Cultural Constraints on Grammar and Cognition in Pirahã: Another Look at the *Design Features* of Human Language

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ABSTRACT

The Pirahã language challenges simplistic application of Hockett's (1960) nearly universally-accepted 'design features of human language', by showing that some of these design features (interchangeability, displacement, and productivity) may be culturally constrained. In particular Pirahã culture constrains communication to non-abstract subjects which fall within the immediate experience of interlocutors. This constraint explains several very surprising features of Pirahã grammar and culture: the absence of creation myths and fiction; the simplest kinship system yet documented; the absence of numbers of any kind or a concept of counting; the absence of color terms; the absence of embedding in the grammar; the absence of 'relative tenses'; the borrowing of its entire pronoun inventory from Tupi; the fact that the Pirahã are monolingual after more than 200 years of regular contact with Brazilians and the Tupi-Guarani-speaking Kawahiv; the absence of any individual or collective memory of more than two generations past; the absence of drawing or other art and one of the simplest material cultures yet documented; the absence of any terms for quantification, e.g. 'all', 'each', 'every', 'most', 'some', etc.

Key terms

design features
interchangeability
productivity
counting
displacement

In the early days of American descriptive linguistics, language was seen as an emergent property of human culture and psychology.[1] For various reasons, theoretical linguistics abandoned the investigation of culture-language connections, except for small pockets of researchers here and there. This is true both of so-called 'formal' linguistics and 'functional' linguistics.[2] In recent years there has been a welcome revival of interest in the influence of language on culture and cognition, especially in more sophisticated investigations of the Linguistic Relativity/Determinism hypothesis (e.g. (Lucy 1992a, 1992b); (Gumperz and Levinson 1996); (Gentner and Goldin-Meadow 2003)). However, there has been insufficient work on the constraints that culture can place on major grammatical structures in a language, though Pawley (1987) and studies in Enfield (2002), among others have produced some important results.

This paper looks in detail at various aspects of Pirahã culture and language that suggest that Pirahã culture severely constrains Pirahã grammar in several ways, producing an array of otherwise inexplicable 'gaps' in Pirahã morphosyntax. These constraints on Pirahã grammar lead to a startling conclusion: that Hockett's *Design Features* of human language, even more widely accepted among linguists than Chomsky's proposed Universal Grammar (UG), must be revised. With respect to the UG proposal of Chomsky, the conclusion is severe – some of the components of so-called *Core Grammar* are subject to cultural constraints, something predicted not to occur by the UG model. I argue that these apparently disjointed facts about the Pirahã language – gaps that are very surprising from just about any grammarian's perspective – ultimately derive from a single cultural constraint in Pirahã, namely, to restrict communication to the immediate experience of the interlocutors, as stated in (1):

(1) *Pirahã cultural constraint on grammar and living*:

a. Grammar and other ways of living are restricted to concrete, immediate experience (where an experience is immediate in Pirahã if it has been seen or recounted as seen by a person alive at the time of telling).

b. Immediacy of experience is reflected in immediacy of information encoding – one event per utterance.[3]

Less explicitly, this paper raises the possibility that culture could also constrain cognition in Pirahã. For example, the results of Gordon's (2004) experiments on counting and number suggest that some members of the community have a severely reduced ability to count. If this is correct, though much more experimentation is still needed before this can be determined, then the absence of counting and the impairment of ability to count might both result from the constraint on talking about things ranging beyond immediate experience. Moreover, if subsequent experiments were to show limitations in Pirahã ability in other areas, e.g. identification of colors, working with concepts involving embedding, and so forth, then these cognitive differences would likely also result from the cultural constraint on grammar proposed above. No experiments have yet been done, other than in Gordon's (2004) research, which as I note in Appendix Three lack cultural sensitivity in design. Nevertheless, it is predicted that the failure to talk about certain concepts could affect cognition in older adults and that younger members of the population, even if they do not talk about such concepts, might be less affected cognitively, depending on the type of concept. Such inabilities, were they shown to exist by rigorous testing could follow from the principle of 'use it

or lose it'. These possibilities are mentioned again in the conclusion and, with regard to counting, in Appendix Three.

If I am successful in establishing that (1) constrains the range of Pirahã grammar to be discussed here, then several consequences for the enterprise of linguistics follow:

a) if culture is causally implicated in grammatical forms, then one must learn one's culture to learn one's grammar. But then a grammar is not simply 'grown', contra Chomsky (2002);

b) linguistic fieldwork should be carried out in a cultural community of speakers because only by studying the culture and the grammar together can the linguist (or ethnologist) understand either;

c) smorgasbord studies, that is, studies which merely look for constructions to interact with a particular thesis by looking in a non-statistically sophisticated way at data from a variety of grammars, are fundamentally untrustworthy because they are too far removed from the original situation. This is bad because grammars, especially grammars of little-studied languages, need an understanding of the cultural matrix from which they emerged to be properly evaluated or used in theoretical research;

d) particulars can be as important as universals. This follows because each culture-grammar pair could in principle produce unique tensions and interactions found nowhere else, each case extending the parameters of our understanding of culture and grammar (however idealized those concepts may be).

Before beginning in earnest, I should say something about my distinction between 'culture' and 'language'. To linguists this is a natural distinction. To anthropologists it is not. My own view of the relationship is that the anthropological perspective is the more useful. But that is exactly what this paper purports to show. Therefore, although I begin with what will strike most anthropologists as a strange division between the form of communication (language) and the ways of meaning (culture) from which it emerges, the conclusion of the paper is that the division is not in fact a very useful one and that Sapir, Boas, and the anthropological tradition generally has this right. In this sense, this paper may be taken as an argument that anthropology and linguistics are perhaps more closely aligned than, say, psychology and linguistics, as most modern linguists (whether 'functional' or 'formal') suppose.

This study began as a description of the absence of numerals, number, and counting in Pirahã, the only surviving member of the Muran language family. However, after considering the implications of this unusual feature of Pirahã language and culture, I came to the conclusion defended in this paper, namely, that there is an important relation between the absence of number, numerals, and counting on the one hand and the striking absence of other forms of precision quantification in Pirahã semantics and culture, on the other hand. A summary of the 'surprising facts' will include at least the elements in (2):

(2) a. Pirahã is the only language known without number, numerals, or a concept of counting.

b. Pirahã is the only language known without color terms.

c. Pirahã is the only language known without embedding (that is, putting one phrase inside another of the same type or lower level, e.g. noun phrases in noun phrases, sentences in sentences, etc.).

d. Pirahã has the simplest pronoun inventory known and evidence suggests that Pirahã's entire pronominal inventory may have been borrowed (see Appendix Two).

e. Pirahã has no perfect tense.

f. Pirahã has perhaps the simplest kinship system ever documented.

g. Pirahã has no creation myths – its texts are almost always descriptions of immediate experience or interpretations of experience; it has some stories about the past, but only of one or two generations back.

h. The Pirahã in general have no individual or collective memory of more than two generations past.

i. Pirahã people do not draw, except for extremely crude stick figures representing the spirit world that they (claim to) have directly experienced.

j. Pirahã has no terms for quantification, e.g. 'all', 'each', 'every', 'most', 'some', etc.

In addition to these facts, the following facts provide additional overt evidence for ways in which culture can be causally implicated in the linguistic structure of the language:

(3) a. The phonemic inventory of Pirahã women is the smallest in the world, with only seven consonants and three vowels, while the men's inventory is tied with Rotokas and Hawaiian for the next smallest inventory, with only eight consonants and three vowels (Everett 1979).

b. The Pirahã people communicate almost as much by singing, whistling, and humming as they do using consonants and vowels (Everett 1985; Everett 2004).

c. Pirahã prosody is very rich, with a well-documented five-way weight distinction between syllable types (Everett, 1979; Everett 1988; Everett and Everett 1984).

For reasons of space, these additional facts on sound structure and cultural interactions are taken up in Appendix One, in the supplemental web materials. They are not crucial to the central arguments of this paper, but nonetheless offer strong, additional support for the causal role played by culture in structuring grammars.

A final fascinating feature of Pirahã culture, which I will argue in the final section to follow from (2) and (3), is given in (4):

(4) The Pirahã continue to be monolingual in Pirahã after more than two hundred years of regular contact with Brazilians and other non-Pirahã.

What we will see as the discussion progresses is that Portuguese grammar and communication violate (1), a profound cultural value among the Pirahã, leading to an explanation for (4).

Any of these properties is sufficiently unusual in itself to demand careful consideration. But their simultaneous manifestation in a single language suggests that there might be some sort of common unifying generalization behind them. They are sufficiently disparate formally, i.e. in terms of potential phrase-structure realizations, that any unifying principle is almost certainly to be found in their meaning, and that in the broadest sense of a constraint on cultural function. What I propose, again, is that Pirahã

culture avoids talking about knowledge which ranges beyond personal, usually immediate, experience or transmitted via such experience. All of the properties in (2) will be shown to follow from this. Abstract entities are not bound by immediate personal experience and so are not discussed by the people.

In developing the arguments to support these theses, I also argue against a simple Whorfian view, i.e. against the idea that linguistic relativity or determinism alone can account for the facts under consideration. In fact, I also argue that the unidirectionality inherent in linguistic relativity may offer an insufficient tool for language-cognition connections more generally, for failing to offer a more fundamental role for culture in shaping language.

This paper is organized as follows. First, I provide an overview of Pirahã ethnography. Next, I describe the absence of numbers, numerals, and counting in Pirahã, offering a summary of my own observations. Next I describe the absence of color terms and pronouns. The next section discusses the remaining items in (2a)-(2j). The penultimate section considers the facts in light of Pirahã cultural values. The final section discusses the lessons to be drawn from the case of Pirahã for linguistic theory, returning to the items listed in (2)-(4). There is no claim that the thesis in (1) or its relation to the facts of (2) has been proven in this paper, but rather that the relation has been supported and that there is no other obvious relation. Any other approach renders the observations in (2)-(4) coincidental.

There are five appendices to this article in the accompanying website. These include discussions of Gordon's (2004) article on numerosity in Pirahã (Appendix Three), the richness and cultural constraints on prosody and word-formation (Appendix One), evidence for pronoun-borrowing (Appendix Two), a full Pirahã text, illustrating many of the linguistic and cultural features discussed in this paper (Appendix Four), and an overview of Pirahã society and culture (Appendix Five).

PIRAHÃ NUMBER, NUMERALS, AND COUNTING

There is no grammatical number in Pirahã (Everett 1983; Everett 1986). There are thus no number contrasts on nouns, pronouns, verbs, or modifiers for number (´= high tone; no mark over vowel = low tone; '=glottal stop):

(5) **hiaitíihí** **hi** **kaoáíbogi** **bai** **-aagá**
Pirahã people he evil spirit fear -be
'The Pirahã are afraid of evil spirits.' OR *'A Pirahã is afraid of an evil spirit.'* OR *'The Pirahã are afraid of an evil spirit.'* OR *'A Pirahã is afraid of evil spirits.'*

(6) **kó'oí, kóhoibiíhai, hi píai, 'aáibígaí, hi**
name name he also, name 3

píai, hi koabáipí
also, he die
'Kó'oí, Kóhoibiíhai, and 'aáibígaí died.'

(7) **kó'oí hi koabáipí**
name he die
'Kó'oí died.'

(8) **báigipóhoaá 'i 'óooí kobai -baaí**
name:f she tarantula watch -intensely
'Báigipóhoaá watched the tarantula(s) closely.' (this can refer to one woman named 'Báigipóhoaá or several)

This particular feature of Pirahã is itself very rare (see Corbett 2000, 50ff). There may be no other languages that lack the grammatical category of number. Though I do not provide more examples of this lack here, there are further examples in the Pirahã text in the Appendix.

NO NUMERALS

There are three words in Pirahã that are easy to confuse with numerals, because they can be translated as numerals in some of their uses.[4] These are listed in (9)-(11):

(9) a. **hói** 'small size or amount'
b. **hoí** 'somewhat larger size or amount'
c. **bá** **a** **gi** **so** 'lit: cause to come together (loosely 'many')
touch -causative associa-tive nominalizer

Some examples which show how Pirahã expresses what in other cultures would be numerical concepts:

(10) a. **tí** **'ítíi'isi** **hói** **hii** **'aba'áigio** **'oogabagaí**
I fish small pred. only want
'I only want {one/a couple/a small} fish.' (NB: This could not be used to express a desire for one fish that was very large, except as a joke.)
b. **tiobáhai** **hói** **hii** 'small child/child is small/one child'

(11) a. **tí** **'ítíi'isi** **hoí** **hii** **'oogabagaí**

I fish larger pred. want
'I want {a few/larger/several} fish.'

b. **tí 'ítíi'isi báagiso 'oogabagaí**
I fish many/group want
'I want {a group of/many} fish.'

c. **tí 'ítíi'isi 'ogií 'oogabagaí**
I fish big want
'I want {a big/big pile of /many} fish.'

Interestingly, in spite of its lack of number and numerals, Pirahã superficially appears to have a count vs. mass distinction:

(12) a. **'aoói 'aaíbái 'ao'aagá 'oí kapió'io**
foreigner many exist jungle other
'There are many foreigners in another jungle.'

b. */? **'aoói 'apagí 'ao'aagá 'oí kapió'io**
foreigner much exist jungle other
? 'There are much foreigners in another jungle.'

(13) a. **'ágaísi 'apagí 'ao'aagá 'oí kapió'io**
manioc meal much exist jungle other
'There is a lot of manioc meal in another jungle.'

b. ***'ágaísi 'aaíbái 'ao'aagá 'oí kapió'io**
manioc meal many exist jungle other
*'There is many manioc meal in another jungle.'

However, this distinction is more consistently analyzed as the distinction between things that can be individuated and things that cannot, thus independent of the notion of counting. We return to this in 2.3. in the discussion of quantification.

There are likewise no ordinal numbers in Pirahã , e.g 'first', 'second', etc. Some of the functions of ordinals are expressed via body parts, in a way familiar to many languages:

(14) **ti 'apaí káobíi 'ahaigí hi tíohió'ío/gaaba káobíi**
1 head fall same generation he towards me/there stay fall
'I was born first then my sibling was born.' (lit: *'I head fall sibling to me/there at fall.')*

The two expressions in (14), **tíohió'ío/gaaba**, are interchangeable in most contexts. They refer to both intermediate points in a succession of participants, events, etc. or to the final position. But we need to be clear on one thing, namely, that the word 'head' does not really mean 'first', not if we assume that 'first' derives its meaning partially in opposition to 'second', 'third', etc. but overlaps with 'first' in referring to something 'at the beginning of a spatial or temporal sequence'.[5]

The Pirahã language has no words for individual fingers, e.g. 'ring finger', 'index finger', 'thumb', etc. They occasionally refer to their fingers collectively as 'hand sticks',

but only when asked by an insistent linguist. By the same reasoning, there is no word for 'last'. Moreover, they do not point with individual fingers. If they use any part of their arms for pointing, they tend to extend a flat hand, turned sideways, or an open palm facing up or down. More often, they point, as is common around the world, with their lower lip or jaw, or a motion of the head. When discussing a large quantity/number of objects, they do not make tallying motions on individual appendages, etc. If they use gestures, they hold the flat hand out, palm down, varying the distance between hand and ground to indicate the size of the 'pile' or amount under discussion. However, a seated Pirahã man or woman (though women rarely do this) occasionally will extend both feet and hands, with toes and fingers also extended to indicate a large number of individual items (they would not do this in my experience for a non-individuated quantity, such as manioc flour, but rather for bags of manioc flour, etc.). Other than these gestures, there is no other use of body parts, objects, or anything to indicate a concept of 'tallying'.

There are no quantifier terms like 'all', 'each', 'every', 'most', 'few' in Pirahã. There are also no 'WH-quantifiers' per se.[6] To appreciate this, let us consider the examples in (15)-(18), to see the closest expressions Pirahã can muster to these quantifiers:

ALL

(15) **hiaitíihí** **hi** **'ogi** **-'áaga** **- ó** **pi** **-ó**
Pirahã people he big -be (permanence) -direction water
-ó **kaobíi**
-direction entered
'All the people went to swim/went swimming/are swimming/bathing, etc.'

MOST

(16) **ti** **'ogi** **-'áaga** **-ó** **'ítii'isi** **'ogi** **-ó**
I big -be(perm) -direction fish big -direction

'i **kohoai-baaí,**
she eat -inten.

koga **hói** **hi** **hi** **-i** **kohoi** **-hiaba**
nevertheless small amount intens. intens. -be eat -not
'We ate most of the fish.' (lit: 'My bigness ate (at) a bigness of fish, nevertheless there was a smallness we did not eat.'

Example (17) is the closest I have ever been able to get to a sentence that would substitute for a quantifier like 'each', e.g. 'each man went to the field'.

