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Cultural Constraints on Grammar and Cognition in Pirahã

Another Look at the Design Features of Human Language

by Daniel L. Everett

The Pirahã language challenges simplistic application of Hockett's nearly universally accepted design features of human language by showing that some of these features (interchangeability, displacement, and productivity) may be culturally constrained. In particular, Pirahã culture constrains communication to nonabstract subjects which fall within the immediate experience of interlocutors. This constraint explains a number of very surprising features of Pirahã grammar and culture: the absence of numbers of any kind or a concept of counting and of any terms for quantification, the absence of color terms, the absence of embedding, the simplest pronoun inventory known, the absence of "relative tenses," the simplest kinship system yet documented, the absence of creation myths and fiction, 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 documented, and the fact that the Pirahã are monolingual after more than 200 years of regular contact with Brazilians and the Tupi-Guarani-speaking Kawahiv.

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> *It does not seem likely ... that there is any direct relation between the culture of a tribe and the language they speak, except in so far as the form of the language will be moulded by the state of the culture, but not in so far as a certain state of the culture is conditioned by the morphological traits of the language.*
> FRANS BOAS, *1911*

In the early days of American descriptive linguistics, language was seen as an emergent property of human culture and psychology.[1] Except for small pockets of researchers here and there, for various reasons both so-called formal and functional linguistics abandoned the investigation of culture-language connections.[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 1992*a*, *b*; 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 the contributors to Enfield (2002), among others, have produced some important results.

This paper looks in detail at various aspects of the culture and language of the Pirahã of Brazil that suggest that Pirahã culture severely constrains Pirahã grammar in several ways, producing an array of otherwise inexplicable "gaps" in Pirahã morphosyntax. These constraints lead to the startling conclusion that Hockett's (1960) design features of human language, even more widely accepted among linguists than Chomsky's proposed universal grammar, must be revised. With respect to Chomsky's proposal, the conclusion is severe—some of the components of so-called core grammar are subject to cultural constraints, something that is predicted not to occur by the universal-grammar 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, *the restriction of communication to the immediate experience of the interlocutors*.

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), and immediacy of experience is reflected in immediacy of information encoding—one event per utterance.[3] Less explicitly, the paper raises the possibility, subject to further research, that culture constrains cognition as well. If the assertion of cultural constraint is correct, then it has important consequences for the enterprise of linguistics.

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, my conclusion is that the division is not in fact a very useful one and that Sapir, Boas, and the anthropological tradition generally have this right. In this sense, this paper may be taken as an argument that anthropology and linguistics are more closely aligned than 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. A summary of the surprising facts will include at least the following: Pirahã is the only language known without number, numerals, or a concept of counting. It also lacks terms for quantification such as "all," "each," "every," "most," and "some." It is the only language known without color terms. It is the only language known without embedding (putting one phrase inside another of the same type or lower level, e.g., noun phrases in noun phrases, sentences in sentences, etc.). It has the simplest pronoun inventory known, and evidence suggests that its entire pronominal inventory may have been borrowed. It has no perfect tense. It has perhaps the simplest kinship system ever documented. It 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. Pirahã in general express no individual or collective memory of more than two generations past. They do not draw, except for extremely crude stick figures representing the spirit world that they (claim to) have directly experienced.

In addition, the following facts provide additional overt evidence for ways in which culture can be causally implicated in the linguistic structure of the language: 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). The Pirahã people communicate almost as much by singing, whistling, and humming as they do using consonants and vowels (Everett

1985, 2004). Pirahã prosody is very rich, with a well-documented five-way weight distinction between syllable types (Everett 1979, 1988; Everett and Everett 1984).

A final fascinating feature of Pirahã culture, which I will argue to follow from the above, is that Pirahã continue to be monolingual in Pirahã after more than 200 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 the Pirahã cultural constraint on grammar and living, a profound cultural value, leading to an explanation for this persistent monolingualism.

Any of these properties is sufficiently unusual in itself to demand careful consideration, but their manifestation in a single language suggests the existence of a 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 that ranges beyond personal, usually immediate experience or is transmitted via such experience. All of the properties of Pirahã grammar that I have listed will be shown to follow from this. Abstract entities are not bound by immediate personal experience, and therefore Pirahã people do not discuss them.

In developing the arguments to support these theses, I also argue against the simple Whorfian 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 offers an insufficient tool for language-cognition connections more generally in that it fails to recognize the fundamental role of culture in shaping language. In what follows I describe the properties of Pirahã grammar mentioned above, consider the facts in light of Pirahã cultural values, and discuss the lessons to be drawn from the case of Pirahã for linguistic theory. I do not claim that my thesis or its relation to the facts has been proven; rather, I suggest that the relation has been supported and that there is no other obvious relation. Any other approach would render the above-mentioned observations coincidental.

[1] I 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 it, 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 has challenged me to consider the absence of Pirahã numerals in a wider cultural and linguistic context. I thank David Gil of the Max Planck Institute for Evolutionary Anthropology in Leipzig for organizing the "Numerals" conference there (March 28 and 29, 2004) and the Institute's Linguistics Department for offering me ideal circumstances in which to rough out the bulk of this paper. I also thank (in no particular order) 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 and Paul Kay for asking challenging questions about my statements on color terms that helped me sharpen my thinking about this enormously. Tom Headland deserves special mention for giving me detailed help on 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 ironic that linguists of the "functional" persuasion should ignore culture's potential impact on grammar, given the fact that 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—a single logical predicate—comes from the standard literature on lexical semantics. Such predicates can be modified but are represented as solitary events (see Van Valin and LaPolla 1997 for one model). This is not to say that a single event cannot be expressed by more than one utterance but merely that multiple events are not expressed in a single utterance/sentence.

Number, Numerals, and Counting

There is no grammatical number in Pirahã (Everett 1983, 1986; Corbett 2000). There are therefore no number contrasts on nouns, pronouns, verbs, or modifiers for number (= high tone; no mark over vowel = low tone; ' = glottal stop):

1.	*hiaitíihí*	*hi*	*kaoáíbogi*	*bai*	*-aagá*
	Pirahã people	he	evil spirit	fear	-be
	"The Pirahã are afraid of evil spirits," "A Pirahã is afraid of an evil spirit," "The Pirahã are afraid of an evil spirit," or " A Pirahã is afraid of evil spirits."				

2.	*kó'oí*,	*kóhoibiíhai*,	*hi*	*píai*,	*'aáibígaí*,
	name	name	he	also,	name
	hi	*píai*,	*hi*	*koabáipí*	
	he	also,	he	die	
	"Kó'oí, Kóhoibiíhai, and 'aáibigaí died."				

3.	*kó'oí*	*hi*	*koabáipí*
	name	he	die
	"Kó'oí died."		

4.	*báigipóhoaá*	*'i*	*'óoí*	*kobai*	*-baaí*
	name:feminine	she	tarantula	watch	-intently
	"Báigipóhoaá watched the tarantula[s] closely." (This can refer to one woman named "Báigipóhoaá" or several.)				

This feature of Pirahã is itself very rare (see Corbett 2000:50). There may be no other language that lacks the

grammatical category of number.

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] *hói* `small size or amount', *hoí* `somewhat larger size or amount', and *bá a gi so* lit. `cause to come together' (loosely `many'). Some examples which show how Pirahã expresses what in other cultures would be numerical concepts are as follows:

5.	a.	*tí*	*'ítíi'isi*	*hói*	*hii*	*'aba'áígio*	*'oogabagaí*
		I	fish	small	predicate	only	want
		"I only want [one/a couple/a small] fish." (This could not be used to express a desire for one fish that was very large except as a joke.)					
	b.	*tiobáhai*		*hói*		*hii*	
		child		small		predicate	
		"small child/child is small/one child"					

6.	a.	*tí*	*'ítíi'isi*	*hoí*	*hii*	*'oogabagaí*
		I	fish	larger	predicate	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-versus-mass distinction (examples preceded by an asterisk are ungrammatical, and those preceded by a question mark would be considered strange):

7.	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."				

8.	a.	*'agaísi*	*'apagí*	*'ao'aagá*	*'oí*	*kapió'io*
		manioc meal	much	exist	jungle	other
		"There is a lot of manioc meal in another jungle."				
	b.	**'agaísi*	*'aaíbái*	*'ao'aagá*	*'oí*	*kapió'io*
		manioc meal	many	exist	jungle	other
		*"There is many manioc meal in another jungle."				

This distinction is more consistently analyzed, however, as the distinction between things that can be individuated and things that cannot, thus independent of the notion of counting.

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

9.	*ti*	*'apaí káobíi*	*'ahaigí*	
	I	head fall	same generation	
	hi	*tíohió'ío/gaaba*		*káobíi*
	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 expressions *tíohió'ío* and *gaaba* here are interchangeable in most contexts. They refer both to intermediate points in a succession of participants, events, etc., or to the final position. But 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.). Pirahã 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 tend not to point with individual fingers, at least when talking to me. Commonly, 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. 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) will occasionally extend both feet and hands, with toes and fingers also extended, to indicate a large number of individual items (they would do this in my experience not for a nonindividuated quantity such as manioc flour but rather for bags of manioc flour, etc.). Other than these gestures, there is no use of body parts, objects, or anything to indicate a concept of "tallying."

