoff 1976: 95)

- (8) *tómsk* (noun) ? *tómsk-ij* / **tómsk-sk-ij*
 tomsk tomsk-SG.NOM.MASC *tomsk-ADJ-SG.NOM.MASC
 ‘Tomsk’ (noun) ‘Tomsk’ (adjective)

(Isacenko 1972; Aronoff 1976: 95)

In (7) the suffix *-sk*, followed by the adjectival endings, is added to the placename *Leningrad*. In (8), because the placename *Tomsk* ends in the combination *sk* already, the suffix *-sk* could be viewed as deleted. However, there are a number of alternatives to this analysis. One could argue that the rule or constraint which derives adjectives of this type requires there to be an *-sk*, either one that is already present or one that is added. Or it could be argued that the lexical item in question has different stems, depending on the context in which it is used.

If one accepts that there are such things as inflectional or morphological classes (instances of pure morphology, such as indexes), it is also possible to treat apparent instances of subtraction as additive. In Murle, for example, it is argued that the last consonant of the base form is deleted in order to form the plural (Haspelmath 2002: 24; Arensen 1982: 40-1).

(9)	<i>nyoon</i>	<i>nyoo</i>
	lamb.SG	lamb.PL
	‘lamb’	‘lambs’
	<i>wawoc</i>	<i>wawo</i>
	white.heron.SG	white.heron.PL
	‘white heron’	‘white herons’
	<i>onyiit</i>	<i>onyii</i>
	rib.SG	rib.PL
	‘rib’	‘ribs’
	<i>rottin</i>	<i>rotti</i>
	warrior.SG	warrior.PL
	‘warrior’	‘warriors’

(Arensen 1982: 40-1, cited in Haspelmath 2002: 24)

Discussing these data in relation to a similar phenomenon in another language, Haspelmath (2002: 167) points out that examples such as (9) cannot be accounted for in terms of addition, because it is impossible to predict the form of the additional elements. However, if we consider the Russian inflectional classes back in Table 0.1 we could come to the same conclusion. For instance, in Table 0.1 all the stems to which the inflectional endings are added end in a consonant. Because the stems are associated with a particular inflectional class, we know which inflections to add.

Equally, we could have considered a subtraction analysis for the Russian forms, but if we allow for the existence of purely morphological phenomena, such as inflectional classes, then it is probable that we can account for the subtraction examples in a similar way. The items in (9) could therefore be treated as belonging to different morphological classes, which are associated with different singular forms.⁴

There are a number of different ways in which languages realize syntactically relevant features. One approach seeks to reduce these operations to concatenation, with the others occurring as the by-product of concatenation and phonology. However, reduction of the inventory of morphological operations does not always lead away from morphology. For example, the most natural alternative to analyses based on subtraction is one based on morphological classes or indexes. From a typological perspective there are, in particular, two different questions which need to be considered when looking at the morphology of a language. The first is whether there are features of the morphological system which are pure morphology, such as inflectional classes. The second is what morphological operations may be used to realize features in addition to concatenation.

0.3 Default Inheritance approaches to morphology

Morphological typology can benefit from input from computational linguistics, as modelling morphological systems enables us to make things explicit, including underlying assumptions which would otherwise go unnoticed. It is worth emphasizing that concatenative morphology can be modelled as finite-state networks, which have well understood mathematical properties (Beesley and Karttunen 2003: 37). As their name suggests, finite-state networks consist of a finite number of states, often represented using circles. The network is basically the set of states and transitions between states, the transitions being represented as arcs or arrows. The task of

recognizing or generating morphology involves transitions from one state to the another. In Figure 0.1, for example, the form *canto* of the Spanish verb *cantar* ‘to sing’ can be analyzed by following the transitions from one state to the next, reading the symbols on the underside of the network and outputting the symbols at the top, which results in the equivalent of a morphological gloss. Of note is the fact that the network requires the use of the epsilon symbol (ϵ), representing the empty string.

[Figure 0.1 here]

While non-concatenative morphology is challenging to model using finite-state networks, it has been shown that it is possible to treat instances of it using finite-state techniques (see Beesley and Karttunen 375-420 and references there).

There is an expectation that non-concatenative morphology will be found in parallel with concatenative morphology. A related assumption is that non-concatenative morphology will be part of the less regular system of a language. If we are to examine this relationship between different areas of a language’s morphology we require the means for representing what generally holds within a language and what is more exceptional. Default inheritance networks are a good way of doing this, because they allow for information to be overridden, and can therefore incorporate varying degrees of regularity. DATR is a language for representing default inheritance networks. These networks consist of *nodes* and connections between them.