EACH

(17) **'igihí** **hi** **'ogiáagaó** **'oga** **hápii;** **'aikáibaísi,** **'ahoáápati** **pío,**
man he bigness field went name, name also,
tíigi **hi** **pío,** **'ogiáagaó**
name he also bigness
'The men all went to the field, **'aikáibaísi, 'ahoáápati, tíigi** *all went.'*

FEW

(18) **gáta -hai hói hi -i**
can -foreign object small intens. -be
'aba -'á -ígi -o 'ao -aagá
remain -temp -associative location possession -be (temporary)

(**'aba'áígio** can often be translated as 'only', though I give its full morphological breakdown here to show that it is not really equivalent in meaning to 'only'. Nor does it share the full range of meanings of 'only')

'agaoa ko -ó
canoe gut -direction
'There were (a) few cans in the foreigner's canoe.' (lit: smallness of cans remaining associated was in the gut of the canoe')

However, there are two words, usually occurring in reference to an amount eaten or desired, which by their closest translation equivalents, 'whole' **báaiso** and 'part' **gíiái** might seem to be quantifiers:

(19) a. **tíobáhai hi bá -a -i -so**
child he touch -causative -connective -nominalizer
'whole'

kohoai -sóog -ab -agaí
eat -desiderative -stay -thus
'The child wanted/s to eat the whole thing.' (lit: 'Child muchness/fullness eat is desiring.')

b. **tíobáhai hi gíi -ái kohoai -sóog**
child he that -there eat -desiderative
'part' (in the appropriate context)

-ab -agaí
-stay -thus
'The child wanted/s to eat a piece of the thing.' (lit: 'Child that there eat is desiring.')

In (19) **báaiso** and **gíiái** are used as nouns. But they can also appear as postnominal modifiers:

(20) a. **tíobáhai hi poogaíhiaí báaiso kohoai**
child he banana whole eat

-sóog -ab -agaí
- desiderative -stay -thus

'The child wanted/s to eat the whole banana.' (lit: 'Child banana muchness/fullness eat is desiring.')

b. **tíobáhai** **hi** **poogaíhiaí** **gíiái** **kohoai** **-sóog**
child he banana piece eat -desiderative

-ab **-agaí**
-stay -thus
'The child wanted/s to eat part of the banana.' (lit: 'Child banana piece eat is desiring.')

Aside from their literal meanings, there are important reasons for not interpreting these two words as quantifiers. First, their Truth Conditions are not equivalent to those of real quantifiers. For example, consider the contrast in (21) vs. (22):

Context: Someone has just killed an anaconda. Upon seeing it, (21a) below is uttered. Someone takes a piece of it. After the purchase of the remainder, the content of (21a) is reaffirmed as (21b):

(21) a. **'áoói** **hi** **paóhoa'aí** **'isoí** **báaiso**
foreigner he anaconda skin 'whole'

'oaboi **-haí**
buy -relative certainty
'The foreigner will likely buy the entire anaconda skin.'

b. **'aió** **hi** **báaiso** **'oaob** **-áhá;** **hi** **'ogió**
affirmative he whole buy -complete certainty 3 bigness

'oaob **-áhá**
buy complete certainty
'Yes, he bought the whole thing.'

Now, compare this with the English equivalent, where the same context is assumed:

(22) a. STATEMENT: He will likely buy the whole anaconda skin.
b. OCCURRENCE: Piece is removed (in full view of interlocutors).
c. STATEMENT: %He bought the whole anaconda skin.

It simply would be dishonest and a violation of the meaning of 'whole' to utter it in (22b). But this is not the case in Pirahã, (21b).

Next, there is no truly quantificational-abstraction usage of **báaiso** 'whole':

(23) ***Ti** **'ísi** **báaiso** **'ogabagai,** **gíiái** **'ogi** **-hiaba.**
1 animal 'whole' want, piece want -negative

'I prefer whole animals to portions of animals.' (lit: 'I desire (a) whole animal(s), not piece(s).')

Sentences like (23) cannot be uttered acceptably in the absence of a particular pair of animals or instructions about a specific animal to a specific hunter. That is, when such sentences are used, they are describing specific experiences, not generalizing across experiences.

It is of course more difficult to say that something does not exist than to show that it does exist, since in the former instance a skeptic can always reply that you have not looked hard enough. Nevertheless facts like those discussed in this discussion, in the context of my nearly three decades of regular research on Pirahã, lead me to the conclusion that there is no strong evidence for the existence of quantifiers in Pirahã.

Given the lack of number distinctions, any nominal is ambiguous between singular, plural, and generic interpretation. This can lead to interpretations which seem quantificational, so we should discuss them here. Consider the examples in (24)-(25):

(24) **tí** **'iíbisi** **hi** **baiai** **-hiaba**
1 blood-one he fear -negative
'I am not afraid of beings with blood.'

(25) **kaoáíbogi** **hi** **sabí** **'áagahá**
evil spirit he mean is (permanent)
'Evil spirits are mean.'

On the surface it looks like these are quantificational phrases. They are of course ambigous between singular readings, e.g. 'I am not afraid of that being with blood' or plural readings 'Those evil spirits are mean', in addition to the generic, more quantificational readings given here. Although there is no word 'all' in Pirahã, it could be countered that perhaps it is the construction itself that produces the universal quantifier reading. Superficially, this seems appealing. But I think it is another manifestation of the translation fallacy. Even though there is a certain 'quantificational smell' here, the truth conditions, again, are not the same as for a real quantificational reading. In fact, I, along with anthropologists and others who have visited the Pirahã, have misunderstood statements like these and/or their literal translations, because we do translate them into Western languages as generic, universal quantification. These never mean that all beings with blood, for example, fail to inspire fear. That there are always exceptions is understood by the utterer and the hearer. It seems, though that such sets conform to (1) because such generic statements are bounded by immediate experience, e.g. 'all evil spirits I know about', and thus are not fully intensional. Rather each member of the set has to be inspected to see if s/he is an evil spirit or being with blood and, if so, whether s/he is like other beings like that or not. If not, the statements in (24) and (25) still hold.

COUNTING

In 1980, at the Pirahã' urging, my wife and I began a series of evening classes in counting and literacy. My entire family participated, with my three children (9, 6, and 3 at that time) sitting with Pirahã men and women and working with them. Each evening

for eight months my wife would try to teach Pirahã men and women to count to ten in Portuguese. They wanted to learn this because they knew that they did not/do not understand non-barter economic relations and wanted to be able to tell whether or not they were being cheated (or so they told us). After eight months of daily efforts, without ever needing to call the Pirahã to come for class (all meetings were started by them with much enthusiasm), the people concluded that they could not learn this material and classes were abandoned. Not one Pirahã learned to count to ten in eight months. None learned to add 3+1 or even 1+1 (if regularly responding '2' to the latter is evidence of learning – only occasionally would some get the right answer. This seemed random to us, as indeed similar experiences were shown to be random in Gordon's research, see Appendix Three).

In addition to this abortive attempt to teach counting, it is also important to the thesis of this paper to review Pirahã trade relations with the outside world, since it is from such relations that we would normally expect counting to emerge as a cultural necessity/goal. What follows is the barest of summaries.

Riverboats come regularly to the Pirahã villages during the Brazil nut season. This contact has probably been going on for more than two hundred years. Pirahã men collect Brazil nuts and store them around their village for trade. They know all traders by name and consider some more honest than others, their judgments in this regard always agreeing with judgments I formed later on my own, based on the quantity of items they receive for the nuts they trade. A Pirahã man will present whatever it is that he has to 'sell' to the owner of the riverboat, whether Brazil nuts, raw rubber, sorva, or wood. The Brazilian will ask in Portuguese, *O que quer meu filho?* 'What do you want my son?' The Pirahã responds *Só Papai sabe*, 'Only Father (i.e. the riverboat owner) knows.' The Pirahã call all riverboat owners *Papai* 'Father' when directly addressing them, but use Pirahã names for them (that are usually pejorative, e.g. 'No Balls', and so forth) when discussing them in Pirahã.[7] It is not clear that the Pirahã understand even most of what they are saying in such situations. None of them seems to understand that this exchange involves relative prestige, etc. Their Portuguese is very, very poor, again, but they can function in these severely circumscribed situations. The Pirahã will point at goods on the boat until the owner says that they are paid in full.[8] They will remember the items they received (but not exact quantities) and come tell me and other Pirahã what transpired, looking for confirmation that they got a good deal. There is little connection, however, between the amount of what they bring to trade and the amount of what they ask for. For example, someone can ask for an entire roll of hard tobacco in exchange for a small sack of nuts or a small piece of tobacco for a large sack. Whiskey is what the Pirahã men prefer to trade for and they will take any amount in exchange for almost anything. For a large quantity, but usually after they are drunk, they will also 'rent' their wives or daughters to the riverboat owner and crew for more whiskey (though, whatever transpires, the riverboat owner should not leave with any women). In this 'trade relationship' that the Pirahã have experienced regularly for over two hundred years, there is no evidence whatsoever of quantification or counting or learning of the basis of trade values. Pirahã living near the TransAmazon Highway are far from Brazil nut groves, so they trade fish to passing truck-drivers and some settlers. But these settlers are non-mobile, unlike riverboat traders. In these cases the Pirahã tend to be much more aggressive, because they know they are feared, and if they are not satisfied with the exchange (and they never are in this

situation in my experience) they simply return at night to steal produce from the settler's fields or any possessions not locked away.

It should be underscored here that the Pirahã ultimately not only do not value Portuguese (or American) knowledge, but they oppose it coming into their lives. They ask questions about outside cultures largely for the entertainment value of the answers. If one tries to suggest, as we originally did, in a math class, for example, that there is actually a preferred response to a specific question, this is unwelcome and will likely mean changing subjects and/or irritation. As a further example of this, consider the fact that Pirahã will 'write stories' on paper I give them, which are just random marks, then 'read' the stories back to me, i.e. just telling me something random about their day, etc. which they claim to be reading from their marks. They may even make marks on paper and say random Portuguese numbers, while holding the paper for me to see. They do not understand at all that such symbols should be precise (demonstrated when I ask them about them or ask them to draw a symbol twice, in which case it is never replicated) and consider their 'writing' as exactly the same as the marks that I make. In literacy classes (see above), however, we were never able to train a Pirahã to even draw a straight line without serious 'coaching' and they are never able to repeat the feat in subsequent trials without more coaching (partially because they see the entire process as fun and enjoy the interaction. But also because the concept of a 'correct' way to draw is profoundly foreign).[9]

As a supplement to this narrative background to Pirahã literacy and numbers, I refer the reader to Appendix Three, where I discuss Gordon's interesting report in order to underscore my claims that the Pirahã do not count.[10]

Finally, I agree that Pirahã and English are incommensurate in several ways and that numbers and counting are one very obvious manifestation of this incommensurability. But it is not clear that linguistic determinism provides the explanation we need. The reason is that the absence of counting is simply one unexpected absence in Pirahã language and culture. There are various others, partially enumerated in (2) above, that, when considered together, suggest that all together result from a higher-level cultural constraint or constraints. The constraint(s) must be cultural, it seems to me, because there does not seem to be any linguistic or cognitive commonality between the items in (2) above. But there is a cultural value that they share, namely, the value of referring only to immediate experience. If we accept this a strong cultural constraint in Pirahã, then all the items of (2) are greatly reduced because each involves quantification, rather than qualification, where I distinguish these two terms here as follows[11]:

(26) Quantification: quantification entails abstract generalizations that range in principle beyond immediate experience.

(27) Qualification: qualification entails judgments about immediate experience.

In the remaining sections, I want to consider a number of other 'lacunas' in Pirahã semantic domains. We begin by demonstrating the absence of color terms.

COLOR TERMS

According to the entry for Pirahã in Kay, Berlin, Maffi, and Merrifield (to appear):

"Múra-Pirahã presents a stable stage III$_{G/Bu}$ system. All four terms for black, white, red/yellow, and green/blue are used by all speakers with clearly defined ranges and very high consensus (100% maximum in all cases) in the term maps. There is also considerable uniformity in the individual naming arrays. No other terms were recorded in the naming task.

The term for black, ***bio^{3}pai^{2}ai^{3}****,* extends strongly into brown and more weakly into purple, which may represent the vestiges of an earlier black/green/blue range for this term. The white term* ***bio^{3}pai^{2}ai^{3}*** [sic; the term meant is: ***ko^{3}biai^{3}***, DLE] *and red/yellow term* ***bi^{3}i^{1}sai^{3}*** *(the latter focused in red and extended into purple) are of interest in that they show signs of coextension in yellow, both in the aggregate naming arrays and in their ranges on the term maps. While focal yellow (C9) is named* ***bi^{3}i^{1}sai^{3}*** *in the aggregates, both terms include it in their ranges, as seen in the term maps. Individual speakers vary in preference between these two terms for inclusion of yellow. Grue is named* ***a^{3}hoa^{3}saa^{3}ga^{1}****. Its term map indicates a focus in green, and is extended into yellow by some speakers.*

** The raised numerals following each syllable indicate tone."*

The proposed color terms of Sheldon are given in Table 1:

Symbol	Term	Gloss	Users	BCT
#	*bio^{3}pai^{2}ai^{3}*	black (extended)	25	+
-	*ko^{3}biai^{3}*	white (extended)	25	+
+	*bi^{3}i^{1}sai^{3}*	red/yellow	25	+
o	*a^{3}hoa^{3}saa^{3}ga^{1}*	green/blue (green-focused)	25	+

Table 1: Word Color Survey Chart of Pirahã Color Terms

In fact, these are not morphologically simple forms. Three are not even words, as shown by the morphological divisions and glosses in (28)-(30):[12]

(28) a. ***bio^{3}pai^{2}ai^{3}*** 'blood is dirty'

b. ***bii*** ***-o^{3}pai^{2}*** ***ai^{3}***
blood -dirty/opaque be/do

(29) a. ***ko^{3}biai^{3}*** 'it sees'

b. ***k*** ***-o^{3}bi*** ***ai^{3}***
object -see be/do

(30) a. ***bi^{3}i^{1}sai^{3}*** 'blood-like'

b. ***bi³i¹*** ***-sai³***
blood -nominalizer

(31) a. ***a³hoa³saa³ga¹*** 'temporarily being immature' (ahoa –s –aag –a)
b. ***a³hoa³s*** ***aa³ga¹***
immature be:temporary

(32) CONCLUSION: There are no color terms in Pirahã.

This conclusion is not intended as an indictment of Sheldon's claims. It is easy enough to see how someone looking for color terms would find them in Pirahã. When one is armed with a set of categories (e.g. the Berlin and Kay (1969) model for color terms, etc.) and no other, then it is understandable that one finds what one can talk about – i.e. that a degree of linguistic relativity colors the research of linguists. And I remind the reader that, as described in Everett (2004), linguistics research among the Pirahã is monolingual. There is no way to get translations from the Pirahã of any precision whatsoever for color terms, number words, verb-suffixes, etc. All meaning has to be worked out by correlating context with utterance (in the most extreme form of Quine's (1960) *gavagai*-confronting fieldresearcher) and by simply learning enough of the culture and language oneself to develop incipient intuitions that guide further testing and reasoning.[13]

However, there is a possible objection to the conclusion that there are no color terms in Pirahã. Paul Kay (personal communication) suggests that if the Pirahã use these phrases regularly in normal speech to describe exactly these colors and the related color 'spaces', then the phrases themselves count as color terms. This is a different concept of color term than I had in mind, namely, morphologically simple terms for colors. But even if we grant Kay's point, that these phrases are idiomatically restricted in certain environments, say, to denote the colors of things, my basic point is the same, namely, that these phrases not only are not simple color words, but that there is no use of color quantification in Pirahã, e.g. 'I like red' or 'I like red things'. At the very least, this absence of morphologically simple color words and absence of quantification (as in generalized quantifier theory, where NPs may be used to denote sets of properties) using color indicate that Pirahã color description is a very different kind of thing from what our experience with other languages would lead us to expect.

There have been no controlled experiments to show whether the Pirahã distinguish colors like or unlike speakers of languages which have color terms. However, I have asked them about different colors on many occasions and I have not noticed any inability to offer distinct descriptive phrases for new colors. Therefore, I expect that the Pirahã would show good ability to distinguish colors under controlled circumstances, unlike their ability with numbers. This is likely because of the fact that color is different from number cognitively and culturally. But since neither color nor number terms are found in Pirahã, it is reasonable to ask what color terms have in common with numbers. Well, both are used to quantify beyond immediate, spatio-temporally bound experience. If you have a concept of a red, as opposed to immediate, non-lexicalized descriptions, you can talk about 'red things' as an abstract category, e.g. 'don't eat red things in the jungle' (good advice). But Pirahã don't refer to plants by generic names, but by species

names. And they don't talk about colors except as describing specific objects in their own experience.

PRONOUNS

In this section, I want to discuss another interesting aspect of Pirahã grammar, its pronoun system. Pirahã has the simplest pronoun inventory known. Moreover, it appears that all its pronouns were borrowed recently from a Tupi-Guarani language, either the Lingua Geral or Kawahiv (Tenharim or Parintintin). How are these unusual facts then to be related to cultural constraint (1)? Well, somehow the grammar seems to have gotten by without them.[14] But even their current use in the grammar shows that they do not have the full range of uses normally associated with pronouns in other languages. For example, Pirahã pronouns function very differently in discourse than most pronouns. They are rarely used relative to English, Navajo, or just about any other language studied. Consider the text in the Appendix, for example, about the killing of a panther. In almost every line of the text a word for 'panther' is repeated. Only when the panther dies is it substituted completely by the 'pronoun' **s-/is-**, which is simply the first syllable (**s-** is how it comes out in rapid speech, like English 'snot either' for 'It is not either') of the word **'ísi** 'animal/meat', which is what it has become after death. That is, while the panther is a primary participant of the discourse, a word for panther (e.g. 'black one', 'marked one', 'cat') is used in almost every line. This is strange in light of most work, e.g. Givon (1983) on 'topic-continuity' in discourse. And this is the common, perhaps exclusive pattern of pronoun vs. proper noun occurrence in discourse. The Pirahã prefer not to use pronouns to refer to an entity, since this is less specific, using something ambiguous or vague in place of a proper name. Pronouns are used relatively little for marking the activities of discourse participants. They are also not used as variables bound by quantifiers. There is no Pirahã equivalent to a 'donkey sentence' (*'Everyone who owns a donkey beats **it***') for example. This reduced role for pronouns is striking. Not only does it follow from (1), but in fact the absence of pronouns prior to their borrowing seems likely. What 'pronouns' in Pirahã are mainly used for is agreement, as described in detail in Everett (1987).