There are no quantifier terms like "all," "each," "every," "most," and "few" in Pirahã. There are also no "WH (information question)-quantifiers" per se.[6] The following examples show the closest expressions Pirahã can muster to these quantifiers:

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

11.	*ti*	*'ogi*	*-'áaga*
	I	big	-be (permanence)
	-ó	*'ítii'isi*	*'ogi*
	-direction	fish	big
	-ó	*'i*	*kohoai-baaí*,
	-direction	she	eat -intensive
	koga	*hói*	*hi*
	nevertheless	small amount	intensive
	hi	*-i*	*kohoi*
	intensive	-be	eat
	-hiaba		
	-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.")

The following is the closest I have ever been able to get to a sentence that would substitute for a quantifier like "each," as in "Each man went to the field."

12.	*'igihí*	*hi*	*'ogiáagaó*	*'oga*
	man	he	bigness	field
	hápií;	*'aikáibaísi,*	*'ahoáápati*	*pío,*
	went	name,	name	also,
	tíigi	*hi*	*pío,*	*'ogiáagaó*
	name	he	also	bigness
	"The men all went to the field, *'aikáibaísi*, *'ahoáápati*, *tíigi* all went."			

13.	*gáta*	*-hai*	*hói*	*hi*	*-i*
	can	-foreign object	small	intensive	-be
	'aba	*-'á*	*-ígi*	*-o*	
	remain	-temporary	-associative	-location	
	'ao	*-aagá*	*'agaoa ko*	*-ó*	
	possession	-be (temporary)	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.") (*'aba'áígio* can often be translated as "only," but the full morphological breakdown shows that it is not really equivalent in meaning to "only," nor does it share the full range of meanings of "only.")				

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

14.	a.	*tíobáhai*	*hi*	*bá*	*-a*
		child	he	touch	-causative
		-i	*-so*	*kohoai*	
		-connective	-nominalizer	eat	

		-sóog	*-ab*	*-agaí*	
		-desiderative	-stay	-thus	
		"The child wanted/s to eat the whole thing." (lit. "Child muchness/fullness eat is desiring.")			
	b.	*tíobáhai*	*hi*	*gíi*	*-ái*
		child	he	that	-there
		kohoai	*-sóog*	*-ab*	*-agaí*
		eat	-desiderative	-stay	-thus
		"The child wanted/s to eat a piece of the thing." (lit. "Child that there eat is desiring.")			

Here *báaiso* and *gíiái* are used as nouns, but they can also appear as postnominal modifiers:

15.	a.	*tiobáhai*	*hi*	*poogaíhiaí*	*báaiso*
		child	he	banana	whole
		kohoai	*-sóog*	*-ab*	*-agaí*
		eat	-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*
		child	he	banana	piece
		kohoai	*-sóog*	*-ab*	*-agaí*
		eat	-desiderative	-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. In the following examples someone has just killed an anaconda and upon seeing it, utters 16a. Someone takes a piece of it, and after the purchase of the remainder the content of 16a is reaffirmed as 16b:

16.	a.	*'áoói*	*hi*	*paóhoa'ai*	*'isoí*
		foreigner	he	anaconda	skin
		báaiso	*'oaboi*	*-haí*	

		"whole"	buy	-relative certainty	
		"The foreigner will likely buy the entire anaconda skin."			
	b.	*'aió*	*hi*	*báaiso*	*'oaob*
		affirmative	he	"whole"	buy
		-áhá		*hi*	*'ogió*
		-complete certainty		he	bigness
		'oaob	*-áhá*		
		buy	-complete certainty		
		"Yes, he bought the whole thing."			

In the English equivalent, where the same context is assumed, when the statement "He will likely buy the whole anaconda skin" is followed by the removal of a piece in full view of interlocutors, it would simply be dishonest and a violation of the meaning of "whole" to say, "He bought the whole anaconda skin," but this is not the case in Pirahã.

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

17.	**Ti*	*'ísi*	*báaiso*	*'ogabagai*
	I	animal	"whole"	want,
	gíiái	*'ogi*	*-hiaba*	
	piece	want	-negative	
	"I prefer whole animals to portions of animals." (lit. "I desire [a] whole animal[s], not piece[s].")			

Sentences like this one cannot be uttered acceptably in the absence of a particular pair of animals or instructions about a specific animal to a specific hunter. In other words, 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, but facts like those discussed here, 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:

18.	*tí*	*'iíbisi*	*hi*	*baiai*	*-hiaba*
	I	blood-one	he	fear	-negative

	"I am not afraid of beings with blood."

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

On the surface it looks as if these were quantificational phrases. They are of course ambiguous between singular reading (e.g., "I am not afraid of that being with blood") and 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 is appealing, but I think that it is another manifestation of the translation fallacy. Even though there is a certain "quantificational smell" here, the truth conditions are not the same for generics as for quantificational readings (see, e.g., Krifka et al. 1995). In fact, I 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 the postulate of cultural constraint on grammar and living because they are bounded by immediate experience (e.g., "evil spirits I know about") and thus are not fully intensional. Rather, each member of the set has to be inspected to see whether it is an evil spirit or being with blood and, if so, whether it is like other such beings.

In 1980, at the Pirahã's 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 told us that they wanted to learn this because they knew that they did not understand nonbarter economic relations and wanted to be able to tell whether they were being cheated. After eight months of daily efforts, without ever needing to call them 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 learned to count to ten, and not one 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 (2004) research.

Riverboats come regularly to the Pirahã villages during the Brazil nut season. This contact has probably been going on for more than 200 years. Pirahã men collect Brazil nuts and store them around their village for trade. They know all the 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) on the basis of the quantity of items they receive for the nuts they trade. A Pirahã man will present whatever it is that he has to "sell," whether Brazil nuts, raw rubber, sorva, or wood, to the owner of the riverboat. The Brazilian will ask in Portuguese, "What do you want, my son?" The Pirahã responds in Portuguese, "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 (which are usually pejorative, e.g., "No Balls") when discussing them.[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. Their Portuguese is

extremely poor, again, but they can function in these severely circumscribed situations. They will point at goods on the boat until the owner says that they have been paid in full.[8] They will remember the items they received (but not exact quantities) and tell me and other Pirahã what transpired, looking for confirmation that they got a good deal. There is little connection, however, between the amount they bring to trade and the amount 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 (though, whatever transpires, the riverboat owner should not leave with any women). In this "trade relationship" there is no evidence whatsoever of quantification or counting or learning of the basis of trade values. Pirahã living near the Trans-Amazon Highway are far from Brazil nut groves, so they trade fish to passing truck drivers and some settlers. In these cases they tend to be much more aggressive because they know that 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 oppose its 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 a preferred response to a specific question, they will likely change the subject and/or show irritation. They will "write stories," just random marks, on paper I give them and then "read" the stories back to me—telling me something random about their day, etc. 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 (for examples, when I ask them to draw a symbol twice, it is never replicated) and consider their "writing" exactly the same as the marks that I make. In literacy classes, we were never able to train Pirahã even to draw a straight line without serious "coaching," and they were never able to repeat the feat in subsequent trials without more coaching (partially because they saw the entire process as fun and enjoyed the interaction but also because the concept of a "correct" way to draw was profoundly foreign).[9]

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 above, that, when considered together, appear to result from a higher-level cultural constraint or constraints. The constraint(s) must be cultural, it seems to me, because, while there does not seem to be any linguistic or cognitive commonality between the items, there is a cultural value that they share, namely, the value of referring only to immediate experience. If we accept this as a strong cultural constraint in Pirahã, then the list of items is greatly reduced because each involves quantification, which entails abstract generalizations that range in principle beyond immediate experience, rather than qualification, which entails judgments about immediate experience.[10]

[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"—be they fiction or linguistic theories, say—must in effect conform. 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 (2004), is that much of Pirahã is largely incommensurate with English and therefore translation is simply a poor approximation of Pirahã intentions and meaning, but we do as well as we can do.

[6] One reviewer has suggested that these Pirahã words *are* quantifier words but have different truth conditions from their English

counterparts. But having different truth conditions simply means having different meanings in this context, and therefore if they have different truth conditions then they are different words.

[7] Traders enjoy telling me how the Pirahã call them *Papai* and love them like a father, but the Pirahã understand it quite differently. For one thing, in Pirahã "Father" can be used in reference to someone one is dependent on, as in this case, where there is dependency for trade items. Ultimately, to the Pirahã, a foreigner with goods seems to be seen as something like a fruit tree in the forest. One needs to know the best way to get the fruit from it without hurting oneself. There is no question of pride or prestige involved.