Information is inherited from higher nodes unless it is specifically overridden. In Figure 0.2 we present a simple default inheritance network, which covers a fragment of English. The diagram is based on a DATR example from Evans and Gazdar (1996: 176).⁵

[Figure 0.2 here]

In Figure 0.2, VERB, EN_VERB, Love, Do, Mow, Sew and Be are all nodes in the network. The nodes Love, Do, and EN_VERB inherit from VERB. Mow, Sew and Be inherit from EN_VERB, and therefore also from VERB. Furthermore, the nodes Mow, Sew and Be may also override information inherited from EN_VERB. The suppletive forms of the past tense of the verb ‘to be’ will have to be specified in its lexical entry. The nodes in Figure 0.2 are locations for information about the morphology of the items in question. As such, they generalize the information which classes of lexemes have in common. The relationships between nodes also make it possible to characterize the degree of exceptionality or lexical idiosyncrasy involved. The form of the past tense is generally *-ed*, but this can be overridden by particular items, such as *do*, whose past tense is *did*. Often, but not always, the past participle will have the same form as the past tense. There are also subregular classes, such as the one where the past participle is formed using *-en*. Default inheritance allows for a concise treatment of these facts. Evans and Gazdar (1996: 176) state the following at the node VERB in (10), where we have omitted some information, as indicated by the ellipses. What is given in (10) is a representation of the information associated with the top node in Figure 0.2.

(10)

VERB:

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<syn cat> == verb  
<syn type> == main
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<mor past> == "<mor root>" ed
<mor passive> == "<mor past>"
<mor present> == "<mor root>"
<mor present participle> == "<mor root>" ing
<mor present tense sing three> == "<mor root>" s
...

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The node name VERB is placed before the colon. Each line containing ‘==’ is a DATR equation. Each left-hand side of a DATR equation contains *paths*. Paths contain a combination of ordered *attributes*. The right-hand side of the equation may contain *values*, such as ‘verb’. Alternatively it may contain paths, or node names, or it may contain a combination of paths, values and node names.

The first equation at VERB states that the syntactic category of items belonging to this class is ‘verb’. The equation after this states that the syntactic type of verb is ‘main’ (i.e. a typical verb is a main verb rather than an auxiliary). The next equation says that the past is a concatenation of *-ed* onto what Evans and Gazdar call the morphological root. At the top node, the rules which directly realize the English past, the present participle and the present tense, involve concatenation. In addition to concatenation there may be general statements which say, for instance, that the passive has the same form as the past. In principle, this statement is independent of whether the past is realized by concatenative or non-concatenative morphology. For the verb ‘to do’, of course, the passive participle and past participle will still be the same, as indicated by examples (11) and (12).

(11) *I have done this.*

(12) *This was done by John.*

In addition to the affixal morphology, phonologically the verb ‘to do’ changes its vowel quality in these forms, but the systematic identity in (11) and (12) is not dependent on the morphology which realizes it, as indicated by the examples which only involve concatenation of *-ed* to form the participles in (13) and (14).

(13) *The man was killed by a Lion.*

(14) *The man has killed a Lion.*

We see that, in English at least, the default rules for inflecting verbs involve concatenation. However, there are also more abstract relationships which need to be stated independently of the actual form, such as the default identity of the past participle and the passive participle. For this particular case Blevins (2003:761-762) argues that -- although other morphological patterns can be found which do require that one set of morphosyntactic feature be referred to another for their realization -- the identity of the past and passive participle does not involve referrals of this kind. As is well known, this identity holds over all verbs in English. This indicates that there are high level regularities in the morphology of languages which do not just involve concatenation of affixes, but statements about the relationships between cells of paradigms. In their study of syncretism Baerman, Brown and Corbett (2005) argue that a variety of mechanisms are required to account for identities of form: underspecification, indexing and referral. The first is uninformative, but still involves morphosyntactic features. The second involves an autonomous morphological structure which cross-cuts morphosyntactic features. The third mechanism, referral, is

both uninformative and autonomous, as it involves switching between paradigmatically opposed feature values.

0.4 Inheritance networks as morphological typology

As indicated at the beginning of this chapter, the weakness of traditional morphological typology was its overly ‘holistic’ approach. However, given a default inheritance approach it is possible to analyze different parts of the morphological system, and it is also possible to see what types of relationships hold between elements of that system in terms of inheritance structures. Among other things, a language may make use of a number of means to realize the same feature, and rules may be overridden.

In the Papuan language Hua there are predesinential ablaut rules which work together with affixes to mark person and number in different tenses and moods (Haiman 1980: 47-52).⁶ In Table 0.5 we give the three verbs to illustrate each of the stem types. The first row gives the imperative and the rest of the table the non-future interrogative forms. The different verb types are given in Table 0.5.

[Table 0.5 here]

In Table 0.5 the person information for each verb is conveyed by changes in the stem vowel, and these combine with two non-future interrogative suffixes. One, *-pe*, is used for the first person plural or the second person singular, while the other, *-ve*, is the default suffix for non-future interrogatives in general. The apostrophe represents a glottal stop, which marks dual number.