Now, one reader of this paper suggested that Pirahã does in fact have variables, in spite of my claim that they play no active role in quantification or the grammar of pronominals. This reader suggests that verbs and nouns are variables, because they are place-holders for large sets of objects. In fact, although this proposal might work for other languages, it does not go through for Pirahã. First, there are only 90 verb roots in the entire Pirahã lexicon. That is, verbs are a closed-lexical class in Pirahã. This means that rather than learn them as variables, the Pirahã can learn them as constants, one-by-one. Moreover, as I show in Appendix Two, the combination of verbs is constrained largely by culture. Further, it is unnecessary to consider nouns variables, since (i) there is no nominal morphology and (ii) the appearance of nouns in the syntax can be determined semantically rather than morphologically, meaning that the behavior of nouns could be determined by their individual meanings rather than their role as variables. So, interestingly, both nouns and verbs behave more like constants than variables in Pirahã.

Let us now turn to consider one more unusual feature of Pirahã, perhaps the strangest of all, namely, the absence of clear evidence for embedding. Indeed the evidence suggests that Pirahã lacks embedding altogether.

I take it as established, therefore, that Pirahã has no number, no numerals, no

counting, and no color terms. I turn now to another surprising feature of Pirahã grammar – its lack of clear evidence for embedding.

LACK OF RECURSION IN PIRAHÃ

This section will consider in turn the absence of embedding from what would be expected to appear as clausal complements, the absence of embedding in (co-)relative clauses, modifier phrases, possession and, finally, morphology.

Let us being by considering how the function of clausal complements is expressed in Pirahã without embedding. English expresses the content of verbs like 'to say', 'to think', 'to want', etc. as clausal complements (I intend the use of 'S' to label the embedded clauses to be theory-neutral):

(33) I said that [$_S$ John will be here].
(34) I want for [$_S$ you to come].
(35) I think [$_S$ it's important].

The contents of such verbs, to the degree that equivalent verbs exist at all in Pirahã, are expressed without embedding:

(36) **ti gái -sai kó'oí hi kaháp -ií**
1 say -nom. name he leave -intention
'I said that kó'oí intends to leave.' (literally 'My saying **kó'oí** intend-leaves')

The verb 'to say' **gái** in Pirahã is always nominalized. It takes no inflection at all. The simplest translation of it is as a possessive NP, 'My saying', with the following clause interpreted as a type of comment. The 'complement clause' is thus a juxtaposed clause interpreted as the content of what was said, but not obviously involving embedding. Pirahã has no verb 'to think', using instead – like many other Amazonian languages, see Everett (2004), the verb 'to say' to express intentional contents, so to say that 'John thinks that ...' would be expressed in Pirahã as 'John's saying ...'. English complement clauses of other types are handled similarly in Pirahã, namely, one of the clauses is nominalized:

(37) a. **hi ob -áa'ái kahaí kai -sai**
he see -attractive arrow make -nom.
'He knows how to make arrows well.' (lit: 'He sees attractively arrow-making')

OR

b. **kahaí kai -sai hi ob -áa'ái**
arrow make -nom. he see -attractive

c. ***hi kahaí kai -sai ob -áa'ái**
he arrow make -nom. see -attractive

There are two plausible analyses for this construction. The first is that there is embedding, with the clause/verb phrase 'arrow make' nominalized and inserted in direct object position of 'matrix' verb, 'to see/know well'. The second is that this construction is the paratactic conjoining of the NP 'arrow-making' and the clause 'he sees well'. The latter analysis seems to fit the general grammar of Pirahã better. This is because as an object the phrase 'arrow-making' should appear before the verb, whereas here it follows it. And there is never any clitic-agreement with such 'object complement clauses' in Pirahã, whereas normally there is optional clitic-agreement available with any direct object (Everett 1988). Further, although as (3'b) shows, the order of 'complement' and 'matrix' clauses can be reversed, the 'embedded' clause can never appear in direct object position, (3'c).

As further evidence of the analysis, consider the corresponding interrogative form of (38):

(38)	**hi**	**gó**	**'igí**	**-ai**	**kai**	**-sai**	**hi**	**'ob**
	he	WH	associate	-do/be	make	-nom.	he	see

-áa'ái
-attractive
'What (thing/kind of) making (does he) know well?' (lit: 'He what associated making sees well?')

(39) ***hi gó 'igi -ai 'ob -áa'ái kai -sai**
'What thing (does he) know well to make?' (lit: 'What associated thing he knows well to make/making?'

To ask a question about (37), the order of the clauses must be that in (38). This follows if there is no embedding, because (i) the interrogative word must always be initial in the phrase and (ii) the appearance of the entire clause/phrase at the front of the construction means that the question of extraction over/from within an embedded or other phrase does not arise. We can, indeed should, interpret (38) as questioning of a constituent of the initial clause, 'arrow-making' and not of an embedded constituent of the clause 'he knows x well'.

Some readers might still find it difficult to accept analyzing nominalized clauses of the type just mentioned apart from embedding, simply because the two are so closely associated in many languages (see Koptjevskaja Tamm (1993)). The response is, first, that nominalization is neither a necessary nor a sufficient condition for embedding. Second, the embedding analysis fails to account for multiple embeddings (why can't multiple nominalized or other types of subordination occur in any sentence?), or for the extraction and word-order facts. On the other hand, there is a close semantic unit formed by certain juxtaposed clauses, e.g. those above, and the nominalization is accounted for by (1b), apart from embedding, which is stated in terms of utterances, rather than clauses.

Other 'subordinate' clauses similarly show no evidence of embedding.

(40)	**ti**	**kobai**	**-baí**	**'áoói,**	**hi**	**'íkao**	**-ap**	**-áp**
	I	see	-intensive	foreigner	he	mouth	-pull	-up

-iig **-á**
-continuative -declarative
'I really watch(ed) the foreigner fishing (with line and hook).' (lit: 'I watch the foreigner intensively. He was pulling (fish) out by (their) mouths.')

(41) ***hi** **gó** **'igí** **-ai** **hi** **'íkaoapápiigá**
he WH associate -do/be he fish
hi **kobai** **-baí** **'áoói**
he see -intensive foreigner
'What did he pull out by the mouth you watched intently?'

(42) **hi** **gó** **'igí** **-ai** **hi** **kobai** **-baí** **'áoói,**
he WH associate -do/be he see -intensive foreigner
'What did he see the foreigner do/why did he watch the foreigner'

Example (41) is ungrammatical because there is no relation that can be understood to obtain between the two clauses. It is asking a question about one clause and making a statement with the other. Since they are not in the same sentence, however, they just come across as unrelated, at least to judge by the looks of incomprehension and lack of interpretation native speakers face in such elicited constructions.

On the other hand, (42) is fine, because it is simply asking about what someone watched – the answer could be a clause or an NP.

Now consider how temporal clauses are handled:

(43) **kohoai** **-kabáob** **-áo,** **ti** **gí** **'ahoai** **-soog**
eat -finish -temporal I you speak -desiderative

-abagaí
-frustrated initiation
'When (I) finish eating, I want to speak to you.' (lit: 'When eating finishes, I speak-almost want')

There is almost always a detectable pause between the temporal clause and the 'main clause'. Such clauses may look embedded based on the English translation. But I see no evidence for such an analysis. Perhaps a better translation would be 'I finish eating, I speak to you.' Consider the similar conditional, which uses nominalization:

(44) **pii** **-boi** **-sai** **ti** **kahapi** **-hiab**
water vertically move -nominalizer I go -negative

-a
-declarative
'If it rains, I will not go.' (lit: 'Raining I go not.)

Both (43) and (44) are best analyzed as simple juxtaposition of two clauses. There is a clear semantic dependency, but this does not necessarily translate into a syntactic relation. The only way I am aware of to ask questions about either of them are, e.g. 'When will you want to speak to me' and 'Why won't you go?'

Pirahã has no relative clauses proper. However, it does have a co-relative clause (Everett, 1986, 1992), as exemplified in (45):

(45)	**ti**	**baósa**	**-ápisí**	**'ogabagaí.**	**Chico**	**hi**	**goó**	**bag**	**-áoba**.
	I	cloth	-arm	want.	name	he	what	sell	-completive

'I want the hammock. Chico what sold.'

There is a full sentence pause between the verb **'ogabagaí** 'want' and the next clause. The two sentences are connected contextually. But this is not embedding. They are each independent, well-formed sentences. The second sentence, on its own, would be a question 'What did Chico sell?' In this context, however, it is the co-relative.

As a final example consider the absence of 'want'-like embeddings, which are handled in Pirahã by a desiderative suffix on the verb, with no evidence of biclausality:

(46)	**'ipóihií**	**'í**	**gí**	**kobai**	**-soog**	**-abagaí**
	woman	she	you	see	-want	-frustrated initiation

'The woman wants to see you.'

Let us now consider other potential cases of embedding in Pirahã, e.g. possession and modification.

(47)	***kó'oí**	**hoagí**	**kai**	**gáihií**	**'íga**	
	name	son	daughter	that	true	

'That is kó'oí's son's daughter'.

(48)	***kaóoí**	**'igíai**	**hoagi**	**kai**	**gáihií**	**'íga**
	who					

'Whose son's daughter is that?'

Neither the declarative (47) nor the interrogative (48) form of recursive possession is acceptable. There is just never more than one possessor allowed per NP. Take out one of the possessors in (47) or (48) and the sentence is grammatical. A cultural observation here is, I believe, deeply important to understanding this restriction. Every Pirahã knows every other Pirahã, from all villages, and they add the knowledge of newborns very quickly, the news passed from village to village very quickly. So one level of possessor is all that would be ever needed – there is simply no need to give further identification. If such identification is needed, however, say in the case of a foreign family, then an extra phrase is juxtaposed:

(49)	**'ísaabi**	**kai**	**gáihií**	**'íga.**	**kó'oí**	**hoagí**	**'aisigí**	**-ai**
	name	daughter	that	true.	name	son	the same	-be

'That is 'ísaabi's daughter. kó'oí's son, being the same.'

This juxtaposition thus makes it clear that **'ísaabi** is **kó'oí**'s son. Let us now consider the claim that there is no recursive modification in Pirahã.

Very rarely one encounters multiple modification in natural discourse and elicited material. A typical example is given in (50):

(50) **gahióo** **'ogií** **biísai** **hoí** **-hio** **'ao** **-'aagá**
airplane big red two there possess -be
'There are two big red airplanes.'

Although this type of multiple modification is very, very rare, it nevertheless occurs. There seems no need to analyse it as embedding, however, but merely, like previous cases, as juxtaposition, stringing out a small number of adjectives in a specified order (e.g. size + color + quantity). There is no ambiguous modification resulting from multiple 'attachment' possibilities as in English (51):

(51) Old men and women.

The ambiguity here is usually understood as the result of attaching 'old' to either the NP containing 'men and women' or to the lower NP containing only 'men'. Since there is no way for 'old' to attach uniquely to 'women', that third ambiguity (where only women would be old) is ruled out. However, Pirahã never allows such conjunction of NPs with modifiers. Rather, the equivalent of (51) in Pirahã would be:

(52) **'ogi** **-áag** **-aó** **toío** **-'aagá** **'igihí,** **'ipóihií** **píaii**
big -be -thus old -be man, woman also
'Everyone (lit: 'people bigness') *is old. Men and women too.'*

Once again, however, (52) involves juxtaposition. This is further supported by the ability to repeat the modifier 'old' in the construction:

(53) **'ogiáagaó** **toío'aagá** **'igihí** **toío'aagá,** **'ipóihií** **toío'aagá** **píaii**
big old man old, woman old also
'Everyone (lit: 'people bigness') *is old. Men and women too.'*

There is likewise no evidence for embedding in Pirahã morphological structure either. In Everett (1986) I sketch the verbal morphology of Pirahã, noting that there are about sixteen separate classes of suffixes. Although I have changed this analysis somewhat, the overall complexity of the verb remains very high, with perhaps more than sixteen suffix classes. However, there is no fact about semantic composition, stress, or morphological attachment that requires recourse to the notion of embedding to account for Pirahã morphology. The system, however complex, can be accounted for by a 'position class' analysis, along the lines of Everett (1986) in which individual morphemes

occupy linearly arranged, semantically distinguished slots. The reader is referred to Appendix Two in the web-based supplemental materials for further discussion.

If indeed there is no embedding in Pirahã, how might this lack be related to cultural constraint (1) above? Embedding increases information flow beyond the threshold of (1b). Although Pirahã most certainly has the communicative resources to express clauses expressed by embedding in other languages, e.g. English, there is no convincing evidence that Pirahã in fact has embedding and, as we have seen, reasons to doubt that it does, since positing it would complicate our understanding of question-formation. This would follow from (1b) which I take to be the iconic principle constraining the grammar's conformity to (1a).[15]

Let's return to the facts given earlier, the surprising gaps in Pirahã and discuss them in terms of possible cultural constraints.

TENSE

Everett (1993) argues that Pirahã has no perfect tense and provides a means for accounting for this fact formally within the neo-Reichenbachian tense model of Hornstein (1990).[16] Perfect tense is a relative tense which is derivative on absolute tenses (to use Comrie's (1985) terminology). It is important to underscore that Everett (1993) is making a point about the *semantics* of Pirahã tense, not merely the morphosyntax of tense representation. In other words, the claim is that there is no way to get a perfect tense *meaning* in Pirahã, not merely an absence of a formal marker for it. Pirahã, according to Everett (1993) has two tense-like morphemes, **-a** 'remote' and **-i** 'proximate'. These are used for either past or present events and primarily are used to mark whether an event is in the immediate control or experience of the speaker ('proximate') or not ('remote').

It is also pointed out in that work that Pirahã has very few words for time at all. The few they have are given in (54)-(65):

(54)	**'ahoapió**	'another day' (lit: 'other at fire')
(55)	**pi'í**	'now'
(56)	**so'óá**	'already' (lit: 'time-wear')
(57)	**hoa**	'day' (lit: 'fire')
(58)	**ahoái**	'night' (lit: 'be at fire')
(59)	**piiáiso**	'low water' (lit: 'water skinny temporal')
(60)	**piibigaíso**	'high water' (lit: 'water thick temporal')
(61)	**kahai'aíi 'ogiíso**	'full moon' (lit: 'moon big temporal')
(62)	**hisó**	'during the day' (lit: 'in sun')
(63)	**hisóogiái**	'noon' (lit: 'in sun big be')
(64)	**hibigíbagá'áiso**	'sunset/sunrise' (lit: 'he touch comes be temporal')
(65)	**'ahoakohoaihio**	'early morning, before sunrise' (lit: 'at fire inside eat go')

Absolute tenses are defined relative to the moment of speech, which is represented as 'S' in the H-R system. The event or state itself is shown as 'E'. Relative tenses are represented by the linear arrangment of S and E with respect to the point of R(eference) for E. So, for example, the tenses of English can be represented in this system as in (66) (where ',' = simultaneous and __ = precedes; see Hornstein (1990) and Everett (1993) for details):

(66)

a.	S,R,E	'present tense'
b.	S___R,E	'future tense'
c.	E, R___S	'past tense'
d.	E___R___S	'past perfect'
e.	S___E___R	'future perfect'
f.	E___S,R	'present perfect'

To account for Pirahã's lack of the perfect, I suggested that [R] is parameterized, with [-R] as the default value. A child would set it at [+R] just in case she heard a perfect tense utterance or, perhaps, a perfect tense interpretation. In that paper, I also noticed the connection between the absence of an R-point in the semantics of Pirahã tense system and the lack of concern with quantifying time in Pirahã culture. I argued that formal grammars actually require any non-coincidental connection in this regard to be Whorfian, namely, that language influences culture, since otherwise the child would have to learn her culture in order to learn her grammar, an order of acquisition proscribed in Chomskyan models. However, in the context of the present exploration of culture-grammar interactions in Pirahã, it is possible, perhaps, to situate the semantics of Pirahã tense more perspicaciously within the overall context, by seeing the absence of precision temporal reference and relative tenses as one further example of (1). This would follow since precision temporal reference and relative tenses quantify and make reference to events outside of immediate experience and cannot, as can all Pirahã time words be binarily classified as 'in experience' and 'out of experience'.

THE CONCEPT OF 'BOUNDARY OF EXPERIENCE' IN PIRAHÃ

When the Pirahã here a boat coming, they will line up on the banks of the river and wait for it to come into sight. They will say 'the boat **'ibipío** arrived'. They will watch a boat disappear around the corner and say 'the boat **'ibipío** left'. When a match is lit, they say that 'the match **'ibipíai** ' (where the **-ai** is the verb form and **-o** the incorporated form).[17] They will repeat the same expression when the match goes out, 'the match **'ibipíai**'. They especially use this for a flickering match and love to watch such a match, saying 'Keep on **'ibipíai**'. After discussions and checking many examples of this, it became clearer that the Pirahã are talking about liminal experiences, i.e. where an item goes in and out of the boundaries of their experience, the flame of a match starting or stopping – in either case it is crossing their experience. A boat leaving or coming is also crossing experience. This term and concept are found throughout Pirahã culture and are very important. The Pirahã's excitement of seeing even a canoe go around a river bend is hard to describe unless you have seen it. The Pirahã see this almost as traveling into another dimension (I say 'almost' because I cannot say with certainty that this is their perception, but this does seem to be an accurate assessment). It is interesting, in light of the postulated constraint in (1) above that there is an important Pirahã term and cultural value for passing across the borderline of experience and non-experience.