[8] This is the patron-client system common in Latin America. The trader always tells the Pirahã that they have overspent, with the result that they are constantly indebted to him.

[9] The end of the literacy classes, begun at the Pirahã's 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 was their word. They reacted by saying that if that is what we were trying to teach them, they wanted us to stop: "We don't write our language." The decision was based on a rejection of foreign knowledge; their motivation for attending the literacy classes turned out to be, according to them, that it was fun to be together and I made popcorn.

[10] Now, of course, human cognition must be able to range beyond immediate experience, and therefore my 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 conducted). My claim is rather that they do not express quantification in nearly as wide a range of lexical or syntactic devices as in other languages.

Color Terms

According to the entry for Pirahã in Kay et al. (n.d.), based on work by Steve Sheldon,

> *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 [Kay et al.'s footnote reads "The raised numerals following each syllable indicate tone"] 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 [the term meant is ko^{3}biai^3] 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 proposed Pirahã color terms of Sheldon are given in table 1. In fact, these are not morphologically simple forms. Three are not even words, as is shown by the following morphological divisions and glosses:[11]

20.	*bii*	*-o^{3}pai^2*	*ai^3*
	blood	-dirty/opaque	be/do
	"Blood is dirty."		

21.	*k*	*-o^{3}bi*	*ai^3*

	object	-see	be/do
	"It sees."		

22.	*bi³i¹*	*-sai³*
	blood	-nominalizer
	"bloodlike"	

23.	*a³hoa³s*	*aa³ga¹*
	immature	be:temporary
	"temporarily being immature"	

There are no color terms in Pirahã. This conclusion is not intended as an indictment of Sheldon's claims. When one is armed with a set of categories (e.g., the Berlin and Kay [1969] model for color terms) and no other, it is understandable that one finds what one can talk about—that is, that a degree of linguistic relativity colors the research of linguists. Also, because linguistics research among the Pirahã is monolingual, there is no way to get translations 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 field researcher) and by simply learning enough of the culture and language oneself to develop incipient intuitions that guide further testing and reasoning.[12]

TABLE 1 World Color Survey Chart of Pirahã Color Terms

There is, however, 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 "space," then the phrases themselves count as color terms. This is a different concept of color term from the one I had in mind (namely, morphologically simple terms for colors), but even if we grant Kay's point mine remains the same: not only are these phrases not simple color words but 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 of quantification (as in generalized quantifier theory, where noun phrases may be used to denote sets of properties) using color indicates 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 as do speakers of languages with 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, in contrast to the situation with numbers, the Pirahã would show good ability to distinguish colors under controlled circumstances. This is likely because 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. Both are used to quantify beyond immediate, spatio-temporally bound experience. If one has a concept of "red" as opposed to immediate, nonlexicalized descriptions, one can talk about "red things" as an abstract category (e.g., "Don't eat red things in the jungle" [good advice]). But Pirahã refer to plants not by generic names but by species names, and they do not talk about colors except as describing specific objects in their own experience.

[11] Sheldon analyzes Pirahã as having three underlying tones. I have argued elsewhere (Everett 1979) that it should be analyzed as having only two tones, and I follow this analysis throughout the paper except for this section. For these examples, taken from Sheldon's work, I use his tones.

[12] This of course means that what I say about Pirahã semantics is largely unreplicable unless the "replication" linguist learns to speak the language.

Pronouns

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) (see also Nimuendajú 1925). [The argument for borrowing may be found in the electronic edition of this issue on the journal's web page.] Somehow the grammar seems to have gotten by without them,[13] but even their current use 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 from most pronouns. In a narrative about the killing of a panther, the word for "panther" is repeated in almost every line of the text. Only when the panther dies is it replaced 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. This is strange in light of most work (e.g., Givon 1983) on topic continuity in discourse, and it is the common, perhaps exclusive pattern of pronoun-versus-proper-noun occurrence in Pirahã discourse. The Pirahã prefer not to use a pronoun to refer to an entity, since this is 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, for example, no Pirahã equivalent to a "donkey sentence" ("Everyone who owns a donkey beats it"). This reduced role for pronouns is striking. Not only does it follow from the cultural constraint on grammar but the absence of pronouns prior to their borrowing seems likely. What "pronouns" in Pirahã are mainly used for is verb agreement (Everett 1987).

In spite of my claim that variables play no active role in quantification or the grammar of pronominals, one reader has suggested 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 work for Pirahã. First, there are only 90 verb roots in the Pirahã lexicon. In other words, verbs are a closed lexical class, and this means that, rather than learn them as variables, the Pirahã can learn them as constants, one by one. Moreover, the combination of verbs is largely constrained by culture. Further, it is unnecessary to consider nouns variables, since there is no nominal morphology and since 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. Thus both nouns and verbs behave more like constants than variables in Pirahã.

[13] 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 found it "inconceivable" that there would have been no first-versus-second-person distinction in the language at any point in its history. In fact, however, Wari (Everett n.d.) is a language that currently lacks any first-versus-second-person distinction.

Lack of Embedding

One more unusual feature of Pirahã, perhaps the strangest of all, is the absence of clear evidence for embedding. Indeed, the evidence suggests that Pirahã lacks embedding altogether. Let us begin by considering how the function of clausal complements is expressed in Pirahã without embedding. English expresses the content of verbs such as "to say," "to think," and "to want" as clausal complements (here the use of a subscript *s* labels the embedded clauses as theory-neutral): "I said that [$_s$John will be here]," "I want [$_s$you to come]," "I think [$_s$it's important]." In Pirahã the contents of such verbs, to the degree that equivalent verbs exist at all, are expressed without embedding:

24.	*ti*	*gái*	*-sai*	*kó'oí*	*hi*	*kaháp*	*-ií*
	I	say	-nominative	name	he	leave	-intention
	"I said that Kó'oí intends to leave." (lit. "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 noun phrase "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 (as do many other Amazonian languages [see Everett 2004]) the verb "to say" to express intentional contents. Therefore "John thinks that ..." would be expressed in Pirahã as "John's saying that. ..." English complement clauses of other types are handled similarly in Pirahã, by nominalizing one of the clauses:

25.	a.	*hi*	*ob*	*-áa'ái*	*kahai*	*kai*	*-sai*
		he	see	-attractive	arrow	make	-nominative

	b.	*kahaí*	*kai*	*-sai*		*hi*	
		arrow	make	-nominative		he	
		ob	*-áa'ái*				
		see	-attractive				
	c.	**hi*	*kahaí*	*kai*	*-sai*		
		he	arrow	make	-nominative		
		ob	*-áa'ái*				
		see	attractive				
		"He knows how to make arrows well." (lit. "He sees attractively arrow-making.")					

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 the "matrix" verb "to see/know well." The second is that this construction is the paratactic conjoining of the noun phrase "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, whereas normally there is optional clitic agreement available with any direct object, there is never any clitic agreement with such "object complement clauses" in Pirahã (Everett 1988). Further, although the order of "complement" and "matrix" clauses can be reversed, the "embedded" clause can never appear in direct-object position.

Further evidence of the analysis is the corresponding interrogative form:

26.	*hi*	*gó*		*'igí*	*-ai*
	he	information question		associate	-do/be
	kai	*-sai*	*hi*	*'ob*	*-áa'ái*
	make	-nominative	he	see	-attractive
	"What [thing/kind of] making [does he] know well?" (lit. "He what associated making sees well?")				

27.	**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?")							

In a question about 25, the order of the clauses must be that in 26. This follows if there is no embedding, because the interrogative word must always be initial in the phrase and because the appearance of the entire clause/phrase at the front of the construction means that the question of extraction from within an embedded or other phrase does not arise. We can, indeed should, interpret 26 as the 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 may still find it difficult to accept the idea of analyzing nominalized clauses of the type just mentioned apart from embedding because the two are so closely associated in many languages (see Koptjevskaja Tamm 1993). Nominalization is, however, neither a necessary nor a sufficient condition for embedding, and an embedding analysis fails to account for multiple embeddings (why can't multiple nominalized or other types of subordination occur in any sentence?) and for the extraction and word-order facts. At the same time, a close semantic unit is formed by certain juxtaposed clauses, and the nominalization is accounted for by the principle of immediacy of information encoding, which is stated in terms of utterances rather than clauses.

Other "subordinate" clauses similarly show no evidence of embedding:

28.	*ti*	*kobai*	*-baí*	*'áoói*	*hi*

	I	see	-intensive	foreigner	he
	'íkao	*-ap*	*-áp*	*-iig*	*-á*
	mouth	-pull	-up	-continuative	-declarative
	"I really watch[ed] the foreigner fishing [with line and hook]." (lit. "I watch the foreigner intently. He was pulling [fish] out by [their] mouths.")				

29.	**hi*	*gó*		*'igí*
	he	information question		associate
	-ai	*hi*	*'íkaoapápiigá*	*hi*
	-do/be	he	fish	he
	kobai	*-baí*	*'áoói*	
	see	-intensive	foreigner	
	"What did he pull out by the mouth you watched intently?"			