The verbs in Table 0.5 each have a basic form, which is the same as the imperative (Haiman 1980: 48): *hu*, *do* and *mi*. In the third singular the vowel of the

basic stem is fronted (Haiman 1980: 50). For the second person and rest of the third person, if the basic stem has a back vowel, it is lowered (Haiman 1980: 49). In the first person the vowel of the basic stem is backed (Haiman 1980: 49). This will only affect verbs of the *mi* type, as the other two types illustrated in the table have back vowels in the basic form. It should be noted that non-future interrogative is just one of a number of tense and mood series which employ this system.

In Hua it is a combination of affixal and non-affixal morphology which marks the person and number in each of the series. If one assumed that the affixes triggered the vowel alternations in the stems, then this would require a proliferation of homophonous affixes across each of the series.⁷ For example, the suffix *-pe* realizes either first person plural or second person singular for the nonfuture interrogative, but the first person plural and second person singular are distinguished by different stem vowels. If the stem vowel alternation is to be treated as a by-product of affixation, then there must be two accidentally homophonous suffixes *-pe*. As we have noted, this system of marking is employed in a number of tense and moods, and so the problem is not limited to the nonfuture interrogative forms. And the problem is not just restricted to the sets of suffixes which individually realize either second person singular or first person plural. The default suffix would also have to be multiply associated with different vowel alternations, if these were to be treated as determined by affixation, or one would be required to posit multiple zero affixes to do this work. Consequently, reducing the Hua phenomena to concatenation with associated alteration of the stem would make the systematic use of the suffixes for each tense and mood appear purely accidental.

The Hua data show that we can have two different types of morphological operation working in tandem to realize the appropriate grammatical features. Figure

0.3, which is an informal representation of an implemented analysis in DATR, gives a default inheritance network for the Hua system.⁸ The individual verbs inherit their stem alternations from a hierarchy of stem types. The node CONJUGATION specifies how to put the stems and suffixes together in order to realize the appropriate forms.

[Figure 0.3 here]

Approaches based on default inheritance allow us to test analyses to see that they work.

0.5 Conclusion

We started off this chapter by outlining the traditional ‘holistic’ morphological typology. We saw that this traditional system was already refined by Sapir, who proposed a distinction between formal processes and degree of synthesis. Theoretical morphology has come a long way since that time, but we are still exploring the ramifications of theoretical distinctions such as that between realizational theories and lexical theories (Stump 2001: 1-30). Pure morphology, inflectional classes, and the different mechanisms associated with phenomena such as syncretism suggest a variety of dimensions along which we can typologize the world's languages. For some languages, morphology will not prove to be particularly interesting, but for others the role of morphology proves to be more intriguing. For languages traditionally associated with polysynthesis there appears to be a greater role for morphology relative to syntax, and for other languages, where there is a greater role for inflection classes or other pure morphological phenomena, morphology may provide additional structure which does not mesh neatly with syntax.

Further Reading

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² Hoeksema and Janda (1988) use the terms ‘context-free’ and ‘context-sensitive’. Being context-free here refers to lack of sensitivity to the phonological or morpholexical properties of the bases to which the morphological operations apply.

³ It should be noted that morphological glossing for the infix and prefix in examples (3) and (4) is somewhat problematic. The infix *-um-* and prefix *man-* are associated with actor voice constructions – and may be glossed as ACT or ACTVOC – and have additional functions other than the ones I have given in the glosses of (3) and (4). For instance, *-um-* may also function to mark indefinite objecthood with transitive verbs. For detailed analyses see Chung (1994), Donohue and Maclachlan (1999), and the entry for Chamorro in Baerman (2005). The actual morphological glossing is not material to the point being made here.

⁴ Arensen (1982: 18) points out that the shortest form is not the most informative when it comes to determining the underlying root, as a voiceless final consonant could appear voiced before a suffix, and this can have an effect on the height of the preceding vowel. But a similar issue arises for familiar languages with automatic word final devoicing, where additive analyses are typically assumed.

⁵ I illustrate the use of default inheritance in DATR with an example from Evans and Gazdar (1996). Their fragment was used to illustrate DATR. It was not specifically intended for discussion of the role of concatenative and non-concatenative morphology.

⁶ I do not discuss all of the ablaut rules here: the presubjunctive and general ablaut rules are not discussed, or the issue of anticipatory desinences (see Haiman 1980: 54-58 and Haiman 1998: 547). I was first introduced to the Hua data during Arnold Zwicky’s course at the 1993 LSA Linguistic Institute at Ohio State University.

⁷ Haiman (1998: 547) states that the ‘three-fold desinences’ involve systematic underspecification of person and number. He also says of the vowel alternation that it ‘is not sensitive to the actual form of the personal desinence ... but to its “PERSON”, and also its identity as a threefold desinence...’

(Haiman 1998: 548). There needs to be a way for the desinence for 2.SG or 1.PL not to trigger the backing associated with first person, when 2.SG is realized. Either there are two identical desinences, or there is some degree of separation between the form of the desinence and the associated features.

⁸ The DATR fragment hua.dtr is available from <http://www.datr.org/>.