KINSHIP TERMS

Pirahã's system may be the simplest system yet recorded. An exhaustive list of the kinship terms is given in (67) – unless specifically mentioned there are no gender distinctions:

(67)
a.	**'ahaigí**	'ego's generation'
b.	**tiobáhai**	'any generation below ego'
c.	**baí'i**	'any generation above ego/someone with power over ego'[18]
c'.	**'ogií**	'any generation above ego/someone with power over ego' (lit: 'big')
d.	**'ibígaí**	'usually two generations above ego or more, but overlaps with c. and c.')' (lit: 'to be thick')
f.	**hoagí**	'biological son' (lit: 'come next to')
g.	**hoísai**	'biological son' (lit: 'going one')[19]
h.	**kaai**	'biological daughter' (a house is a **kaaiíi** 'daughter thing')
i.	**piihí**	'child of at least one dead parent/favorite child'[20]

Is it a coincidence, another one, that this kinship system is found in Pirahã, given the other facts we have been discussing? Or could it be of a piece with all that we have seen, another effect of (1)? The latter seems the most economical and satisfying explanation. Note that the kinship terms only refer to known relatives. One never refers to relatives that died before one was born. During one four-week period in 1995 I worked exclusively on trying to build a genealogy for an entire village. I could not find anyone who could give the names of his/her great-grandparents and very few who could remember the names of all four grandparents. Most could only remember (or would only give) the names of one or two grandparents. I was able to include names back four generations from my main informant, but that was only because there were two unusually old Pirahã (both women) in the village who could remember two grandparents each. The simple fact is that the kinship terms conform exactly to (1).

Since kinship and marriage constraints are closely related in most societies, it is worth mentioning the effects of this simple kinship system on Pirahã marriage relations. Not surprisingly, in light of this system, marriage is relatively unconstrained. Pirahã can marry close relatives. I have seen adults I knew to share one biological parent marry and am told that this is not rare. But I have never seen a marriage between full-biological siblings. Some people say it exists, but I have never witnessed it.

This raises the additional question of how or whether the Pirahã distinguish between just anyone at their generation and biological siblings. They seem to keep track of this pretty well. This is surprising as well because children not uncommonly switch families and are occasionally raised by the village, especially orphans. But people do keep track of their biological siblings.

There is a nominal suffix in Pirahã, **-gíi** meaning 'real' or 'true'. Pirahã can add this to most nouns, including kinship terms, as shown in (68)-(69):

(68)
a.	**'áoói**	'foreigner'
b.	**'áoói–gíi**	'Brazilian' (lit: 'real foreigner' – the ones they knew first)

(69)
a.	**'ahaigí**	'same generation'

b. **'ahaigí–gíi** 'biological sibling' (lit: 'real sibling')

ABSENCE OF CREATION MYTHS AND FICTION

The Pirahã do not create fiction, e.g. fables, fairy-tales, legends, etc. And they have no creation stories or myths. This contrasts with information that we have on the related language, Mura. Nimuendaju (1948) is not the only one to have observed that the Mura people have a rich set of texts about the past. All of this field research, however, was carried out in Portuguese, so it is difficult to evaluate. If we had texts in the Mura language, it would be easier in principle to verify, e.g. by grammatical and topical devices, the authenticity of the texts or whether they might have in fact been borrowed. In any case, it seems unavoidable that Mura, a dialect closely related to Pirahã, had texts about the distant past, perhaps fables, some legends, and other fiction (and, in Portuguese, according to some anthropologists (see Oliveira (1978)) it still has such texts.[21]

I have attempted to discuss cosmology, the origin of the universe, etc. with the Pirahã innumerable times. My relations with them are extremely good. They themselves initiate many of these discussions. So there is no longer any question of reticence to discuss the 'true story' with me as an outsider. In the early days, before I spoke Pirahã, I would occasionally try to use Portuguese to elicit the information. Often this or that Pirahã informant would tell me (in Portuguese) that they had stories like this and would even tell me bits and pieces, which I thought were similar to Christian stories or Tupi legends common in that part of Brazil (e.g. the widespread beliefs about river porpoises and dolphins, especially the pink-dolphin, emerging from the rivers at night to take on human form and go in search of human women to marry/rape/etc.). Indeed now that I speak Pirahã, I know that even among themselves the Pirahã repeat and embellish these stories. It is clear, therefore, that the Pirahã can utter fictional stories. But there are two important observations to make in order to understand the role of these stories in Pirahã culture. First there are no indigenous creation myths or fiction any longer, if indeed they ever existed. There is not a single story about the ancient past told by any Pirahã other than bits and pieces of Tupi and Portuguese stories (which are not always acknowledged as such). Pirahã say, when pressed about creation, for example, simply that 'Everything is the same', meaning that nothing changes, nothing was created. Second, talking about the stories of other cultures can be best understood, it seems to me, as the Pirahã 'mentioning' texts that they have experienced qua texts. It is not a case of them 'using' the texts to seriously discuss or explain anything in the world around them or the ancient world. They thus are like oral literary theorists in their telling and discussion of the texts of others. Further, the claim that Pirahã lacks myths is further supported by (i) the fact that Nimuendaju (1948) though easily collecting myths from the Mura, was unable to collect them from the Pirahã; (ii) no one ever refers to a mythical figure, story, or concept in normal conversation; (iii) when questioned directly about creation, the Pirahã deny that anything was created, claiming that the way things are is the way they have always been.

DISCUSSION

Let's review the gaps we began with:

(2) a. Pirahã is the only language known without number, numerals, or a concept of counting.

b. Pirahã is the only language known without color terms.

c. Pirahã is the only language known without embedding.

d. Pirahã has the simplest pronoun inventory known and evidence suggests that Pirahã's entire pronominal inventory may have been borrowed.

e. Pirahã has no perfect tense.

f. Pirahã has perhaps the simplest kinship system ever documented.

g. Pirahã has no creation myths – its texts are almost always descriptions of immediate experience or interpretations of experience; it has some stories about the past, but only of one or two generations back.

h. The Pirahã in general have no individual or collective memory of more than two generations past.

i. Pirahã people do not draw, except for extremely crude stick figures representing the spirit world that they (claim to) have directly experienced.

j. Pirahã has no terms for quantification, e.g. 'all', 'each', 'every', 'most', 'some', etc.

We have seen that these facts follow from (1). One might object that (1a) and (1b) seem tenuously related at best. However, I believe that (1b) is simply a form-iconic expression of the meaning restriction in (1a). Each utterance is a single 'experience'. If this is correct, then all the facts above follow.

Pirahã thus provides striking evidence for the influence of culture on major grammatical structures. This contradicts the following assertion:

> *"In fact, virtually all linguists today would agree that there is no hope of correlating a language's gross grammatical properties with sociocultural facts about its speakers."*
> (Newmeyer (2002, 361))

If I am correct, Pirahã in fact shows that gross grammatical properties not only correlate with sociocultural facts but can be determined by them.

But if this is correct, what does this mean for the nature of human language or, at least, for Pirahã as a normal human language? It is useful in this regard to review the well-known 'design features' of human language proposed by Hockett (1960). These are given in (71)

(71) HOCKETT'S DESIGN FEATURES OF HUMAN LANGUAGE

1. Vocal-Auditory Channel
2. Broadcast Transmission and Directional Reception
3. Rapid Fading
4. Interchangeability
5. Total Feedback
6. Specialization
7. Semanticity
8. Arbitrariness
9. Discreteness
10. Displacement
11. Productivity

12. Duality of Patterning
13. Traditional Transmission

The three features that stand out in particular here are (i) Interchangeability; (ii) Displacement; and (iii) Productivity. So let us take these up in turn.

To the degree that counting is absent as a concept from the Pirahã language, that semantic or cognitive domain is incommensurate and not interchangeable with languages that can discuss counting. I suspect that there are other domains of Pirahã where interchangeability is also absent, but in the domain of counting, the lack of interchangeability can be considered established (see Appendix Three for more details from Gordon (2004)). I submit that the evidence is sufficient in this case to conclude that Design Feature 4 is not uniformly inviolable.

With regard to Displacement, I believe that the facts above show that it is heavily restricted in Pirahã, as a cultural principle. Pirahã of course exhibits Displacement because people talk regularly about things that are absent from the context at the time of talking about them. But this is but one degree of Displacement. The ability to talk about things in principle removed from personal experience, e.g. abstractions of the type represented by counting, numbers, quantification, multigenerational genealogies, complex kinship, colors, and other semantic/cultural domains discussed above, show that Displacement is severely constrained in Pirahã grammar and language (I-language and E-language in Chomsky's (2002) terms) by Pirahã culture.

Item 11 in Hockett's list, Productivity, is also shown to be severely restricted by Pirahã culture, since there are simply things that cannot be talked about, for reasons of form and content, in Pirahã in the current state of its grammar.

So where does this take us? Consider again the lessons projected earlier:

(72) (a) if culture is causally implicated in grammatical forms, then one must learn one's culture to learn one's grammar. But then a grammar is not simply 'grown', contra Chomsky (2002);

(b) linguistic fieldwork should be carried out in a cultural community of speakers because only by studying the culture and the grammar together can the linguist (or ethnologist) understand either;

(c) smorgasbord studies, that is, studies which merely look for constructions to interact with a particular thesis by looking in a non-statistically sophisticated way at data from a variety of grammars, are fundamentally untrustworthy because they are too far removed from the original situation. This is bad because grammars, especially grammars of little-studied languages, need an understanding of the cultural matrix from which they emerged to be properly evaluated or used in theoretical research;

(d) particulars can be as important as universals. This follows because each culture-grammar pair could in principle produce unique tensions and interactions found nowhere else, each case extending the parameters of our understanding and of the interaction of culture and grammar.

These lessons seem to be validly drawn from the discussion of this paper. Now let us consider a final unusual feature of Pirahã, to be addressed here, from (4) above:

(4) The Pirahã continue to be monolingual in Pirahã after more than two hundred years of regular contact with Brazilians and other non-Pirahã.

New light is shed on this question by the preceding discussion, conforming to many of the Pirahã' own narrative explanations of this fact. Simply, Portuguese is incommensurate with Pirahã in many areas and culturally incompatible, like all Western languages, in that it violates (1) in so many aspects of its structure and use. The Pirahã say that their heads are different. In fact the Pirahã language is called **'apaitíiso** 'a straight head', while all other languages are called **'apagáiso** 'a crooked head'. Our discussion here, I believe, helps us to understand this as more than a parochial ethnocentrism. Given the connection between culture and language in Pirahã, to lose or change one's language is to lose one's identity as a Pirahã, or as they call themselves, **hiaitíihí**, 'a straight one/he is straight'.

11. Conclusion

Though Pirahã is an extreme case, it teaches us something about the deep loss inherent in the death of any language, even if the people survive. When Portuguese-speaking Muras visit the Pirahã today, as happens, howbeit rarely, the Pirahã do not envy them. They see them as simply second-rate, false Brazilians. The Pirahã say that 'We are not Brazilians. We are Pirahã.' Without their language or their culture, they would fail to be Pirahã. Their language is not endangered by their own attitudes, certainly. But it is endangered, as are many others, because the Pirahã themselves are endangered by ever more-intrusive presence of settlers, Western diseases, alcohol, and the inexorable changing world that we live in. For the rest of us, this beautiful language and culture, so fundamentally different from anything the Western world has produced, has much to teach us about linguistic theory, about culture, about human nature, about living for each day and letting the future take care of itself, about personal fortitude, toughness, love, and many other values too numerous to mention here. And this is but one example of many other endangered languages and cultures in the Amazon and elsewhere with 'riches' of a similar nature that we may never, ever know about, because of our own shortsightedness. There is a more urgent need than ever before for field researchers to document these languages and for more individuals and foundations to follow the lead of the Hans Rausing Endangered Languages Document Project and donate to support research on these languages.

For those who would like to maintain Universal Grammar, the arguments here, and especially those of Everett (2004) provide a striking challenge – how to defend an autonomous linguistic module that can be affected in many of its core components by the culture in which it 'grows'. This is a challenge because if the form or absence of things like recursion, sound structure, word structure, quantification, numerals, number, and so on are tightly constrained by a specific culture, as I have argued above, then this seriously weakens the case for an autonomous, biologically-determined module of language, e.g. UG.

The reader will have noticed that to this point I have not referred to 'cognition' per se, although the word is in the title of this paper. Cognition enters in crucially, however, to the claims of Gordon (2004) (discussed in EE1) regarding the lack of counting in Pirahã. And one could argue that cognition might be further implicated in each of the

"gaps" and unusual features of Pirahã grammar. One might also investigate the possibility that their culture affects the cognitive abilities and/or schema available to members of Pirahã society. Because of the need for future research, I am not prepared to make more than two very modest claims about Pirahã cognition here. But if these are on the right track, then placing "cognition" in the title of this paper is crucial. The first claim is that, if I am correct that the Pirahã cannot count (something that will require much more experimentation to determine), then it is likely that this is due to the long-term effects of the cultural constraints discussed above. Gordon (2004) alludes to a Whorfian approach to the matter by claiming that Pirahã's lack of counting might derive from their lack of number words. And yet many societies in the Amazon and elsewhere have borrowed number words as they develop economic ties that require numerical abilities. The hypothesis of this paper, which explains both the lack of counting and the lack of borrowing, is that Pirahã's counting "deficiency" and their failure to borrow number words (in spite of commercial contact with Brazilians and in spite of borrowing their pronouns) are due to cultural constraints. My second claim is that if the Pirahã show additional cognitive deviations from Western expectations with regard to, e.g., color identification, ability to interpret multiply embedded structures, or relative tense concepts (all matters that require careful, culturally appropriate psychological experimentation), then these would seem most economically understood in terms of cultural constraints as well. Thus what the paper has labored most intensely to establish, namely, that Pirahã culture constraints Pirahã grammar, also predicts that these constraints could eventually affect cognition as well.

Finally, let me say something here about an alternative view that has been suggested by some readers of this paper, namely, that the gaps in Pirahã discussed above are a result of a lack of 'conceptual structure', i.e. that the Pirahã are substandard mentally. This rather repugnant view should be discussed, I suppose. But it is easy to deal with. Let's begin by asking what the source of this collective conceptual deficit might be. The answer is that it could only derive from be genes, health, or culture. Genes is ruled out since the Pirahã people (according to my own observations and Nimuendaju's (1948)) have long intermarried with outsiders. In fact, they have intermarried to the extent that no well-defined phenotype can be stated, other than stature. So there is no likely genetic basis for hypothesized Pirahã 'conceptual abilities'. Pirahãs also enjoy a good and varied diet of fish, game, nuts, legumes, and fruits. So there doesn't seem to be any dietary basis for any conceptual inferiority. We are then brought to culture. And here my argument is exactly that their grammatical differences derive from cultural values. However, I am in general *not* making a claim about Pirahã conceptual abilities but about their expression of certain concepts linguistically. This is a crucial difference.

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APPENDIX ONE: PROSODY, CULTURE, AND WORD-FORMATION

PROSODY

In this appendix, I want to discuss some examples of surprising richness in Pirahã grammar. They are surprising because they are complex compared to other languages and because they show that Pirahã grammar is more complex than the impression one might have gotten from reading only about the 'gaps' focused on in the body of this paper. The purpose of this appendix is two-fold. First, since the main text discusses negative features of Pirahã grammar, in this appendix I want to offer some balance so that the reader is not given the impression that I think the Pirahã language is primitive. Second, the phenomena discussed here provide strong additional evidence of cultural influence on grammar.

To begin our discussion, let us consider the following hypothetical situation. Let us say that cultural considerations could in principle play a causal role in phonological structures (not merely selecting them but forming them, to use a distinction made in Everett 1994), how would our conception of phonology change? What would constitute a 'causal role' for these factors in the phonology?

Here is a possible scenario. Imagine that a language could have various systems/modalities of sound structure, beyond its phonetics and phonology. And then consider the possibility that one modality can affect another, but not necessarily via constraint-rankings or rules, the standard devices of phonological theory proper. If so, then to understand the sound system of language, **L**, at any level (e.g. 'what happens' or 'what native speakers know when they know the sound system of their language') we must look carefully at the modalities of expression made available via an ethnography of communication and not merely at a supposed universal formal apparatus. Corollaries of this scenario might include, e.g. the appearance of new roles for old constraints (e.g. mode-faithfulness of segments being highly ranked to mark syllable types; syllables are maintained, a form of prosodic faithfulness, in order to parse the larger speech stream, not merely to enhance the perception of segments; and thus arguments for syllables may go beyond phonotactics and segmental enhancement and the syllable may have roles not envisioned by the so-called 'phonological hierarchy'). If this were true, then linguistic fieldwork would be forced to acknowledge the importance of ethnographic understanding in tandem with phonological study. Is there such a case? Indeed. Consider the following facts about Pirahã phonology, beginning with its phonemes.