30.	*hi*	*gó*		*'igí*
	he	information question		associate
	-ai	*hi*	*kobai*	*-baí*
	-do/be	he	see	-intensive
	'áoói			
	foreigner			
	"What did he see the foreigner do?/Why did he watch the foreigner?"			

Example 29 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 that native speakers face in such elicited constructions. In contrast, 30 is acceptable because it is simply asking about what someone watched; the answer could be a clause or a noun phrase.

Now consider how temporal clauses are handled:

31.	*kohoai*	*-kabáob*	*-áo*	*ti*
	eat	-finish	-temporal	I
	gí	*'ahoai*	*-soog*	
	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 from 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." The similar conditional that follows uses nominalization:

32.	*pii*	*-boi*	*-sai*	*ti*
	water	vertically move	-nominalizer	I
	kahapi	*-hiab*	*-a*	
	go	-negative	-declarative	
	"If it rains, I will not go." (lit. "Raining I go not.")			

Both 31 and 32 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 ways I know to ask questions about them are "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):

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

Here 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. Each is an independent, well-formed sentence. The second sentence, on its own, would be a question, "What did Chico sell?" In this context, however, it is the co-relative.

Finally, "want"-like embeddings are handled in Pirahã by a desiderative suffix on the verb, with no evidence of biclausality:

34.	*'ipóihií*	*'í*	*gí*	*kobai*	*-soog*	
	woman	she	you	see	-want	
	-abagaí					
	-frustrated initiation					
	"The woman wants to see you."					

Let us now consider two other potential cases of embedding in Pirahã, possession and modification:

35.	**kó'oí*	*hoagí*	*kai*	*gáihií*	*'íga*
	name	son	daughter	that	true
	"That is Kó'oí `s son's daughter."				

36.	**kaóoí 'igíai*	*hoagi*	*kai*	*gáihií*	*'íga*
	who	son	daughter	that	true
	"Whose son's daughter is that?"				

Neither the declarative (35) nor the interrogative (36) form of recursive possession is acceptable. No more than one possessor per noun phrase is ever allowed. Removing one of the possessors in either sentence makes it grammatical. A cultural observation here is, I believe, important for understanding this restriction. Every Pirahã knows every other Pirahã, and they add the knowledge of newborns very quickly. Therefore one level of possessor is all that is ever needed. If further identification is called for, say, in the case of a foreign family, then an extra phrase is juxtaposed:

37.	*'ísaabi*	*kai*	*gáihií*	*'íga*
	name	daughter	that	true
	kó'oí	*hoagí*	*'aisigí*	*-aí*
	name	son	the same	-be
	"That is 'ísaabi `s daughter. Kó'oí's son being the same."			

Here the juxtaposition makes it clear that 'ísaabi is Kó'oí's son.

Very rarely, one encounters multiple modification in natural discourse and elicited material. A typical example is as follows:

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

There seems no need to analyze this as embedding, however. It is merely, as in previous cases, 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 "old men and women." The ambiguity here is usually understood as the result of attaching "old" to either the noun phrase containing "men and women" or the lower noun phrase containing only "men." Since there is no way for "old" to be attached uniquely to "women," the third ambiguity (in which only women would be old) is ruled out. However, Pirahã never allows such conjunction of noun phrases with modifiers. Rather, the equivalent in Pirahã would be:

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

Once again, 39 involves juxtaposition. This is further supported by the ability to repeat the modifier "old" in the following construction:

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

There is likewise no evidence for embedding in Pirahã morphological structure. Although the complexity of the verb is very high, with perhaps more than 16 suffix classes, there is nothing about its 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.

If indeed there is no embedding in Pirahã, how might this lack be related to cultural constraint? Embedding increases information flow beyond the threshold of the principle of immediacy of information encoding. Although Pirahã most certainly has the communicative resources to express clauses that in other languages are embedded, there is no convincing evidence that Pirahã in fact has embedding, and, as we have seen, positing it would complicate our understanding of question formation. This would follow from the principle of immediacy of information encoding, which I take to be the iconic principle constraining the grammar's conformity to cultural constraint.[14]

[14] Peter Culicover (personal communication) suggests that Pirahã's lack of embedding is a kind of linguistic "fossil."

Tense

I have argued elsewhere (1993) that Pirahã has no perfect tense and have provided a means for accounting for this fact formally within the neo-Reichenbachian tense model of Hornstein (1990). This is an argument 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 has two tenselike morphemes, *-a* `remote' and *-i* `proximate'. These are used for either past or present events and serve primarily to mark whether an event is in the immediate control or experience of the speaker ("proximate") or not ("remote").

In fact, Pirahã has very few words for time. The complete list is as follows: *'ahoapió* `another day' (lit. `other at fire'), *pi'í* `now', *so'óá* `already' (lit. `time-wear'), *hoa* `day' (lit. `fire'), *ahoái* `night' (lit. `be at fire'), *piiáiso* `low water' (lit. `water skinny temporal'), *piibigaíso* `high water' (lit. `water thick temporal'), *kahai'aíi 'ogiíso* `full moon' (lit. `moon big temporal'), *hisó* `during the day' (lit. `in sun'), *hisóogiái* `noon' (lit. `in sun big be'), *hibigíbagá'áiso* `sunset/sunrise' (lit. `he touch comes be temporal'), *'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 Hornstein-Reichenbach system (see also Comrie 1985). 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. Thus, for example, the tenses of English can be represented in this system as follows (where a comma = simultaneous and __ = precedes [see Hornstein 1990 and Everett 1993 for details]): S, R, E = present tense; S__R, E = future tense; E, R__S = past tense; E__R__S = past perfect; S__E__R = future perfect; E__S, R = present perfect.

To account for Pirahã's lack of the perfect, I have suggested that [R] is parameterized, with [-R] as the default value. Children would set it at [+R] just in case they heard a perfect-tense utterance or, perhaps, a perfect-tense interpretation. I have also pointed to 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 have argued that formal grammars require that any noncoincidental connection in this regard be Whorfian; language must influence culture, since otherwise children would have to learn their culture in order to learn their 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 to situate the semantics of Pirahã tense more perspicaciously by seeing the absence of precise temporal reference and relative tenses as one further example of the cultural constraint on grammar and living. This would follow because precise 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."

When the Pirahã hear a boat coming, they will line up on the riverbank 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 *-ai* is the verb form and *-o* the incorporated form).[15] They will repeat the same expression when the match goes out. They especially use this for a flickering match and love to watch one, saying "Keep on *'ibipíai*." After discussions and checking of many examples of this, it became clearer that the Pirahã are talking about liminality—situations in which an item goes in and out of the boundaries of their experience. This concept is found throughout Pirahã culture. Pirahã's excitement at seeing a canoe go around a river bend is hard to describe; they see this almost as traveling into another dimension. It is interesting, in light of the postulated cultural constraint on grammar, that there is an important Pirahã term and cultural value for crossing the border between experience and nonexperience.

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

Kinship Terms

Pirahã's kinship system may be the simplest yet recorded. An exhaustive list of the kinship terms is the following (unless specifically mentioned, there are no gender distinctions): *'ahaigí* `ego's generation', *tiobáhai* `any generation below ego', *baí'i* `any generation above ego/someone with power over ego,'[16] *'ogií* `any generation above ego/someone with power over ego' (lit. `big'), *'ibígaí* `usually two generations above ego or more but overlaps with *baí'i* and *'igií'* (lit. `to be thick'), *hoagí* `biological son' (lit. `come next to'), *hoísai* `biological son' (lit. `going one'),[17] *kaai* `biological daughter' (a house is a *kaaií* `daughter thing'), *piihí* `child of at least one dead parent/favorite child'.[18]

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 the cultural constraint on grammar and living? The latter seems the most economical and satisfying explanation. Kinship terms refer only to known relatives; one never refers to relatives who 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 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 for 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 the principle of immediacy of experience.

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 a biological parent marry and

have been told that this is not rare, but I have never seen a marriage between full biological siblings.

This raises the additional question of how the Pirahã distinguish between just anyone at their generation and biological siblings, which they seem to do pretty well despite the fact that children not uncommonly switch families and are occasionally (especially orphans) raised by the village. The nominal suffix *gíi* `real' or `true' can be added to most nouns, including kinship terms: *'áoói* `foreigner', *'áoói-gíi* `Brazilian' (lit. `real foreigner'—the ones they knew first), *'ahaigí* `same generation', *'ahaigí–gíi* `biological sibling' (lit. `real sibling').

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

[17] These two terms for "son" appear to be synonyms; I have never been able to discover any difference between them in texts, direct questions, indirect observations, etc., and they seem to be used with equal frequency.