Table One
Pirahã Phonemes

Consonants () = missing from women's speech[22]			
p	t	*k	?
b		g	
	(**s**)		h
Vowels			
i			
			o
	a		

The first thing to notice about Table One is that the segmental inventory is one of the smallest in the world. The next is that it includes sounds found in no other language,

subject to cultural constraints. The third is that the /s/ is in ()s because it is not found in women's speech, but only in men's.

Though this is one of the simplest segmental phonemic inventories in the world (the women's inventory does seem to be the simplest known), we should juxtapose alongside this simplicity, the complexity of Pirahã's prosodies. Pirahã's stress rule is a good place to begin, since it is well-known.

This rule, from Everett & Everett (1984), is considered one of the more complex and unusual stress rules in the literature, mainly for its phonological consequences (rather than, say, any difficulty in stating or recognizing it):

(1) Pirahã stress rule: stress the rightmost token of the heaviest syllable type in the last three syllables of the word.

The phonetic basis of 'heaviness' in (1) is just this: Voiceless consonants are always longer than voiced consonants and there are five syllable weights based partially on this contrast:

(2) Pirahã 's five syllable weights: CVV>GVV>VV>CV>GV

Pirahã is a tonal language, as well. But stress, tone, and syllable weight vary independently in the language. To see this, I will just review one simple set of examples, in (3), from Keren Everett (1998). In the examples in (3), tone is independent of stress. ´ = high tone; no mark over vowel = low tone. The stressed syllable is marked by **!.** There are no secondary stresses ('=glottal stop).

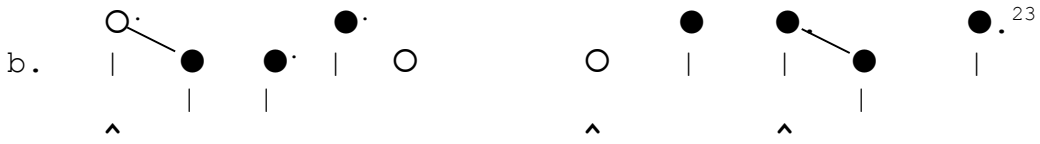
(3) a. **!**tígí 'small parrot'
b. **!**pìgì 'swift'
c. **!**sàbí 'mean, wild'
d. **!'**ábì 'to stay'
e. tíí**!**híí 'bamboo'
f. 'ì**!**tì 'forehead'
g. tì**!'**í 'honey bee'
h. tí**!**hì 'tobacco'

Thus alongside Pirahã's extremely simple segmental phonology, it manifests an extremely rich set of prosodies. This leads us to ask a reasonable question, namely, does the language exploit this differential complexity in any way? Indeed, as Everett (1985) describes it, Pirahã communication makes crucial use of the CHANNELS in (4), below, where Hymes (1974) defines a channel as 'sociolinguistically constrained physical medium used to carry the message from the source to the receiver'. The four principal modalities or channels in Pirahã after 'normal' speech are:

(4) *CHANNEL*	*FUNCTIONS*
a. **HUM SPEECH**	Disguise Privacy Intimacy Talk when mouth is full Child language acquisition relation
b. **YELL SPEECH**	Long distance Rainy days Most frequent use – between huts & across river
c. **MUSICAL SPEECH** ('big jaw')	New information Spiritual communication Dancing, flirtation Women produce this in informant sessions more naturally than men. Women's musical speech shows much greater separation of high and low tones, greater volume.
d. **WHISTLE SPEECH** (sour or 'pucker' mouth' – same root as 'to kiss' or shape of mouth after eating lemon)	Hunting Men-only (as in ALL whistle speeches!) One unusual melody used for aggressive play

Example (5) is illustrates how prosodic information in Pirahã is exploited to create these channels. The inventory in Table One above, also partially shows how little the segments contribute to the total set of phonological information in a given Pirahã word. In (5) we see that the phrase in (5a) has the quasi-musical representation in (5b), the basis for the channels just summarized.

(5) a. **kái?ihí?ao -?aagá gáihí**
paca poss/exist-be there
'There is a paca there.'

b. 

All channels must include the information in (5b), though only the consonant and vowel channel needs to include the information in (5a). The notes represent syllables, with 'ties' indicating unbroken falls/rises in whistle speech.

In the musical form in (5b) there is a falling tone, followed by a short low, with a preceding break in the whistle (where the glottal stop would have been in **kai*?i*hi**), followed by another short break (where the **h** would be) and a short high tone, and so on. Thus, the syllable boundaries are clearly present in whistle (humming, and yelling) channels, even though the segments themselves are missing. The syllable in this case indicates length, offers an abstract context for tone placement, and the overall word is stressed according to syllable weight (see Everett (1988) for details). The syllable in these cases is vital to communication in differing channels, primarily in parsing the input.

But does the discovery of channels like this imply any causal interaction between culture and grammar? Or are these channels outside the grammar proper? Notice that these channels rely crucially on the syllable weights and stress rule in (1) and (2) above. So, if nothing else, they help account for what is otherwise an anomalous level of complexity in the stress rule. Yet the facts cut deeper than this. Consider the following example of what Everett (1985) calls the 'sloppy phoneme effect' :

(6) **tí píai ~ kí píai ~ kí kíai ~ pí píai ~ 'í píai ~ 'í 'íai ~ tí píai, etc. (*tí tíai, * gí gíai**, ***bí bíai**) 'me too'

(7)'**apapaí ~kapapaí ~papapaí ~'a'a'aí ~kakakaí ~(*tapapaí, *tatataí, *bababaí, *gagagaí**) 'head'

(8) '**ísiihoái ~kísiihoái ~písiihoái ~píhiihoái ~kíhiihoái** ~ (alternations with /t/s or involving different values for [continuant] or [voicing] are unattested) 'liquid fuel'

Pirahã allows a tremendous amount of variation among consonants, though not for the features [continuant] or [voice]. This can be accounted for, but only if we refer to Pirahã's channels. The ungrammatical examples in (6)-(8) show that the features [continuant] and [voice] are linked in the sense that they may never vary in the effect. Only place features may vary. With no reference to channels this is without explanation. But in light of the channels this follows because [continuant] and [voice] are necessary

for stress placement (Everett (1988)) which in turn must be preserved in every discourse channel, or the constraint in (9) is violated:

(9) *Constraint on functional load and necessary contrast* (Everett (1985)):
a. Greater Dependence on the Channel Greater Contrast Required
b. Lesser Dependence on the Channel Less Constrast Required

Notice that I am not claiming that the absence of variation for different values of [continuant] (whether a consonant is a stop, e.g. [t], or a fricative, e.g. [s]) is predicted by 'channels' alone. This case in fact demands that we further investigate the connection between [continuant] [voice] (whether the vocal fold are vibrating or not). There is no claim that ethnography replaces phonology! But I am claiming that without the study of channels and their role in Pirahã culture, not even an understanding of Pirahã's segmental phonology is possible.

Moreover, this type of example is important for the theory of phonology, i.e. as part of UG. The lesson is just this: as a modality-dependent channel, phonology may be subject to constraints that are (i) language specific and (ii) grounded not only in the physical properties of the instantiating modality (the phonetics) but also or alternatively on the culture-specific channels of discourse employed. This is a very important result because it shows that the 'interface conditions' of the HUMAN COMPUTATIONAL SYSTEM, in Chomsky's (1995) terms, may range beyond PF and LF, if we define an interface system as a system setting bounds on interpretability for HC_L. Such examples also show how coherent fieldwork can be useful for theory. Thus not only the fieldworker, but also the phonologist must engage the language as forming a coherent whole with culture. And this in turn means more fieldwork, the reconsideration of old phonological themes, new training for graduate students, new data-bases, and on and on.

VERBAL MORPHOLOGY

In Pirahã a small (90) class of verb roots can be combined to form new verbs. But only new verbs expressing culturally recognized events or states are accepted, closing mirroring Pawley's (1987) careful work on verb/event-formation in the Kalam language of New Guinea. Some examples are given below, all taken from the text 'Killing the panther' of Appendix ___ in the supplemental web-materials:

(10) **ʔakí, ʔakí ti kagáí -hi-aí kagi #ab -á -i**
here, here I mark -he-be partner#grab-move -into
(bene/malefactive)(jaguar)

-p -í ***k*** ***-o -á -i***
-down-sudden undergoer -die -move -into

'Here the jaguar pounced upon my dog.'

(11) **gaí *s* *-ib* *-a* *-i* *-b* *-i* *-ab* *-ab***
there animal-hit -move -into-down -sudden -grab -remain

-á ***-o*** ***-p*** ***-i*** ***-i*** ***-á***
–move -onto -down -sudden -intent -certainty

'There the jaguar killed the dog by pouncing on it.'

(12)

kagi	***ab***	***-o***	***-í***	***-boí***	***-ta***	***-á***	***-sog***
partner	not	-move	-into	-move quickly down	-iterative	-move	-desi- derative

-ab	***-ai***	***-sai***	**ʔóó**	**-agá //**
-remain	-be:in	-gerund formation	know	-be:temporary (of characteristic)

'It is right on top of the dog. It pounced on the dog and killed him.'

The complex verbs in (10)-(12), shown by italics, are formed, as described in Everett (1986), by combining verb roots (non-hierarchically, i.e. like beads on a string) before the rest of the verb morphology. The interesting observation for our purposes here, however, is that most combinations are rejected by the people. Only combinations that result in culturally accepted events are allowed, just as Pawley (1987) describes for Kalam. Although it goes beyond the scope of this paper to document verbal morphology in detail here, this cultural constraint on verbal morphology provides yet another example of how one cannot 'do a grammar' independently of understanding something of the culture from which it emerges.

After a verb is formed, then a combination of Pirahã's sixteen classes of suffixes is added. Even setting aside the complexity of cultural and grammatical constraints on combing verb roots, the number of possible verb forms based on suffixal combinations alone (there are no verbal prefixes, only pronominal proclitics) is 2^{16}. So it would be completely erroneous to suppose that the Pirahã language is in someway less complex than better-known languages. Pirahã simply distributes the complexity in ways that are surprising in purely formal linguistic terms, but understandable, again, in what we can label 'ethnogrammatical' terms.

APPENDIX TWO: EVIDENCE FOR BORROWED PRONOUNS

4. Pirahã pronouns

In this section, I borrow heavily from Thomason & Everett (2001; henceforth, TE). There are various reasons why many scholars deny that pronoun paradigms can be borrowed. As TE say:

> *"Skepticism about the probability, or even the possibility, of pronoun borrowing has led some scholars to reject analyses of borrowed pronominal paradigms out of hand. In our opinion, this view leads to unwarranted conclusions about historical developments in specific languages and language families: if sets of pronouns are sometimes borrowed, then a language's pronouns cannot be automatically assumed to be 'fossils', relics that point directly to a language's genetic affiliation."*

The proposal that the entire set of pronouns of Pirahã was borrowed came to my attention originally from Aryon Rodrigues (personal communication, 1978, based on Rodrigues's own knowledge and his recollection of the statement of Nimuendaju (1948), cited below). Citing Rodgrigues, Everett discussed the idea briefly in three places (1979, 1986, in press). In this section, I want to summarize the evidence that Pirahã pronouns were borrowed from Tupi-Guarani, either from Tenharim or from Nheengatu. Then I address the reasons that pronouns in Pirahã might have been borrowed and how they function as optional agreement (see Everett (1987) for a detailed discussion) and never function as variables and very rarely even as 'Topic-continuation' (Givon (1983)) tools in discourse.

In 1978, at the beginning of my field research on Pirahã, I discussed some of my data with Rodrigues, my M.A. thesis advisor. Upon seeing the Pirahã pronouns, Rodrigues noted that they are nearly identical to the singular Nheengatu forms - in fact, that they are nearly identical to the Proto-Tupi-Guarani forms. TE argue that Pirahã pronouns were most likely borrowed from one (or both) of the Tupi-Guarani languages with which Pirahã speakers are known to have been in contact, Nheengatu and Tenharim. This is such a controversial claim, and so important to the discussion here, that it is worth repeating the evidence and discussion.

Pirahã has only three basic personal pronouns (Table 2). There are also several pronominal clitics that are shortened forms of longer (non-pronominal) words, listed in Table 2:

Phonemic shape	Phonetic shape	gloss
/ti/	[čI]	'1st person'
/gi/, /gia/	[nI], [nI'a]	'2nd person'
/hi/	[hI]	'3rd person'
/'i/	['I]	'3rd person feminine'
/'is/	['Is]	'3rd person non-human'

TABLE 2. PIRAHÃ PRONOMINALS

The last two of these ergative pronominal forms, **'i** '3rd fem' and **'is** '3rd non-human' have a special status: neither form is used in isolation. So, for example, in response to the question, 'Who did that?', one could answer **ti** 'me', **gi** 'you', or **hi** 'him'

(though one would only use the latter while pointing and would usually preface it with the deictic **gái** 'that', e.g. **gái hi** 'that one', but one could not answer **'i** 'she' or **'is** 'the animal'. To refer to a woman or animal actor, it is necessary to use the full form of the word from which the clitic is derived, **'ipóihií** 'woman' or **'ísi** 'animal'. (The third-person pronoun **hi** has specifically masculine reference only when it is contrasted with the 3rd feminine clitic **'i**; see Everett 1986.)

The three basic Pirahã pronouns comprise perhaps the simplest pronominal system known. They are often optional in discourse, so that their functional load is not as great as that of pronouns in many other languages, especially given the fact that Pirahã has no form of agreement marked on the verb, aside from the pronominal clitics. As we have seen, Pirahã lacks grammatical number. So there is no singular/plural distinction in Pirahã pronouns. The pronouns are all number-neutral. If speakers want to talk about more than one of something, they use a form of 'big', illustrated in (15) and (16) above. Note also that the pronouns form a syntactic class of words separate from nouns; they act like clitics and can double nouns (see Everett 1987).

In considering the proposal that the Pirahã pronouns are loanwords, only the three basic pronouns **ti**, **gi**, and **hi** are relevant, since they are the only 'pure' pronouns and the only pronominal forms that can function as independent pronouns. And in comparing Pirahã pronouns to Tupi-Guarani pronominals, it's vital to take the entire inventory of Tupi-Guarani pronouns into account, because the languages of this family have two sets of pronouns each. For Nheengatu, for instance, some sources, e.g. Tastevin (1910:62), give only one of the language's two sets, and it's not the set that matches the Pirahã pronouns; other sources, e.g. Gonçalves Dias (1965:29, 4', 69), give both sets. The relevant set is the independent ergative pronominal paradigm of Nheengatu (and, according to Jensen 1998, this was also the Proto-Tupi-Guarani paradigm); these are the most frequently-occurring pronouns in the language:

Phonemic shape	Phonetic shape	gloss
/xe/	[šI]	'1sg'
/ne/	[ne], [nde]	'2sg'
/ahe /	[ahe]	'3sg/pl'
/iande/	[ɨande]	'1pl inclusive'
/ore /	[ore]	'1pl exclusive'
/pe/, /pee/	[pe], [pee]	'2pl'

TABLE 3. NHEENGATU FREE ERGATIVE PRONOUNS

Another relevant form is the prefix (or clitic) /i-/ [I], [e] '3sg/pl'.

Compare this Nheengatu set to the very similar pronouns of Tenharim (from Helen Pease, p.c. 1998):

Phonetic shape	gloss
[ǰi]	'1sg'
[nde], [ne]	'2sg'
[hea]	'3sg feminine'
[ahe]	'people', or 'person now dead'

TABLE 4. TENHARIM FREE ERGATIVE PRONOUNS

My claim is that the basic Pirahã pronouns are nearly identical to those of Nheengatu and Tenharim. Superficially, however, the Pirahã pronouns don't look much like the Tupi-Guarani pronouns; so this proposal will not be convincing without some additional information about the phonology of Pirahã that shows how the phonetic realizations of the Tupi-Guarani forms align with the Pirahã phonemic system.

Pirahã has just eight consonants in the segmental inventory of men's speech, and seven in women's speech: /p b t k g ' h/ and, in men's speech only, /s/ (see K. Everett 1998 for a phonetic study of Pirahã segments and prosodies). Women substitute /h/ for men's /s/. Several consonant phonemes have significant allophonic variation; for our purposes, the relevant allophones are [b] and [m] for /b/; [g] and [n] for /g/; [t] and [č] for /t/; and [s] and [š] for /s/. The two alveopalatal allophones, the affricate [č] and the fricative [š], occur always and only before a front vowel; but [š] of course occurs only in men's speech. Both men and women have three vowel phonemes, front, central, and back: /i/, with allophones [I] and [e]; /a/; and /u/, with allophones [u] and [o].

Now, compare the Pirahã pronouns to the Nheengatu pronouns. Nheengatu 1sg **xe** is pronounced [šI], according to various sources (and Aryon Rodrigues, p.c. to Everett, 1998). The only alveopalatal phones in Pirahã are [č] and [š]; but since [š] is not found in women's speech, [č] is the only alveopalatal consonant found in both men's and women's speech. This makes [č] the most likely Pirahã nativization of Nheengatu [š]. The affricate [č] would be even more likely if the source pronoun were instead Tenharim [ǰI] '1sg'; note also that, according to Jensen (1998:6), the relevant Proto-Tupi-Guarani pronoun began with a voiceless alveopalatal affricate. The Nheengatu 2sg pronoun varies between [nde] and [ne]; the second pronunciation is conditioned by a preceding nasal segment. Since Pirahã has no [d], but does have [n] as the word-initial allophone of /g/, both [nde] and [ne] would be expected to be borrowed as Pirahã /gi/ [nI]. (See Everett 1979 for details of /g/ allophony.)

This leaves the Pirahã third-person pronoun **hi** to be accounted for. This pronoun, as it turns out, provides additional, semantic evidence for borrowing. Both Nheengatu and Tenharim have a third-person pronoun **ahe**, though with slightly different meanings ('3sg/pl' in Nheengatu, 'people' or 'person now dead' in Tenharim). In addition, Nheengatu has a pre x (or clitic) form **i-** [I], [e] also meaning '3sg/pl'. Now, Pirahã lacks vowel-initial syllables entirely (Everett 1988, K. Everett 1998), so that the Nheengatu form /i-/, if borrowed into Pirahã, would need an added prothetic consonant, presumably either the unmarked continuant /h/ or the unmarked stop /'/ to satisfy the language's syllable structure constraints (Everett 1988). In this instance, a prothetic /h/ seems the more likely choice, because a prothetic glottal stop would make the general third-person pronoun homophonous with the derived Pirahã clitic **'i** '3 feminine' (if this feminine clitic already existed in Pirahã at the time of borrowing). Pirahã **hi** is also a reasonable nativization of the Nheengatu (or Tenharim) third-person pronoun **ahe**; since this pronoun already has a consonant, deleting the initial vowel rather than adding a second consonant would not be surprising. The Pirahã pronoun **hi** and the Nheengatu pronoun **ahe** share a striking, and unusual, usage feature which adds strength to the case for a historical connection between them: in addition to their use as ordinary third-person prounouns, both are also used as

demonstratives, roughly akin to the referential indefinite pronoun, translated 'someone' in English, though it can be interpreted as simply vague in Pirahã or ambiguous. It is usually 3masculine, but not always. It can even be used for non-third persons, as in Pirahã ***hi 'obaa'ai ti*** 'I am really smart', literally 'A person sees well, me7). It is important not to confuse this use with a predicate nominal construction which is crosslinguistically common, e.g. If I were you...', 'You are indeed her', or, even, 'That woman is a man'. In this environment *de dicto* distinct entitites can be freely declared *de re* equivalent. But the case just cited from Pirahã involves no predicate nominals and is based on the vagueness of **hi**, which closely matches the semantics of the, ex hypothesi, source pronoun from Tupi-Guarani.

What has been demonstrated here is that Pirahã pronouns match the relevant pronoun sets of Nheengatu and Tenharim very closely, phonologically and, in the case of **hi** in one quite specific and unusual semantic usage feature. The match is so close, in fact, that coincidence seems quite unlikely, though with such short forms coincidence cannot be ruled out conclusively. As we noted above, borrowing is in itself quite likely, because the Pirahã have had close long-term contacts with speakers of both Nheengatu and Tenharim, especially with Nheengatu, which was for centuries the trade language of Amazonia.

Nimuendaju (1948, 25') indirectly suggests a possible scenario by which this borrowing might have taken place:

> *'Martius' contention that most of the words of the* Mura *language are of* Tupian *origin has remained unsubstantiated. Even the number of elements adopted from the Lingua Geral is strangely small. Most noticeable are the regular use of the first and second singular, personal pronouns, and first person plural of Lingua Geral.'*[24]

What we know in hindsight is that the Mura, speaking a mutually intelligible dialect with the Pirahã, were in the process of switching to Portuguese. Today there are over three thousand Muras living from Manicoré in the state of Amazonas, along the Madeira river, to the large reserve they have been granted near the Rio Autazes region. So far as I have been able to tell, from my own visits to Mura settlements and discussions with anthropologists and government employees, the Mura language has not been used among the people for over two generations and none can remember more than a couple of words. In fact, many of the 'Mura words' so remembered turn out to be Lingua Geral. This shift to Portuguese seems to have been accelerating about the time that Nimuendaju made his visit. So the borrowing of the pronouns of the Lingua Geral was occurring at a time of linguistic shift and turmoil in the history of the Mura people. The Pirahã, on the other hand, have long-resisted influence from outside languages, having a small number of borrowings. However, if I am correct there were no pronouns in Pirahã prior to this time. It is quite possible that the daily contact between the Muras and the Pirahã, speaking the same language, could have transmitted the Tupi-Guarani forms to Pirahã via the Mura. This seems a plausible scenario in any case, i.e. that initial Mura language shift left its marks in Pirahã. Moreover, the short forms borrowed, **hi**, **ti**, and **gi** [ni], fit in well with the Pirahã clitic-agreement system (Everett 1986, 1988), which uses the first CV of some generic nouns to indicate agreement (optionally) on the verb.

Caution is required, of course: there is not enough information about the specific social circumstances of the contacts between Pirahã and Tupi-Guarani speakers, and much too little information about the history of Pirahã, given its lack of well-attested relatives. The language does, or did, have relatives, including at least Matanawi, Yahahi, and Bohura, as well as Mura; but all these relatives are extinct, and we have virtually no linguistic data for them. That is, we can establish two of the requisites for a successful argument for borrowing in this case: there was certainly extensive contact, and the pronouns in question are certainly old in Tupi-Guarani languages. It is also true that no genetic relationship has been established between Pirahã and Tupi-Guarani. Still, we can't prove that the pronouns in question are innovative in Pirahã; and we have no evidence (yet) of other borrowings in Pirahã from Tupi-Guarani. Nevertheless, even with large gaps in the case for borrowing, on balance it seems to be the best historical explanation for the Pirahã facts.

APPENDIX THREE

In a series of videotaped psychological experiments, Gordon and K. Everett (ca. 1993) collect data to investigate the claim that the very concept of counting is foreign to the Pirahã. Gordon (2003) develops this theme in more detail, with impressive statistical interpretation of this and additional experimental results. Although I disagree with his assertion that Pirahã has a one-two-many system of counting (there are no such numbers, as has been seen above) and although I find his conclusion that the Pirahã facts offer support for Whorfianism unconvincing, I nevertheless agree broadly with the principal conclusion he draws from his experimental results, namely, that Pirahã people neither count nor understand the concept of counting. I want to briefly review his results here, followed by a critical evaluation of his methodology and its potential effect on his results.

-No recursivity of number system (Gordon 2003:4):

"There was no recursive use of the count system – the Pirahã never used the count words in combinations like hói-hoí to designate larger quantities..."

-No tallying or accurate representation of even small numbers (Gordon 2003:4):

"Fingers were used to supplement oral enumeration, but this was highly inaccurate even for small numbers less than five."

-Pirahã performance on 'counting' tasks were based on (i) linear matching and (ii) subitizing (chunking in groups of three or less):[25]

"The tasks were devised to use objects that were available and familiar to the participants (sticks, nuts, batteries). The results of the tasks, along with schematic diagrams, are presented in Figure 1. These are roughly ordered in terms of task demands. Sitting across from the participant and with a stick dividing my side from theirs, I presented an array of objects on my side of the stick (below the line in the figures) and they responded with a matching linear array of AA batteries on their side of the table (above the line). The first matching tasks began with simple linear arrays of batteries to batteries. This progressed to clusters of nuts matched to the battery line, orthogonal matching of battery lines, matching of battery lines that were unevenly spaced, and copying lines on a drawing. In all of these matching experiments, participants responded with relatively good accuracy with up to 2 or 3 items, but performance deteriorated considerably beyond that up to 10 items. In the first simple linear matching task (a), performance hovered at near 75% up to the largest quantities. Matching tasks with greater cognitive demands required mental transposition of the sample array to match array without benefit of tagging for numerical quantity. Performance dropped precipitously down to 0% for the larger quantities in these tasks. One exception was task (d) with unevenly spaced objects. Although this was designed to be a difficult task, participants showed an anomalous superiority for large numerosities over small. Performance initially deteriorated with increased set size up to 6 items, then shot up to near perfect performance for set size ' through 10. A likely interpretation of this result was that the "uneven" spacing for larger set sizes promoted recoding of arrays into smaller configurations of 2 or 3 items. This allowed participants to use a chunking strategy of treating each of the subgroups as a matching group."

-Pirahã use an 'accumulator' analog model of quantity when estimating relative values of larger numbers of objects

> *"The experiments clearly show that the Pirahã have great difficulty in perceiving numerosities when set sizes exceed about three items. However, they can take advantage of spatial chunking to decrease the demands of larger set sizes. As tasks demand more of spatial transformations and memory, performance deteriorates rapidly. These data point to the fact that when the Pirahã see a relatively small quantity such as a set size of four or five items, they do not show the kind of mandatory enumeration of objects that we engage in. There is no "language of thought" for counting that goes beyond the spoken variety. On the other hand, performance was not completely random. Since averaged responses mapped almost exactly onto target values, this suggests that participants were indeed engaged in the task, but that they were tapping only an approximate means of quantifying sets. This split between exact enumeration to analogue estimation parallels that found in adults from counting cultures when task demands do not allow explicit enumeration"*

The conclusion is that the Pirahã are able to subitize, i.e. recognize numbers of three or less immediately, like all other members of our species, apparently. But above this 'magic number' three, counting must take place and that exceeds Pirahã' capacities (Gordon 2003:9):

> *"Given these facts, the present data strongly support a claim that the Pirahã lack fundamental numerical concepts that are basic to a language like English, that the two languages are incommensurate, and that this case is a clear candidate for strong linguistic determinism. It appears then that languages really can differ in the radical kind of way that has been denied by many modern theorists. Furthermore, as a result of this incommensurability, the speakers of said languages cannot seem to entertain concepts of the other language –at least not without considerable education. "*

DISCUSSION OF GORDON'S CONCLUSIONS

In assessing Gordon's results, we must ask to what extent his experimental design was culturally sensitive, since without careful incorporation of cultural knowledge into the experimental design, it is easy to achieve artificial results. Second, we need to ask how the experiments were actually carried out and subsequently interpreted. This is especially important since the Pirahã are monolingual and Gordon does not speak Pirahã.

With regard to the first question, the Pirahã do not like to be put in situations in which they must 'perform' acts not normally part of their culture for outsiders. Linguistic informant work for most them means either telling me what they think I should know or simply entertainment, without any overt sign that they take it to be a serious enterprise. Even after nearly three decades of work among them, only a handful make a serious effort to allow me to control the topics and pace of an informant session. There is no easy solution to this for most linguistic work and I cannot expect Gordon to have solved it for his own work. He did the best he could and I had no better suggestions at the time to offer him. Yet the fact remains that Gordon's experiments involved just this kind of disliked activity. Pirahã were asked to work with objects and tasks that did not have any obvious

connection to culturally familiar activities (e.g. sorting batteries, sticks, etc.). Gordon's experiments lacked culturally sensitivity in design, as is further illustrated by the alternative ways he could have investigated these matters mentioned below. (In fairness to him, during the time that he was working on his experiments, I had my own priorities and offered little help.) Following the experiments, Gordon worked alone in interpreting the results, hampered by his lack of knowledge of the Pirahã language or culture, as well as by the fact that neither my wife nor I were available to help him by discussing with him the plausibility of his results, or even the relevance of his experimental design to test numerosity in Pirahã.

With the benefit of hindsight, it is possible to consider alternative ways of investigating Pirahã numerosity. To see this, let us consider some examples of other ways of approaching the problem might help drive home the relevance of culture and other types of domains that might have been investigated.

First, although the Pirahã make simple houses, these houses must respect the laws of physics. Their construction is not totally random, nor could it be if the houses were to be functional. So if they are not to blow over in the first rain storm that they must fit together well, e.g. they must have more or less equal height for the walls. They must be supported by house poles embedded a certain minimal depth into the ground. A man has to have some idea of how much thatch to collect for the roof, and so on. It seems crucial to any account of numerosity in Pirahã to conduct experiments involving this kind of pre-existing cultural knowledge, or to interview people about this, or to at least systematically observe them to see how they do this.

Another example is found in women's activities. Women make dresses according to a simple pattern (and they will *not* wear dresses either made by any other pattern or made by a non-Pirahã). These dresses have a certain length of hem, sleeves, and waist, among other things. Can we determine exactly how they are make dresses of a standard pattern?

As a final example, could we find out how hunters tell others how far to go into the jungle to find a particular kind of game (something they do regularly)? Gordon's results do not reflect consideration of any of these kinds of culturally important activities. This is not to blame him. During the time that he might have most benefited from my help, I was too busy on other projects to be of much assistance.

Nevertheless, I think that Gordon's conclusions are likely correct. I believe that examples like those given above can be explained without reference to quantification, based on the idea that Pirahã simply compare items pairwise for similarity. But claims that Gordon has shown some kind of numerosity in the language other than that described in this paper cannot be substantiated at present. Further, more culturally relevant, experiments are needed.

APPENDIX FOUR: PANTHER TEXT

Killing the Panther

Author '**AHÓÁPATI**
(Brazilian name is Simão)
July 28, 1980
Maici River
Posto Novo
Collected, translated, analyzed, and transcribed by
Daniel L. Everett

/ 'pause'
// 'greater pause'

1. **'akí,** **'akí** **ti** **kagáí** **-hi** **-aí** **kagi** **#ab** **-á** **-i**
here, here I mark -he -be partner #grab -move -into
(jaguar)

-p **-í** **k** **-o** **-á** **-i**
-down -sudden undergoer -die -move -into
'Here the jaguar pounced upon my dog.'

2. **ti** **kagáíhiaí** **kagi** **#ab** **-á** **-i** **-p** **-í**
I jaguar partner #grab -move -into -dow -sudden

k **-o** **-ái** **'aí** **ti** **ai** **-á** **'ai** **-á**
undergoer -die -do then I did -thus did -thus
'There the jaguar pounced on my dog and the dog died, it happened with respect to me.'

3. **gaí** **s** **-ib** **-a** **-i** **-b** **-i** **-ab** **-ab**
there animal -hit -move -into -down -sudden -grab -remain

-á **-o** **-p** **-i** **-i** **-á**
–move -onto -down -sudden -intent -certainty
'There the jaguar killed the dog by pouncing on it.'

4. **'i** **kagi** **#ab** **-á** **-i** **-p** **-í** **-sigí** **-ai**
it partner #grab move -into -down sudden -assoc. -be

gaí **si** **-i** **'ís** **-a** **-p** **-i** **-k**
there place -thus animal -move -down -sudden -trans

-ob **-á** **-o** **-b** **-i** **-í** **-haí**
-see -move -onto up/away -intend -sudden -relative
certainty
'With respect to it, the jaguar pounced on the dog, I thought I saw it. '

5. **'aí** **ti** **'ai** **-á** **'akí** **kopaíyai** **kagi** **#ab** **-á**
then I did -thus here blackness partner #grab -move
(panther)

-i **-p** **–á** **-hai**
-into -down -complete -relative certainty
'Then I recognized that the panther pounced on my dog.'

6. **'aí** **kopaíyai** **kagi** **#ab** **-á** **-i** **-p** **-á**
then panther partner #grab -move -into -down -completive

-hai **-i**
-relative certainty -prosody
'Then the panther pounced on my dog.'

?. **'aí** **ti** **gá** **'ai** **-á** **kopaíyai** **'áaga** **-há**
then I say did -thus panther be permanent -complete certainty

-í **-a**
-down -declarative
'Then I said that this (is the work of) a panther.'

8. **'aí** **kopaí** **ti** **gái** **'akí** **si** **'ís** **-a** **-p**
then pantherI say here place animal –move -down vert.

-i **k** **-ob** **-ab** **-á** **-o** **–p**
-sudden undergoer -see -remain -move -onto -vertical

-ií **-haí**
-intend -relative certainty
'Then I said with respect to the panter, "Here is where it went. I think I see (where it went)".'

9. **mm** **ti** **gá** **'ai** **-á** **'akí** **'ís** **-a** **-o** **-b**
vocal pause I say did -thus here animal -move -horizontal -down

-ogá **'ai** **-á** **'ai**
-on did -thus be:in raised surface
'Uh, I said "The jaguar then jumped up on the log".'

10. **giaibaí** **kopaíyai** **kági** **ab** **-á** **-i** **-p**
dog panther partner grab -move -into -vertical

-á **-há** **-ii**
-completive -complete certainty -intend
'As for the dog, the panther pounced on the partner.'

11. **kopaíyai** **'íb** **-ai** **k** **-oaí** **-s** **-aagá**
panther hit -do undergoer -die -animal -be temporary

-hai (last syllable MID tone, due to intonation)
-relative certainty
'The panther hit the dog and it had died.'

12. **'aí** **k** **-apá** **-g** **-ob** **-aó**
then undergoer -expell -completive -move away horizontal -when

s **-ob** **-á** **-í** **-b** **-á** **-o**
animal -see -down -into -on/up -down -onto

-hoagái **-'ii** **-gá** **'aí**
-inchoative action -continuative -incompletive do
'Then when I had gunshot the jaguar, it began to fall.'

13. **kaapási** **'aí** **ti** **gái** **kaapási** **ka'áowí**
name then I say name basket

k **-ob** **-á** **-aá** **-ta**
undergoer -throw causative -imperative -iterative

-**haí**
-relative certainty
*'"**Kaapási**", I said, "Throw a basket (to me)".'*

14. **'í** **kagi** **-hoi** **'ób** **-á** **-aá** **-ta**
it basket -thing throw -caus. -imperative -iterative

-haí **kagi** **ab** **-á** **-i** **-p** **-í**
-relative certainty (last tone more mid range) basket grab -move -into -down -decl.
'Throw me a basket to put the dog into.'