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

Absence of Creation Myths and Fiction

The Pirahã do not create fiction, and they have no creation stories or myths. This contrasts with information that we have on the related language, Mura. Nimuendajú (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 and is therefore 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).[19]

I have attempted to discuss cosmology, the origin of the universe, etc., with the Pirahã innumerable times. They themselves initiate many of these discussions, so there is no question of any reluctance 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 women to marry, rape, and so on). Indeed, now that I speak Pirahã, I know that even among themselves the Pirahã repeat and embellish these stories. But there are no indigenous creation myths or fiction any longer, if indeed they ever existed, and there is not a single story about the ancient past told by any Pirahã other than bits and pieces of Tupi and Portuguese stories (not always acknowledged as such). When pressed about creation, for example, Pirahã say simply, "Everything is the same," meaning that nothing changes, nothing was created. Their talking about the stories of other cultures can be best understood, it seems to me, as "mentioning" texts that they have experienced qua texts rather than "using" them to discuss or explain anything in the world around them or the ancient world. They are like oral-literary theorists in their telling and discussion of the texts of others. Nimuendajú (1948), though easily collecting myths from the Mura, was unable to collect them from the Pirahã. No one ever refers to a mythical figure, story, or concept in normal conversation, and when questioned directly about creation Pirahã claim that the way things are is the way they have always been.

[19] The quality of anthropological research on Pirahã varies. Several anthropologists (see esp. Gonçalves 1990, 2001; Oliveira 1978; Oliveira

and Rodrigues 1977; Roppa 1977) have done a reasonable job of describing aspects of Pirahã culture, but a previous description of the kinship system (Oliveira 1978), weakened by the researcher's inability to speak the language, contains confusions between cliticized possessive forms of a particular kinship term and distinct kinship terms. The longer-term studies of Pirahã cosmology and naming by Gonçalves are the most reliable ever done by an anthropologist, but one simply cannot come to the best conclusions about Pirahã meanings working through the medium of the very poor Portuguese of Pirahã informants. Gonçalves based much of his research on work with two Pirahã informants whose Portuguese was somewhat better than that of most Pirahã because they had been taken away from the village as boys and lived for several years with Brazilians along the Madeira River until they were discovered and restored to their people, but even their Portuguese was 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.

Discussion

We have seen that the gaps observed in Pirahã—the absence of number, numerals, or a concept of counting and of terms for quantification, the absence of color terms and embedding, the extreme simplicity of the pronoun inventory, the lack of a perfect tense, the simplicity of the kinship system, the absence of creation myths, the lack of individual or collective memory of more than two generations past, and the absence of drawing except for extremely crude stick figures representing the spirit world claimed to have been directly experienced follow from the postulate of the cultural value of immediacy of experience that constrains grammar and living. Pirahã thus provides striking evidence for the influence of culture on major grammatical structures, contradicting Newmeyer's (2002:361) assertion (citing "virtually all linguists today"), that "there is no hope of correlating a language's gross grammatical properties with sociocultural facts about its speakers." If I am correct, Pirahã shows that gross grammatical properties are not only correlated with sociocultural facts but may be determined by them.

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): vocal-auditory channel, broadcast transmission and directional reception, rapid fading, interchangeability, total feedback, specialization, semanticity, arbitrariness, discreteness, displacement, productivity, duality of patterning, traditional transmission. The three features that stand out in particular here are interchangeability, displacement, and productivity.

To the degree that Pirahã lacks a concept of counting, it is incommensurate in that semantic or cognitive domain with languages that have such a concept. I suspect that there are other domains of Pirahã in which interchangeability is also absent, but in the domain of counting the lack of interchangeability can be considered established (see Gordon 2004). I submit that the evidence is sufficient in this case to conclude that this design feature is not uniformly inviolable.

With regard to displacement, I believe that the facts above show that it is severely restricted in Pirahã as a cultural principle. Pirahã of course exhibits displacement in that people regularly talk about things that are absent from the context at the time of talking about them, but this is only one degree of displacement. The inability in principle to talk about things removed from personal experience (for example, abstractions of the type represented by counting, numbers, quantification, multigenerational genealogies, complex kinship, colors, and other semantic/cultural domains discussed above) shows that displacement in Pirahã grammar and language is severely constrained by Pirahã culture.

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

The implications of all this for the enterprise of linguistics are as follows:

1. If culture is causally implicated in grammatical forms, then one must learn one's culture to learn one's grammar, but then, contra Chomsky (2002), a grammar is not simply "grown."

2. 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.

3. Studies that merely look for constructions to interact with a particular thesis by looking in an unsophisticated way at data from a variety of grammars are fundamentally untrustworthy because they are too far removed from the original situation. Grammars, especially those of little-studied languages, need an understanding of the cultural matrix from which they emerged to be properly evaluated or used in theoretical research.

4. Particulars can be as important as universals. This is so because each culture-grammar pair could in principle produce tensions and interactions found nowhere else, each case extending our understanding of the interaction of culture and grammar.

Now let us consider a final unusual feature of Pirahã—that the Pirahã continue to be monolingual in Pirahã after more than 200 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's 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 the immediacy-of-experience constraint on grammar and living 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—*hiaitíihí*, `a straight one/he is straight'.

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, the Pirahã do not envy them. They see them as simply second-rate, false Brazilians. The Pirahã say, "We are not Brazilians. We are Pirahã." Without their language or their culture, they would fail to be Pirahã. Their language is endangered because they themselves are endangered by the ever more intrusive presence of settlers, Western diseases, alcohol, and the inexorably changing world that we live in. This beautiful language and culture, fundamentally different from anything the Western world has produced, have 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 know about because of our own shortsightedness. The need is more urgent than ever 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 them.

For advocates of universal grammar the arguments here present a challenge—defending an autonomous linguistic module that can be affected in many of its core components by the culture in which it "grows." If the form or absence of things such as recursion, sound structure, word structure, quantification, numerals, number, and so on is tightly constrained by a specific culture, as I have argued, then the case for an autonomous, biologically determined module of language is seriously weakened.

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"—in other words, that the Pirahã are substandard mentally—is easily disposed of. The source of this collective conceptual deficit could only be genetics, health, or culture. Genetics can be ruled out because the Pirahã people (according to my own observations and Nimuendajú's have long intermarried with outsiders. In fact, they have intermarried to the extent that no well-defined phenotype other than stature can be identified. Pirahãs also enjoy a good and varied diet of fish, game, nuts, legumes, and fruits, so there seems to be no dietary basis for any inferiority. We are left, then, with culture, and here my argument is exactly that their grammatical differences derive from cultural values. I am *not*, however, making a claim about Pirahã conceptual abilities but about their expression of certain concepts linguistically, and this is a crucial difference.

As I mentioned in the beginning, the constraint against discussing things outside of immediate experience could have cognitive as well as grammatical effects. For example, cognition is directly implicated in the claims of Gordon (2004) 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 culture affects the cognitive abilities and/or schemas available to members of Pirahã society. Pending future research, I am prepared to make only two very modest claims about Pirahã cognition. First, 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, but 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. Second, if the Pirahã show additional cognitive deviations from Western expectations with regard to, for example, 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 constrains Pirahã grammar, also predicts that the effect of this constraint could eventually affect cognition as well.

Appendix A

The Pirahã village in which I have worked most is located near the Trans-Amazon Highway on the Maici River, which intersects the highway roughly 90 kilometers east of the town of Humaitá, Amazonas, Brazil. The coordinates of the village are S 07°21.642′ by W 062°16.313′ (fig. A).

(87 kB)

Fig. A. Location of the study site.

The Pirahã were once part of the powerful Mura nation, consisting of at least the two subgroups Mura and Pirahã. Nimuendajú (1948) gives a concise and useful overview of the history of the Mura nation since contact. Although the present-day Mura, speakers of a dialect mutually intelligible with Pirahã,[a] have assimilated almost completely to Brazilian *riberinho* (riverine) culture, the Pirahã continue to live almost exactly as described in all

earlier reports from the eighteenth century to the present (though today women wear dresses and men wear shorts, whenever available, rather than going nude as they did until about 75 years ago.) The "gaps" in Pirahã culture and language discussed here seem genuinely to reflect Pirahã culture synchronically and diachronically.

The Pirahã live next to water. Their houses are all built facing the river, as close to it as they can be in the dry season (*piiáiso* `shallow water'), a time when they usually sleep directly on the sand with little or no shelter 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 the rainy season (*piioábaíso* `deep water') village occupants distribute themselves by nuclear families, each family unit occupying its own house (figs. B–H). The houses of the same village in the rainy season are built in a line along the river, usually well-hidden in jungle growth and usually 10–50 paces apart. The rainy-season villages are smaller, usually consisting of one elderly couple and their sons or daughters and the latter's spouses and children. The houses of a village need not be on the same side of the river; occasionally siblings may build their houses on opposite banks.

(120 kB)

Fig. B. Typical arrangement of houses in the village. Pirahã usually build next to their siblings or parents.

(167 kB)

Fig. C. Typical Pirahã house.

(107 kB)

Fig. D. Pirahã woman rolling a strip of bark on her leg to make a bowstring.

(98 kB)

Fig. E. Numeration class.

(63 kB)

Fig. F. Pirahã drawing of a house cat.

(77 kB)

Fig. G. Another cat drawing.

(70 kB)

Fig. H. Pirahã drawing of a tapir and (lower edge) some of the more successful exercises in number-copying.

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, the 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, and 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 though tired and hungry, carrying a sharpened pole for protection. They called him their "parent," hugged him and smiled, and gave 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 the parent of a 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, as is shown by the remarks and expressions and gestures of others watching. I have never seen anyone intervene to stop anyone from violating community norms.

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 already married, they first disappear from the village for two to four days while their former spouses call for and search for them. Upon their return, they either begin a new household or return to their spouses, from whom there is almost never any retaliation. Spouses are roughly equal in terms of workload and hierarchical relations. Relations between men and women and boys and girls, whether married or not, are always cordial and often marked by flirting. Sexual relations are relatively free between unmarried individuals and even between individuals married to other partners during the village dancing and singing that often occurs during full moons. Aggression is observed from time to time and may range from mild to severe (my wife has witnessed a gang rape of a young unmarried girl by most of the village men), but it is never condoned and it is extremely 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 4 years) are given much open affection and are relatively pampered. As soon as children can walk well, however, they are expected to 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.

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 ones, and make a soup,

but mainly they just throw a bigger fish directly on the fire, sometimes having gutted it first. They 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 them. Most important in understanding their material culture is their lack of concern with the nonimmediate or the abstraction of present action for future benefit, for example, "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 and little else. Their homes are extremely simple. There are two major types, the *kaíi-ií* `daughter-thing' and the *`aitaíi-ií* `palm thing', a less substantial structure. The former is built mainly of split trunks of paxiuba palm (*Iriartea* sp.) and has a raised platform for sleeping and a roof of small stick crossbars and thatch made from the central, youngest shoot of a species of palm that Brazilians and others in the area use almost exclusively for roofing. It takes about a day to assemble the materials and another half day, working slowly, to put up, though it can take several days 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 leaves, mainly palm, 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 does so only in very severe storms. Pirahã make disposable, very crudely woven baskets for transporting material from the fields and discard them after one or two uses. They make necklaces from seeds, homespun cotton string, teeth, feathers, beads, beer-can pull-tabs, and/or other objects that show little symmetry and are very crude and unattractive compared with 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 that they see almost daily.[b] They 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 in Tupian and Brazilian settlements. Although I have paid for Brazilians to come to teach them 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. They maintain their canoe supply largely by stealing from Brazilian settlements or trading or laboring with Brazilians or Tenharim.

The men wear loincloths, 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 reject ready-made dresses). Men wear gym or bermuda shorts that they get in trade 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 so 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 who did witness the plane's visit and based their models on the models of the eyewitnesses. These models (some 12–24 inches long and 5–6 inches high) usually have two propellers, one placed above the cabin section and the other at the nose. 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 concrete experience accumulated by themselves and other living Pirahã. Interestingly, they make model planes only in the day or so preceding the plane (when they know it is coming) and the day or so after its visit.

The Pirahã's material culture is thus of the most functional, immediately applicable type. They do not imitate the outside world or desire its goods. For example, artifacts that they trade for (such as machetes, cans, pans, etc.) are not well cared-for and are often "lost" the day they are purchased. Pirahã value nonaccumulation of goods and hardness of body. The average family can put all of its belongings in a couple of small cans. Pirahã frequently go hungry 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.

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 "channeling for") spirits, men (never women) speak in a falsetto. They call this speaking like a *kaoáíbogí `igiaábií* `fast-mouth' (the most common type of spirit). 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 afterward, saying simply something like *tíi kosaagá, kobaihiaba*, "I don't know, I didn't see it."

Spirits vary widely in 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 and the *kaoáíbogí* in holes in the ground. People speak of alternately 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); the Pirahã do not draw this type of comparative distinction. The most they might say of, for example, a good hunter is that "he really hunts" (where-*bai*, a verbal intensifier, translated here as "really," is the closest thing they have to a quantifier).

[a] I have come to agree with Nimuendajú that the Mura (and Pirahã) appear to be a language isolate (with dialects). The attempt by others (e.g., Loukotka 1968) to classify them with other language is based on too few data to be taken very seriously.

[b] 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 50 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 could see nothing. I asked them what they were fussing about. One man asked 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 *`igagaì* `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 shows that spirits are not merely fictional characters to the Pirahã but concrete experiences.

Appendix B

Pirahã grammar is more complex than might be supposed from this listing of "gaps." Here I want to discuss some of this complexity, partly to provide a more balanced view of the language and partly because the phenomena in question constitute strong additional evidence of cultural influence on grammar.

If cultural considerations could in principle play a causal role in phonological structures (not merely selecting but forming them), what would constitute that causal role? 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 could affect another but not necessarily via constraint-rankings or rules, the standard devices of phonological theory proper. If this were the case, then to understand the sound system of a language at any level (e.g., "what happens" or "what native speakers know when they know the sound system of their language") we would have to 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, among other things, the appearance of new roles for old constraints. For example, mode-faithfulness of segments might be highly ranked to mark syllable types; syllables might be maintained not merely to enhance the perception of segments but to parse the larger speech stream, and therefore arguments for syllables might go beyond phonotactics and segmental enhancement and the syllable might have roles not envisioned by the so-called phonological hierarchy. Is there such a case? There is.

The consonants of Pirahã are /p b t k g' h/ and, in men's speech only, /s/, and the vowels are /i a o/.[a] Though this is one of the simplest segmental phonemic inventories in the world (and the women's inventory does seem to be the simplest known), it must be juxtaposed with the complexity of Pirahã's prosodies. Its stress rule is a good place to begin. This rule (Everett and Everett 1984) is considered one of the more complex and unusual stress rules in the literature, mainly for its phonological consequences. The rule is: stress the rightmost token of the heaviest syllable type in the last three syllables of the word. The phonetic basis of "heaviness" is that voiceless consonants are always longer than voiced consonants, and there are five syllable weights based partially on this contrast: CVV > GVV > VV > CV > GV.

Pirahã is a tonal language as well, but stress, tone, and syllable weight vary independently. In the following examples (from K. Everett 1998) tone is independent of stress (' = high tone; no mark over vowel = low tone; the stressed syllable is marked by ! and there are no secondary stresses): !*tígí* `small parrot', !*pígí* `swift', !*sàbí* `mean, wild', !`*ábì* `to stay', *tí*!*híí* `bamboo', `*í*!*tí* `forehead', *tí*!'*í* `honey bee', *tí*!*hí* `tobacco'.

Thus, alongside its extremely simple segmental phonology Pirahã manifests an extremely rich set of prosodies. Does it exploit this differential complexity in any way? Indeed, as Everett (1985) describes it, Pirahã communication makes crucial use of various channels. For our purposes here, I define "channel" as a "sociolinguistically constrained physical medium used to carry the message from the source to the receiver," in the spirit of the ideas develops in Hymes (1974). The four principal channels in Pirahã after "normal" speech are hum speech (used for disguise, privacy, intimacy, talking when mouth is full, and child language acquisition), yell speech (used for long-distance communication, on rainy days, and between huts and across the river), musical speech ("big jaw"; used to convey new information, for spiritual communication, and for dancing and flirtation; women produce this in informant sessions more naturally than men, and their musical speech shows much greater separation of high and low tones and greater volume), and whistle speech ("sour or `pucker' mouth"—same root as "to kiss" or shape of mouth after eating lemon; used in hunting and by men only, sometimes for aggressive play). ("Young Boys Singing" [WAV: 4.8 MB; MP3: 1.3 MB]).

The following example illustrates how prosodic information in Pirahã is exploited to create these channels. The phrase in a has the quasi-musical representation in b, the basis for the channels just summarized.

a.	*kái`ihî`ao*	*-`aagá*	*gáihí*
	paca possible	exist-be	there
	"There is a paca there."		
b.			

[a] 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.

All channels must include the information in the quasi-musical representation of b, though only the consonant and vowel channel needs to include the information in a. The notes represent syllables, with "ties" indicting unbroken falls/rises in whistle speech.

In the musical form 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`ihi*), 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 the whistle, humming, and yelling channels even though the segments themselves are missing. The syllable in this case indicates length and 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.

Does the discovery of channels like this imply any causal interaction between culture and grammar, or are these channels outside the grammar proper? Because they rely crucially on the syllable weights and the stress rule, if nothing else they help account for what is otherwise an anomalous level of complexity in the stress rule, but the facts cut deeper than this. Consider the following example of what I have called the "sloppy phoneme effect" (Everett 1985): *tí píai* ~ *kí píai* ~ *kí kíai* ~ *pí píai* ~ *`í píai* ~ *`í íai* ~ *tí píai,* etc. *(*tí tíai, * gí gíai, *bí bíai)* `me too', *`apapaí* ~ *kapapaí* ~ *papapaí* ~ *`a`a`aí* ~ *kakakaí* ~ *(\*tapapaí, \*tatataí, \*bababaí, \*gagagaí)* `head', *`ísiihoái* ~ *kísiihoái* ~ *písiihoái* ~ *píhiihoái* ~ *kíhiihoái* ~(alternations with /t/s or involving different values for the features continuant or voicing are unattested) `liquid fuel'.