15. **sigi** **-ái** **-hí** **'aí** **báóhoipaí** **s** **-a**
same -be -nominalizer then cat animal -move

-o
-horizontal

'ab **-a** **-ab** **-o**
grab -cause -remain -onto
'The same cat pounced on the dog.'

16. **kopaíai** **s** **-a** **-o** **'ab** **-a** **-ab** **-á**
panther it -move -onto grab -caus. -remain -completive

-há **-taío** **'aí** **'ab** **-a** **-ab**
-complete certainty therefore then not -causative -remain

-á **-á** **-taío**
-move –complete certainty -therefore
'The panther pounced on the dog, thus it caused him to be not.'

1'. **'í** **kag** **-igí** **-a** **'iowi** **hi** **á**
it partner -with -be:in there he move
comitative proximate

-o **-b** **-ísigí** **-o** **kag** **-ig** **-í**
-onto -down -same -directional basket -with -into

-a **'iowi**
-declarative there proximate
'Put the jaguar into the same basket with the dog.'

18. **hi** **a** **-o** **-b** **-is** **-ig** **-í** **-o**
he move -onto -down -animal -with -into -directional

'ab **-a** **-ab** **-á** **-taó** **hi** **agí**
not -causative -remain -move –thus 3 logical
comitative

-a **só** **-'o** **-i**
-complete time -pass -immediate
certainty
'Put it in with the dog, he caused the dog to be not. He has therefore already (died).'

19. **'ís** **agí** **-a** **'í** **ig** **-á** **-i** **-p**
animal logical -complete it with –move –into -down
connective certainty

-áó **kagi** **-hoi** **'o** **-á** **-o** **-b** **-á**
-when basket -thing move -move -onto -down -causative
jerk

-há **'aí**
-complete then
certainty
'When you have the jaguar parts in the basket, then put the basket on your head (with a tumpline, DLE)'

20. **giaibái** **-hi** **'aí** **'a** **-hoa** **-ó**
dog -nominalizer then cause -fire -directional

'ita **-ógi** **'aaga** **-há** **'ai**
snout -big be:temp -complete then
certainty
'The dog then at night smelled him for sure then.'

21. **kagi** **ígi** **-í** **-bag** **-ái** **-hí**
partner with -into -touch -be:in -complete
certainty

kagi **ab** **-á** **-boi** **-ta** **-á**
partner grab -move -move -iterative -move
quickly
down

hí	**-ab**	**-á**	
3	-negative	-complete certainty	

'It is right on top of the dog. It pounced on the dog and killed him.'

22.

kagi	**ab**	**-o**	**-í**	**-boí**	**-ta**	**-á**	**-sog**	
partner	not	-move	-into	-move quickly down	-iterative		-move	-desi derative

-ab	**-ai**	**-sai**	**'óó**	**-agá //**
-remain	-be:in	-gerund	know	-be:temporary (of characteristic)

'It is right on top of the dog. It pounced on the dog and killed him.'

23.

'aí	**ti**	**gá**	**-'ai**	**-á**	**'aí**	**kaapási**	**hi**
then	I	say	-do	-declarative	then	name	3

ísi	**hi**
animal	3

'Then I was talking, then Kaapasi he, animal, he ...'

24.

ká	**-ap**	**-í**	**'oog**	**-ab**	**-i**	
far	-expell	-sudden	want	-remain	-into	

sahaí	**k**	**-apá**	**-o**	**-b**	**-íi**
prohibitive	undergoer	-expell	-onto	-down	-continuative

-ga	**-át**	**-i**
-incompletive	-imperative	-declarative

'Don't shoot from far away. Be shooting down on it.'

25.

'i	**ti**	**boí**	**-t**	**-á**	**-o**	**-b**	**-í**	
3f	1	move quickly down	-repetitive (subroutine)	-move	-onto	-down	-sudden	

-haí	**'í**	**-k**	**-o**	**-ab**	**-á**	**-o**	
relative certainty	it	-accom plishment	-die	-remain	-move	-onto	

-b	**-á**	**-há**	**-taío**	**'ís**	**-agí**	**-a /**		
-down	-declarative	-complete certainty	-thus	animal	-logical connective	cert.	comp	

'I moved quickly down towards the action onto the trunk, (I) killed it, thus it changed (died).'

26.

'í	**k**	**-o**	**-ab**	**-á**	**-o**	**-b**	**-íi**	
it	undergoer	-die	-remain	-move	-onto	-down	-continuative	

-gá	**-há**	**-taí**	**-o**
-incompletive	-complete certainty	-thus	-directional

'í	**-k**	**-ahá**	**-p**	**-ií**	**hi**	**-ab**	**a**	**-há**	
3f	-undergoer	-depart	-down	-intend	3	-not	be	-complete certainty	

-taí	**-o /**
-thus	-directional

'It was dying and it wasn't able to leave therefore.'

2'.

'igí	**-'ai**	**'í**	**k**	**-o**	**-ab**			
with	-be:temp	3f	undergoer	-die	-remain			

-á	**-o**	**-b**	**-á**	**-á**	**-taí**	**-o**	**'aí**	
-move	-onto	-down	-move	-complete certainty	-thus	-directional		then

k	**-o**	**-ab**	**-á**	**-o**	**-b**	**-íi**	**-gá**	
undergoer	-die	-remain	-move	-onto	-down	-con-tinuative		-incomplete

'OK, then, it thus came to die. Then it was coming to die.'

28.

'aí	**kaapási**	**'igí**	**-a**	**'apá**	**-o**	
then	name	with	-declarative	expell	-onto	

-b	**-í**	**-sái**	**-hí**
-down	-sudden	-gerundive	-comment

'Then Kaapasi, OK, he shot it.'

29.

'aí	**s**	**-agí**	**a**	**k**	**-o**	**-áb**			
then	animal	-logical connective		declarative	undergoer	-die	-		
remain									

-á	**-o**	**-b**	**-á**	**-í**	**s**	**-agí**	**-a**		
-move	-onto	-down	-move	-comment	animal	-logical connective		decl.	

sit	**-o**	**-á**	**-op**	**-áó**	**k**	**-ahá**	**-pi**	**-tá**
stand	-move	-move	-go	-when	undergoer	-go	-down onto	-iterative

'Then the animal thus changed and was dying. When the animal stood up it went away again.'

30.

k	**-o**	**-áb**	**-á**	**-o**	**-b**	**-áí**	**-saí**	
undergoer	-die	-remain	-move	-onto	-down	-do	-gerundive	

'Its dying was lingering.'

31.

ti	**'agiá**	**k**	**-apa**	**-íg**	
I	therefore	undergoer	-expell	-with	

-á	**-o**	**-b**	**-í**	**-ta**	**-haí**
-move	-onto	-down	-sudden	-iterative	-relative certainty

i	**toí**	**hi**	**-ó**	**'í**	**ái**	**hí**	**'aí**
it	elbow	his	-directional	it	bone	he	hurt

'I therefore shot it again, breaking its elbow.'

32.

ti	**í**	**k**	**-apa**	**-íg**	**-á**	**-o**	**-b**
1	3f	undergoer	-expell	-with	-move	-onto	-down

-í	**-ta**	**-haí**	**'aí**	**ti**	**giá**
-sudden	-iterative	-relative certainty	then	I	therefore

k	**-ap**	**-á**	**-o**	**-b**	**-í**	**-so**
undergoer	-expell	-move	-onto	-down	-sudden	-then

'Then I shot it again, I therefore shot it again then.'

33.

k	**-o**	**-ab**	**-ái**	**k**		**-o**	**-ab**
undergoer	-die	-remain	-do	undergoer		-die	-remain

-á	**-ig**	**-á**	**-o**	**-b**	**-i**	**-haá**
-move	-with	move	-onto	-down	-sudden	complete certainty

'aí	**'is**	**-ai**	**-ta**	**-ógi**
then	animal	-bone	-projection	-strong

'It came to die, it came to die; it had thick fur.' ('fur' = 'essence' here)

34.

'í	**k**	**-oa**	**-ií**	**hi**	**ab**	**-a**	**-á**	**-taí**
3f	undergoer	-die	-intend	he	not	do	-move	-there fore

o	**gíi**	**-sai**	**'is**	**-ai**	**-ta**
directional	there	-nominalizer	animal	-bone	-projection

-ógi
strong

'It intended thus to die. He did not move, therefore. His fur/essence is strong.'

35.

k	**-o**	**-aí**	**hi**	**ab**	**-i**	**-kwí**
undergoer	-die	-do	3	not	–epenthesis	-temporary quality

gái	**'aowi**	**-í**	**'aowi**		**gíai**	**k**
there	foreigner	-directional	foreigner		you	undergoer

-ob	**-ai**	**hi**	**-ab**	**-i**	**-kwí**	
see	-do	3	-not	-epenthesis	-temporary quality	

'He had not died. (I said) "That foreigner, you (Dan) the foreigner, have not seen (a jaguar) dead.'

36.

'aí	**pi'ái**	**'í**	**k**	**-a**	**-ap**	**-í**	**-kwí**
then	now	it	undergoer	-move	-move:away	-epen.	temp. qual.

pi'ái	**-'íí**	**-g**	**-a /**	
now	-continuative	-incompletive	-declarative	

'Then right away, (I) moved it, right then.'

3'.

'aí	**báóhoipaí**	**so**	**'isaitaógi**	**so'oá**	**k**	**-obai**
then	cat	already	foreign:name	already	undergoer	seen

'Then cats, ' isaitaógi (not DLE) has already seen.'

38.

'akí	**kagáíhiáí**	**so**	**kopaíyai**	**'isaitaógi**
here	marked (jaguar)	only	panther	foreign:name (not DLE)

hi	**í**	**k**	**-ob**	**-ai**	**hi**	**ab**	**-ii**	**-g**
3	it	undergoer	-see	-do	he	not	-cont.	-incompl.

-á
-declarative

'Here jaguars (he has seen), only panthers the foreigner (not DLE) has not yet seen.'

39.

pi'ái	**so'óá**	**hiaitíihí**	**k**	**-ap**	**-í**
now	already	Pirahã	undergoer	-expell	-away/sudden

-kwí	**pi'ái**	**-'íga /**	
-temporary quality	right	-now	

'Now, the Pirahãs have just now shot (a jaguar).'

40.

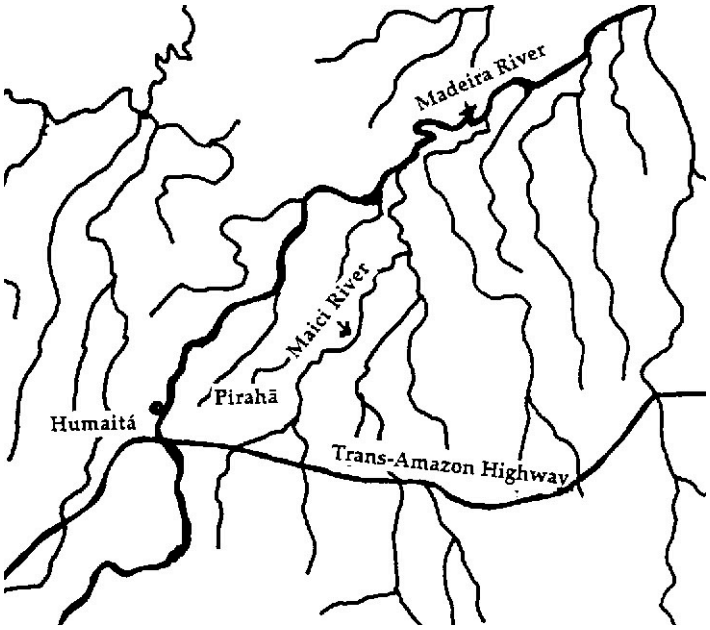
'aí	**hiaitíihí**	**baai**	**-owí**	**baóhoipaí**	**kopaíyaihi**
then	Pirahã	fear	-intensive permanent quality	cat	panther

'igíai
OK (text ending)

'Then the Pirahãs are intensely afraid of panthers. The end.'

Appendix Five:
Pirahã Society and Culture

ETHNOGRAPHIC OVERVIEW OF THE PIRAHÃ



The above map shows that the Pirahã village I have worked most in is located on the Maici River near the TransAmazon Highway. The Maici River intersects the TransAmazon roughly 90 kilometers east of the town of Humaitá, Amazonas. The coordinates of the Pirahã village are S 07°21.642' by W 062° 16.313'.

European contact with autocthonous peoples of the Americas, whether indirect (e.g. disease or trade items) or direct (face-to-face), was traumatic for most indigenous peoples. In many cases this trauma led to cultural disintegration and loss of knowledge and cultural specializations, marginalizing whole populations. It would be a serious error of *faux archaism* to suppose that a cultural trait produced by 'contact trauma' fairly reflected a natural view of the synchronic or diachronic state of the culture. The evidence from records of the Mura and Pirahã for nearly 300 years since contact was first made in 1714 strongly supports the conclusion that Pirahã culture has changed little since contact with Europeans. It is therefore clear that the 'gaps' in Pirahã culture and language discussed below seem to genuinely reflect Pirahã culture synchronically and diachronically, with no evidence of traumatic change and loss caused by contact.

The Pirahã were part of the powerful Mura nation, consisting of at least the two subgroups Mura and Pirahã. Nimuendaju (1948) gives a concise and useful overview of the history of the Mura nation since contact, beginning with the first European record of these people in 1714.[26] Although the current-day Mura, speakers of a mutually intelligible dialect with Pirahã, have assimilated almost completely to Brazilian *riberinho* (riverine)culture, the Pirahã continue to live almost exactly as described in all earlier reports from the 18th century to the present. (Though today women wear dresses and men

use shorts, whenever available, rather than going nude as they did until about the last 75 years.)

GEOGRAPHY AND SPATIAL ORGANIZATION

The Pirahã live next to water (all villages are along the Maici river). Their houses are all built facing the river, as close to it as they can be in dry season (**piiáiso** 'shallow water'), a time when they usually sleep directly on the sand with little or no shelter at all, except for shade provided for infants during the day. At this time of year, family units sleep near one another at night, but for the most part, the entire community (swelling to 50-100 people on a single beach) sleeps and eats together. In rainy season (**piioábaíso** 'deep water') village occupants distribute themselves by nuclear families, each family unit occupying its own house (pictures of Pirahã houses and different village activities are provided in the supplemental web materials to this article). The houses of the same village in the rainy season are built in a line along the river, usually well-hidden in jungle growth, with houses usually 10-50 paces apart. The rainy season villages are smaller, usually consisting of one elderly couple and their sons or daughters and their spouses and children. Houses of a village need not be on the same side of the river. Occasionally siblings may build their house on the opposite bank.

SENSE OF COMMUNITY

Although Pirahã live at times as nuclear families, there is a strong sense of community and mutual responsibility for the well-being of other community members. For example, a father of one family will feed or care for another child, at least temporarily, if that child is abandoned, even for a day. I once asked some men if they minded sharing food with an older man who was unable to contribute much labor to the community and no longer hunted or fished. The men around me answered quickly and in agreement that he had fed them when they were too young to feed themselves. Therefore, they were pleased to feed him and help him. Shortly thereafter this man got lost in the jungle. For three days the entire village searched for him, with little food or sleep. They were very emotional when they found him, safe but tired and hungry, carrying a sharpened pole for protection. They called him their 'parent' and hugged him and smiled, giving him food as soon as they reached the village.

In spite of a strong sense of community, I have observed almost no community-approved coercion of village members. It is unusual for a Pirahã, even a parent towards his/her child, to order another Pirahã about. This happens occasionally, but it follows no pattern other than that one individual is acting in a community-disapproved manner, shown by the remarks and expressions and gestures of others watching. (Though, in keeping with the 'no coercion' value, I have never seen anyone intervene to stop anyone from violating community norms.)

MARRIAGE AND SUBCOMMUNITY RELATIONS

Couples initiate cohabitation and procreation without ceremony. If they are unattached at the time, they simply live together in the same house. If they are married, they first disappear from the village for about 2-4 days, while their former spouses call for and search for them. Upon their return, they begin a new home or, if it was just a 'fling' return to their previous spouses. There is almost never any retaliation from the

cuckolded spouses. Spouses are roughly equal in terms of work load and hierarchical relations. Relations between men and women and boys and girls, whether married or not, are always cordial and often marked by light to heavy flirting. Sexual relations are relatively free between unmarried individuals and even between individuals married to other partners during village dancing and singing, usually during full moons. Aggression is observed from time to time, from mild to severe (my wife has witnessed a gang rape of a young unmarried girl by most of the village men). But aggression is never condoned and it is very, very rare.

Adult-child relations are also marked by cordiality and little coercion. Parents do not as a rule strike their children or order them about. Infants and toddlers (up until about four years) are given much open affection and are relatively pampered. As soon as children can walk well, however, they are expected to gradually take on adult-like responsibilities. Often 10-13 year old boys will fish while fathers and mothers work in the field or go gathering or hunting.

ECONOMY AND MATERIAL CULTURE

The Pirahã are hunters and gatherers with very little agriculture. They eat mainly fish and wild fruit and nuts, depending on the time of year. They sometimes boil their fish, almost always the smaller fish, and make a soup, but mainly they just throw the bigger fish directly on the fire, sometimes gutting it first. The Pirahã know how to preserve meat, by smoking, drying, and salting, but they never do this except to trade meat with outsiders. Among themselves they say 'I store my meat in the belly of my brother', that is, they share with those who need meat, never storing up for the future. They fish mainly with bow and arrow, though if there are hooks and line available they will use this. Most important in understanding Pirahã material culture is their lack of concern with the non-immediate or the abstraction of present action for future benefit, e.g. 'saving for a rainy day'.