Pirahã allows a tremendous amount of variation among consonants, though not for continuant or voice. This can be accounted for if we refer to Pirahã's channels. The ungrammatical examples above 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 on functional load and necessary contrast (Everett 1985) is violated. With greater dependence on the channel, greater contrast is required. 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 and voice (whether the vocal folds are vibrating or not). I am not suggesting that ethnography replaces phonology, but I am suggesting that without an understanding 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 as part of universal grammar. As a modality-dependent channel, phonology may be subject to constraints that are language-specific and grounded not only in the physical properties of the instantiating modality (the phonetics) but also or alternatively in 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 phonetic and logical form if we define an interface system as a system setting bounds on interpretability for human computation. 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 databases, and so on.

[a] **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).

Appendix C

In a series of videotaped psychological experiments, Peter Gordon and K. Everett (ca. 1993) collected data to investigate the claim that the very concept of counting is foreign to the Pirahã. Gordon (2003) has developed 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 and find his conclusion that the Pirahã facts offer support for the Whorfian hypothesis unconvincing, I agree broadly with his conclusion that Pirahã people neither count nor understand the concept of counting. The results of his study include the following (Gordon 2004:498):

> *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....*
>
> *Fingers were used to supplement oral enumeration, but this was highly inaccurate even for small numbers less than five....*
>
> *The tasks were devised to use objects that were available and familiar to the participants (sticks, nuts, batteries).... 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 ... and they responded with a matching linear array of AA batteries on their side of the table.... 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 7 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....*
>
> *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 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 and 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 recognize numbers of three or fewer immediately, but above this "magic number" counting must take place, and that exceeds Pirahã's 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.*

In assessing Gordon's results, we must ask to what extent his experimental design was culturally sensitive and how the experiments were carried out and subsequently interpreted. 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 of them means either telling me what they think I should know or simply entertainment, without any 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 problem for most linguistic work, and I cannot expect Gordon to have solved it. 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.). As an example of the resultant problems, in the videos of his experiments that he originally posted to his web site, off-camera comments by Pirahã show clear lack of understanding of the purpose of the experiment. For instance, one speaker says, "He wants you to pick them up quickly" rather than "count them." Following the experiments, Gordon worked alone in interpreting the results, hampered by his lack of knowledge of the Pirahã language and culture and by the fact that neither my wife nor I was available to help him by discussing with him the plausibility of his results or even the relevance of his experimental design.

With the benefit of hindsight, it is possible to consider alternative ways of investigating Pirahã numerosity. 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. If they are not to blow over in the first rainstorm, they must fit together well—for example, they must have walls of more or less equal height, and the house poles must be driven 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 preexisting cultural knowledge or to interview people about this or at least to observe them to see how they do this.

Again, women make dresses according to a simple pattern. These dresses have a certain length of hem, sleeves, and waist, among other things. Can we determine exactly how they make these dresses?

Finally, could we find out how hunters tell others how far to go into the jungle to find a particular kind of game? Gordon's results do not reflect consideration of any of these kinds of culturally important activities.

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 on the basis of 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 D

The idea that the entire set of pronouns of Pirahã might be borrowed was suggested to me by Aryon Rodrigues (personal communication, 1978), and I have discussed it briefly elsewhere (Everett 1979, 1986, n.d.). In 1978, at the beginning of my field research on Pirahã, I discussed some of my data with Rodrigues, my M.A. thesis adviser. Upon seeing the Pirahã pronouns, Rodrigues noted that they are nearly identical to the singular Nheengatu forms and in fact nearly identical to the Proto-Tupi-Guarani forms. With Sarah Grey Thomason, I have argued (2001) 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.

Pirahã has only three basic personal pronouns (table A). There are also several pronominal clitics that are shortened forms of longer (non-pronominal) words. The last two of these ergative pronominal forms, *`i*' `third person feminine' and *`is*`third person nonhuman have a special status: neither form is used in isolation. Therefore, for example, in response to the question, "Who did that?" one could answer *ti* `I', *gi* `you', or *hi* `he', 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 an 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 third-person feminine clitic *`i* [see Everett 1986]).

Online-only Table

TABLE A Pirahã Pronominals

The three basic Pirahã pronouns comprise perhaps the simplest pronominal system known. They are often optional in discourse, and therefore 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 the pronouns are all number-neutral. If speakers want to talk about more than one of something, they use a form of "big." The pronouns form a syntactic class of words separate from nouns; they act like clitics and can double as 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 with Tupi-Guarani pronominals, it is 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 is not the set that matches the Pirahã pronouns; other sources (e.g., Gonçalves Dias 1965:29, 47, 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 (table B).

Online-only Table **TABLE B** Nheengatu Free Ergative Pronouns

Another relevant form is the prefix (or clitic) /i-/ [*I*], [e] `third person singular/plural'. Compare this Nheengatu set with the very similar pronouns of Tenharim (table C) (from Helen Pease, personal communication, 1998).

Online-only Table **TABLE C** 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 do not 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.

As we have seen, 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/. 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 [ʂ] for /s/. The two alveopalatal allophones, the affricate [č] and the fricative [ʂ], occur always and only before a front vowel; but [ʂ] 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].

Nheengatu first person singular *xe* is pronounced [ʂI], according to various sources (and Aryon Rodrigues, personal communication, 1998). The only alveopalatal phones in Pirahã are [č] and [ʂ], but since [ʂ] 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 [ʂ]. The affricate [č] would be even more likely if the source pronoun were instead Tenharim [ji] `first person singular' also, according to Jensen (1998:6), the relevant Proto-Tupi-Guarani pronoun began with a voiceless alveopalatal affricate. The Nheengatu second-person singular 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 ("third person singular/plural" in Nheengatu, "people" or "person now dead" in Tenharim). In addition, Nheengatu has a clitic form *i-* [I], [e] also meaning "third person singular/plural." Now, Pirahã lacks vowel-initial syllables entirely (Everett 1988, K. Everett 1998), and therefore 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* 'third person 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, the deletion of the initial vowel rather than the addition of 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 pronouns, 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 "third person masculine" but not always. It can even be used for non-third persons, as in Pirahã *hi `obaa' ai ti* `I am really smart' (lit `A person sees well, me'). It is important not to confuse this use with a predicate nominal construction that is cross-linguistically common, for example, "If I were you," "You are indeed she," or even "That woman is a man." In this environment *de dicto* distinct entities 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 hypothesized 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 very unlikely, though with such short forms coincidence cannot be ruled out. 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.

Nimuendajú (1948:25') indirectly suggests a possible scenario by which this borrowing might have taken place: "Martius' [1867] 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."[a] 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 3,000 Muras stretching 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 them for over two generations, and no one can remember more than a few words of it. 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 Nimuendajú made his visit. Therefore 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, in contrast, have long resisted influence from outside languages, having a small number of borrowings, and 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. 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 we have far 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. In summary, 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 cannot 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.

[a] Martius's error is not as difficult to understand as it might first appear. 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.

Appendix E

The following description of the killing of a panther was given me by 'Ahóápati (Simão) at Posto Novo on the Maici River on July 28, 1980 (/ = pause; // = longer pause):

1.	*`akí,*	*`akí*	*ti*	*kagái*	*-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*	*kagáihiaí*	*kagi*	*#ab*	*-á*	*-i*	*-p*	*-í*	
	I	jaguar	partner	#grab	-move	-into	-down	-sudden	
	k	*-o*	*-ái*	*'aí*	*ti*	*ai*	*-á*	*'aí*	*-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	-intend	-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	-associative	-be
	gaí	*si*	*-i*	*'is*	*'a*	*-p*	*-i*	*-k*	
	there	place	-thus	animal	-move	-down	-sudden	-transitive	
	-ob	*-á*	*-o*	*-b*	*-i*	*-í*	*-haí*		
	-see	-move	-onto	up/away	-intend	-sudden	-relative certainty		
	"With respect to it, the jaguar pounce on the dog, I thought I saw it."								

5.	*`aí*	*ti*	*`ai*	*-á*	*`akí*	*kopaíyai*	*kagi*	*#ab*	*-á*
	then	I	did	-thus	here	blackness (panther)	partner	#grab	-move
	-i	*-p*	*-á*	*-hai*					
	-into	-down	-complete	-relative certainty					
	"The 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.							