Pirahã material culture is very simple (see Oliveira and Rodrigues (1977) for an exhaustive list of artifacts). They produce strong, large bows (2-2.7 meters in length) and arrows. They make little else. Their homes are extremely simple. There are two major types, the **kaíi-ií** 'daughter-thing', the more substantial one and **'aitaíi-ií** 'palm thing', a less substantial construction. The former is built mainly of the trunks of paxiuba (irartea sp.) palm, split in two halves, and has a raised platform for sleeping, with a roof of small stick crossbars and thatch made from the center, youngest shoot of a species of palm that Brazilians and others in the area use almost exclusively for roofing. This takes about one day to assemble the materials and another half a day, working slowly, to put up, though they can take several days to finish because the Pirahã often work no more than an hour or so at a time. The latter kind, the 'palm thing' is used mainly for shade on the beach and is just sticks with any kinds of leaves, though mainly palm leaves, as a roof. (In the dry season these are made only to provide shade for children. Adults will just sleep on the sand and sit in the bright sun all day, occasionally putting some branches vertically in the sand in front of themselves for shade.) Both types of houses blow over, but the former only in very severe storms. The less substantial 'house' can blow over in a strong breeze. They make disposable, very crudely woven baskets for transporting material from the fields. They discard these after one or two uses. They make necklaces from seeds, home spun cotton string, and teeth, feathers, beads, beer can pull-tabs and/or other objects, that

show little symmetry and are very crude and unattractive compared to the artifacts of other, especially Tupian, groups in the region, e.g. the Tenharim and Parintintin. These are decorative only secondarily, their primary purpose being to ward off the evil spirits they see almost daily.[27] They have always been a river culture and depend on canoes for their daily survival. But they only occasionally make any. The indigenous canoe is just tree bark which does not last very long and cannot carry big loads. The Pirahã greatly favor the hardwood dugout canoes made by Tupian and Brazilian settlements. Although I have paid for Brazilians to come to teach the Pirahã how to make the dugout canoes and though they have made the canoes and I have provided all the tools necessary to continue making them, they have never made one on their own, only two under the supervision of Brazilian canoe-makers, and maintain their canoe supply largely by stealing from Brazilian settlements, or trading or laboring with Brazilians or Tenharim.

The men wear loin-cloths and the women go naked when there is no supply of cloth to make clothes. When there is sufficient cloth, and these days there usually is, the women make their dresses following a universal pattern among the Pirahã (they refuse ready-made dresses). Men wear gym or bermuda shorts they get in trade, etc. from Brazilians or other outsiders.

Toys for children are normally not made, though children play with dolls and other toys from the outside if available. The people know how to make (spinning) tops, whistles, toy canoes, and carved dolls, but they never do unless asked. Occasionally, just after a plane has visited the village, the Pirahã boys collect balsa wood and make model planes. I have also seen boys from villages that did not actually see the plane show up a couple of days later with model planes, having learned of the visit from boys that did witness the plane's visit and based their models on the models of the eyewitnesses. These planes are built according to an interesting accumulated experience. The models usually have two propellers, rather than the single propeller of the monomotor planes that are the only ones that have ever visited them. One propeller is placed above the cabin section of the model plane (these models are usually 12-24 inches long and about 5 or 6 inches high) and the other propeller at the nose of the model. This model is an amalgam of the two types of aircraft that have visited the Pirahã, a land plane with a nose propeller and an amphibious aircraft with the propeller and engine above the cabin because it lands on water.

Thus the Pirahã are imitating accumulated (by themselves and other living Pirahã), concrete experience. Interestingly, they do not make model planes in the absence of direct experience with real planes. A day or so preceding the plane (when they know it is coming) and a day or so after its visit are they only times they make them.

Pirahã material culture is thus of the most functional, immediately applicable type. They do not imitate the outside world, nor desire its goods. For example, artifacts that they trade for (such as machetes, cans, pans, etc.) are not well-taken care of and are often 'lost' the same day they are purchased. Pirahã value non-accumulation of goods and hardness of body. The average family can put all of its belongings in a couple of small cans. Pirahã go hungry frequently and allow their children to go hungry. But this is rarely because of lack of food. It is because they want to be **tigisái** 'hard'. And they never sleep through an entire night unless drunk. Pirahã take short naps (15 minutes to two hours at the extremes) during the day and night. Consequently, it is often very difficult for outsiders to sleep well among the Pirahã, because they talk all night long.

This lack of desire for anything beyond what can be used now is, I believe, related to (1). Neither in speech, body, nor culture do they wish to go beyond immediate, concrete experience.

RELIGION

Religion among the Pirahã consists principally in talking to, dancing for, and imitating various types of spirits in dress and behavior during certain phases of the moon (usually full moon). Villages usually have one or two men who speak frequently to and for the spirits. When speaking for (what might be called 'possession by' or 'channelling for') spirits, men (never women) speak in a falsetto. They calls this speaking like a 'fast mouth' (the most common type of spirit) **kaoáíbogí 'igiaábií**. They do not describe what they are doing as 'speaking for' spirits, nor does anyone else so describe it. Men speaking in this way will deny any knowledge of having so spoken if asked about it afterwards, saying simply something like **tíi kosaagá, kobaihiaba** 'I don't know, I didn't see it.'

There are a wide variety of spirits, determined by their behavior, appearance, and normal place of residence. For example, the **híoó'iai** 'he is high' live in the sky, while the **báígipóhoai** live in trees. The **kaoáíbogí** live in holes in the ground. People talk alternatively of fearing and respecting these spirits. But no one prays to or makes offerings to any of them. No one is considered an expert in spirits (or anything else in the culture), however great their relative interest or ability to the outside observer. The Pirahã do not draw this type of comparative distinction. The most they might say of, e.g., a good hunter is that 'He really hunts' (where **–bai** a verbal intensifier, translated here as 'really', is the closest thing the Pirahã have to a quantifier, see the next section).

Notes

[1] I want to thank the Pirahã for their friendship and help for more than half of my life. Since 1977 the people have taught me about their language and way of understanding the world. I have lived for over six years in Pirahã villages and have visited the people every year since 1977. I speak the language well and can say anything I need to say in the language, subject to the kinds of limitations discussed in this paper. I have not published on Pirahã culture per se but I have observed it closely for all of these years and have discussed most of my observations, including those reported on here, with the Pirahã themselves.

My wife, Keren, is the only non-Pirahã to have lived longer among the Pirahã than I. She has offered invaluable help, strong criticism, and inspiration in my studies of the Pirahã language over the years. Peter Gordon's enthusiasm for studying Pirahã counting experimentally and his insightful conclusions have challenged me to consider the absence of Pirahã numerals in a wider cultural and linguistic context. I especially want to thank David Gil of the Max Planck Institute for Evolutionary Anthropology in Leipzig for organizing the Numerals conference there (March 28 & 29, 2004) and to express my gratitude to the Linguistics Department of the MPI for offering me ideal circumstances in which to rough out the bulk of this paper while a Visitor of the Institute. Special thanks (in no particular order) to Ray Jackendoff, Lila Gleitman, Timothy Feist, Bill Poser, Nigel Vincent, Keren Everett, Arlo Heinrichs, Steve Sheldon, Pattie Epps, Tony Woodbury, Brent Berlin, Tom Headland, Terry Kaufman, Grev Corbett, Peter Gordon, Sally Thomason, Alec Marantz, Donca Steriade, Craige Roberts, Mary Beckman, Peter Culicover and Iris Berent for comments of varying detail on this paper. I especially want to thank Paul Kay for asking many challenging questions about my statements on color terms. He has helped me sharpen my thinking about this enormously. Tom Headland also deserves special mention for giving me detailed help in how to make my ethnographic summary more intelligible to anthropologists.

This paper supersedes any other published or unpublished statement by me on those aspects of Pirahã grammar here addressed.

No one should draw the conclusion from this paper that the Pirahã language is in any way 'primitive'. It has the most complex verbal morphology I am aware of and a strikingly complex prosodic system. The Pirahã are some of the brightest, pleasantest, most fun-loving people that I know. The absence of formal fiction, myths, etc. does not mean that they do not or cannot joke or lie, both of which they particularly enjoy doing at my expense, always good-naturedly. Questioning Pirahã's implications for the 'design features of human language' is not at all equivalent to questioning their intelligence or the richness of their cultural experience and knowledge.

[2] It is particularly ironic that linguists of the functional persuasion should ignore culture's potential impact on grammar because functional linguistics inherited from Generative Semantics the view that form is driven largely by meaning (and, more recently, by general cognitive constraints as well), because the locus and source of meaning for any human are principally in the culture.

[3] The notion of 'event' used in this paper comes from the standard literature on lexical semantics, i.e. a single logical predicate. Such predicates can be modified, but are

represented as a solitary events. See Van Valin and LaPolla (1997) for one model of lexical semantics. Note that this constraint does not say that a single event cannot be expressed by more than one utterance, merely that multiple events are not expressed in one utterance/sentence.

[4] The 'translation fallacy' is well-known, but field linguists in particular must be ever-vigilant not to be confused by it. Bruner, Brockmeier, and Harré (2001, 39) describe it as the supposition that there is only one human reality to which all 'narratives 'must in effect conform – be they fiction or linguistic theories, say. Throughout this paper, I will urge the reader to be on guard against this – the mistake of concluding that language x shares a category with language y if the categories overlap in reference.

[5] Part of the conclusion of this paper, agreeing with Gordon (2003), is that much of Pirahã is largely incommensurate with English and so translation is simply a poor approximation of Pirahã intentions and meaning, but we do as well as we can do.

[6] One reviewer suggests that these Pirahã words *are* quantifier words, but have different truth conditions from their English counterparts. But having different truth conditions just means have different meanings in this context so if it could be shown, as I do here, that they have different truth conditions then they are different words. Period.

[7] All traders enjoy telling me how the Pirahã love to call them **Papai** and love them like a father, referring to this trading ritual. The Pirahã understand it quite differently, however. For one thing, as noted in section ' below, in Pirahã 'father' can be used in reference to someone you are dependent on, temporarily or permanently, as in this case, where there is dependency for trade items. Ultimately, to the Pirahã, I think that a foreigner with goods is seen something like a fruit tree in the forest. One needs to know the best way to get the fruit out of it without hurting oneself. There is no question of pride or prestige involved.

[8] This is a typical 'patrão/patron' system, common in Latin America. The trader always tells the Pirahã that they have overspent, so that they are constantly indebted to him.

[9] The end of the literacy classes, begun at the Pirahã' request (and separate from the math classes already described), was as follows. After many classes, the Pirahã (most of the village we were living in, about 30 people) read together, out loud, the word **bigí** 'ground/sky'. They immediately all laughed. I asked what was so funny. They answered that what they had just said sounded like their word for 'sky'. I said that indeed it did because it IS their word. They reacted by saying that if that is what we were trying to teach them, they wanted us to stop because 'We don't write our language'. The end of literacy. No hard feelings. But the decision was based on a rejection of foreign knowledge. Their motivation for attending the literacy classes turned out to be, according to them, because it was fun to be together and because I made popcorn.

[10] Peter Gordon became interested in the Pirahã because, while we were colleagues at the University of Pittsburgh, I told him that they had no numbers, did not count, yet had a count-mass adjective distinction (see (12) and (13) above). The latter claim, it turns out, is not very convincing, but he became interested because his dissertation research at MIT was on the count-mass distinction. He determined to measure Pirahã' counting ability rather than to rely merely on my anecdotal evidence.

[11] Now, of course human cognition must be able to range beyond immediate experience. So the claim is not that the Pirahã cannot do this. I have no basis for such a claim (though

experiments to test this ability should be carried out in the future). My claim is rather that they do not express quantificational in nearly as wide a range of lexical or syntactic devices as in the examples above.

[12] Sheldon (1974) analyzes Pirahã as having three underlying tones. Everett (1979) argues that it should be analyzed as having only two tones. I follow this analysis throughout the paper (except for this section), as I have in all publications on the language. For the examples of this section, taken from Sheldon's work, I use Sheldon's tones.

[13] And this of course means that what I say about Pirahã semantics is largely unreplicable unless the 'replication' linguist learns to speak the language, etc. Assuming that someone twice as smart and talented as I were found, not too difficult to imagine I suppose, that would still require an investment of several years focused on the Pirahã language. Unlikely, though not impossible, to imagine.

[14] It is possible that tones were used rather than free-form pronouns, though the only use of tones currently on pronouns is to distinguish 'ergative' from 'absolutive' in the first person (**ti** = absolutive; **tí** = ergative). One reader of this paper said that he found it 'inconceivable' that there would have been no first vs. second person distinction in the language at any point in its history. In fact, however, Wari' (Everett (to appear)) is a language that currently lacks any first vs. second person distinction.

[15] Culicover (p.c.) suggests that Pirahã's lack of embedding is a kind of linguistic 'fossil'.

[16] The reader is urged to consult Everett (1993) if further argumentation and explication of tense in Pirahã is desired.

[17] Verbal events are also culturally restricted in Pirahã. But verbal 'incorporation' is quite common (stringing together several verb roots, see Everett (1986, section 18) to form another verb. For 'arrival' and some other events, there are always multiple verb roots incorporated. For 'match flicker' however, there is only the single verb **'ibipíai**.

[18] Whether this is related to the use of Portuguese *Papai* 'father' in dealing with river traders, I do not know, though I suspect that it is. I am not sure which came first.

[19] These two terms for 'son' appear to be synonyms. I don't really believe in synonyms, but I have never been able to discover any difference between the terms in texts, direct questions, indirect observations, etc. They seem to be used with equal frequency.

[20] It seems to have both of these meanings simultaneously, though different people seem to use it in different ways, some favouring the former, some the latter meaning.

[21] The quality of anthropological research on Pirahã is heterogeneous. Several anthropologists (see especially Gonçalves (1990, 2001); Oliveira (1978); Oliveira and Rodrigues (1978); and Roppa (1978) have done a reasonable job of describing aspects of Pirahã culture, but a previous description of the kinship system (Oliveira (1978)) is dramatically weakened in quality by the failure of the researcher to speak the language, leading to confusions between cliticized possessive forms of the same kinship term with distinct kinship terms. The longer-term studies of Pirahã cosmology and naming by Gonçalves (1990, 2001), while very informative overall, show areas that could have been improved had the author been able to speak the language. However, the studies by Gonçalves are easily the most reliable ever done by any anthropologist on Pirahã. But one simply cannot come to the best conclusions about Pirahã meanings and Pirahã explanations working through the medium of the very poor Portuguese of Pirahã

informants. Gonçalves based much of his research on work with two Pirahã informants (who either interpreted for him or served directly as informants), whose Portuguese names are Bernardo and Paulo. Their Portuguese was somewhat better because they were taken away from the village as young boys and lived for a couple of years with Brazilians along the Madeira river until discovered and restored to their people by (Bernardo tells me that this was Arlo Heinrichs of the SIL, though Heinrichs says that this is incorrect, because he arrived for the first time when Bernardo was already about ten years old). But even these two informants' Portuguese is insufficient for getting at the meanings of terms as they emerge both from the culture and especially from the very complex morphological structure of Pirahã. One final comment: anthropologists and other linguists often make what I consider to be the mistake of referring to the Pirahã as 'Mura-Pirahã'. This term confuses speakers of related dialects with a single people. The Pirahã never refer to the Mura as the same group and do not think of them as that way. In the Pirahã language, the Mura are referred to as 'foreigners'.

[22] ***k*** is somewhat problematic. It seems to be a phoneme, but in most of its appearances it can be analyzed as a portmanteau realization of /h/ + /i/ or /h/ +/u/. See Everett (1979) for details.

[23] The length of the notes is determined by the relative lengths of the syllables, as is the height of the notes. The wedges under the lines indicate stress. The values are CVV = whole note; GVV = dotted half; VV = half; CV = dotted quarter; GV = quarter.

[24] Martius's error is not as difficult to understand as it might first appear, i.e. that anyone could think that Pirahã vocabulary is/was Tupian. In my first visit to the Pirahã, they tended to give Tupian (Nheengatu) words as answers to my attempts to elicit vocabulary in their language. I might not have spotted this for a while, since this was my first field experience except that my wife, Keren Everett, speaks a Tupi language, Sateré, and told me that those words could not be Pirahã unless Pirahã was Tupian.

[25] I am merely sketching Gordon's results. The reader should consult Gordon (2003) for full details.

[26] I have come to agree with Nimuendaju (1948) that the Mura (and Pirahã) appear to be a language isolate (with dialects). The attempt by others, e.g. Loukotka (1968) to classify it with other languages is based on too little data to take very seriously.

[27] One morning in 1980, during a nine-month stay among the Pirahã, I awoke to yelling, crying, and whooping near the river's edge, about fifty feet from where I was trying vainly to sleep. I went to the crowd, which included nearly every man, woman, and child in the village. They were all pointing across the river and some were crying, some were yelling, and all were acting as though what they were seeing was very frightening. I looked across the river, but I could see nothing. I asked them what they were fussing about. One man answered incredulously, 'Can't you see him there?' 'I see nothing. What are you talking about?' was my response. 'There, on the other bank, on that small strip of beach, is **'igagaí** a mean not-blood-one. There was nothing on the other side. But the people insisted that he was there in full view. This experience has haunted me ever since. It underscored how spirits are not merely fictional characters to the Pirahã, but concrete experiences.