7.	*`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	panther	I	say	here	place	animal	-move	-down vertical
	-i	*k*	*-ob*	*-ab*	*-á*	*-o*	*-p*	*-ií*	*-haí*
	-sudden	undergoer	-see	-remain	-move	-onto	-vertical	-intend	-relative certainty
	"Then I said with respect to the panther, '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 raised surface	did	-thus	be:in						
	"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	-ií				
	-completive	-complete certainty	-intend				
	"As for the dog, the panther pounced on the partner."						

11.	*kopaíyai*	*`íb*	*-ai*	*k*	*-oaí*	*-s*	*-aagá*	*-hai*
	panther	hit	-do	undergoer	-die	-animal	-be temporary	-relative certainty (last syllable mid tone, due to intonation)
	"The panther hit the dog and it had died."							

12.	*`aí*	*k*	*-apá*	*-g*	*-ob*	*-aó*	
	then	undergoer	-expel	-completive	-move away horizontal	-when	
	s	*-ob*	*-á*	*-í*	*-b*	*-á*	*-o*
	animal	-see	-down	-into	-on/up	-down	onto

	-hoagái	-'ii	*-gá*	*'ai*			
	-inchoative action	-continuative	-incompletive	do			
	"Then when I had shot 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	-haí
	undergoer	-throw	causative	-imperative	-iterative	-relative certainty
	"'Kaapási', *I said, 'Throw a basket (to me).'"*					

14.	*`í*	*kagi*	*-hoi*	*`ób*	*-á*	*-aá*	*-ta*
	it	basket	- thing	throw	- causative	- imperative	-iterative
	-haí	kagi	ab	-á	-i	-p	-í
	-relative certainty (last tone more mid-range)	basket	grab	- move	-into	-down	- declarative
	"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	*'ab*	*-a*	*-ab*	*-o*		
	-horizontal	grab	-cause	-remain	-onto		
	"The same cat pounced on the dog."						

16.	*kopaíyai*	*s*	*-a*	*-o*	*`ab*	*-a*	*-ab*	*-á*	
	panther	it	- move	- onto	grab	- causative	- remain	-completive	

	-há	*-taío*	*'aí*	*'ab*	*-a*	*-ab*	*-á*	*-á*	*-taío*
	-complete certainty	therefore	then	not	-causative	-remain	-move	-complete certainty	-therefore
	"The panther pounced on the dog, thus it caused him to be not."								

17.	*`í*	*kag*	*-igí*	*-a*	*`iowi*	*hi*	*á*	*-o*	
	it	partner	-with comitative	-be:in	there proximate	he	move	-onto	
	-o	*-b*	*-ísigí*	*-o*	*kag*	*-ig*	*-í*	*-a*	*'iowi*
	-onto	-down	-same	-directional	basket	-with	-into	-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*	*-tao*	*hi*	*agí*	
	not	-causative	-remain	-move	-thus	he	logical comitative	
	-a	*so*	-'o	*-i*				
	-complete certainty	time	-pass	immediate				
	"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 connective	-complete certainty	it	with	-move	-into	-down
	-áo	*kagi*	*-hoi*	*'o*	*-'á*	*-o*	*-b*	*-á*
	-when	backet	-thing	move	-move jerk	-onto	-down	causative

	-há	*'ai*						
	-complete certainty	then						
	"When you have the jaguar parts in the backet, then put the basket on your head [with a trumpline]."							

20.	*giaibái*	*-hi*	*`aí*	*`a*	*-hoa*	*-ó*
	dog	-nominalizer	then	cause	-fire	-directional
	'ita	*-ogi*	*'aaga*	*-há*	*'ai*	
	snout	-big	be:temp	-complete certainty	then	
	"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 quickly down	-iterative	-move
	hi	*-ab*	*-á*			
	he	-negative	-complete certainty			
	"It is right on top of the dog. I 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	-desiderative
	-ab	*-ai*	*-sai*	*-oo*	*-agá//*			
	-remain	-be:in	-gerund	know	-be:temporary (of characteristic)			
	"It is right on top of the dog. I pounced on the dog and killed him."							

23.	*`aí*	*ti*	*gá*	*-`ai*	*-á*	*`aí*	*kaapási*	*hi*	*ísi*	*hi*

	then	I	say	-do	-declarative	then	name	he	animal	he
	"Then I was talking, then Kaapasi he, animal, he ..."									

24.	*ká*	*-ap*	*-í*	*`oog*	*-ab*	*-i*	*sahaí*	*k*	*-apá*
	far	-expel	-sudden	want	-remain	-into	prohibitive	undergoer	-expel
	sahaí	*k*	*-apá*	*-o*	*-b*	*-ii*	*-ga*	*-át*	*-i*
	prohibitive	undergoer	-expel	-onto	-down	-continuation	-incompletive	-imperative	-declarative
	"Don't shoot from far away. Be shooting down on it."								

25.	*`i*	*ti*	*boí*	*-t*	*-á*	*-o*	*-b*	*-í*
	3f	I	move quickly down	-repetitive (subroutine)	-move	-onto	-down	-sudden
	-haí	*'i*	*-k*	*-o*	*-ab*	*-á*	*-o*	
	relative certainty	it	-accomplishment	die	-remain	-move	-onto	
	-b	*-á*	*-há*	*-taio*	*-is*	*-agi*	*-a/*	
	-down	-declarative	-complete certainty	-thus	animal	-logical connective	-complete certainty	
	"I moved quickly down toward 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*	*'i*	*-k*	*-ahá*	*-p*
	-incomletive	-complete certainty	-thus	-directional	it	-undergoer	-depart	-down
	-ii	*hi*	*-ab*	*a*	*-há*	*-tai*	*-o/*	

	-intend	he	-not	be	-complete certainty	-thus	-directional	
	"It was dying and it wasn't able to leave therefore."							

27.	*`igí*	*-`ai*	*`i*	*k*	*-o*	*-ab*		
	with	-be:temp	it	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*	*-ii*	*-gá*
	undergoer	-die	-remain	-move	-onto	-down	-continuative	-incompletive
	"OK, then, it thus came to die. Then it was coming to die."							

28.	*`aí*	*kaapási*	*`igí*	*-a*	*`apá*	*-o*
	then	name	with	-declarative	expel	-onto
	-b	*-í*	*-sái*	*-hi*		
	-down	-sudden	-gerudive	-comment		
	"Then kaapasi, OK, he shot it."					

29.	*`aí*	*s*	*-agí*	*a*	*k*	*-o*	*-áb*		
	then	animal	-logical	declarative	undergoer	-die	remain		
	-á	*-o*	*-b*	*-á*	*-í*	*s*	*-agí*	*-a*	
	-move	-onto	-down	-move	-comment	animal	-logical connetive	declarative	
	sit	*-o*	*-á*	*-op*	*-áo*	*k*	*-ahá*	*-pi*	*-tá*
								-down	-

	stand	-move	-move	-go	-when	undergoer	-go	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*	*-ái*	*-saí*
	undergoer	-die	-remain	-move	-onto	-down	-do	-gerundive
	"Its dying was lingering."							

31.	*ti*	*`agiá*	*k*	*-apa*	*-íg*	*-á*	*-o*	*-b*
	I	therefore	undergoer	-expel	-with	-move	-onto	-down
	-í	*-ta*	*-haí*	*i*	*toí*	*hi*	*-o*	*'i*
	-sudden	-iterative	-relative certainty	it	elbow	his	-directional	it
	ái	*hi*	*'aí*					
	bone	he	hurt					
	"I therefore shot it again, breaking its elbow."							

32.	*ti*	*í*	*k*	*-apa*	*-íg*	*-á*	*-o*	*-b*
	I	it	undergoer	-expel	-with	-move	-onto	-down
	-í	*-ta*	*-haí*	*'aí*	*ti*	*giá*	*k*	*-ap*
	-sudden	-iterative	-relative certainty	then	I	therefore	undergoer	-expel
	-á	*-o*	*-b*	*-í*	*-so*			
	-move	-onto	-down	-sudden	-then			
	"Then I sot 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
	'ai	*'is*	*-ai*	*-ta*	*-ogi*		
	then	animal	-bone	-projection	-strong		
	"It came to die, it came to die; it had thick fur [= 'essence' here]."						

34.	*`í*	*k*	*-oa*	*-ií*	*hi*	*ab*	*-a*	*-á*	*-taí*
	it	undergoer	-die	-intend	he	not	do	-move	-therefore
	o	*gí-*	*-sai*	*'is*	*-ai*	*-ta*	*-ogi*		
	directional	there	-nominalizer	animal	-bone	-projection	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	he	not	-epenthesis	-temporary quality
	gái	*'aowi*	*-í*	*'aowi*	*gíai*	*k*	
	there	foreigner	-directional	foreigner	you	undergoer	
	-ob	*-ai*	*hi*	*-ab*	*-i*	*-kwí*	
	see	-do	he	-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	-epenthesis	temporary quality
	pi`ái	*-'ii*	*-g*	*-a/*				
	now	-continuative	-incompletive	-declarative				
	"Then right away, [I] moved it, right then."							

37.	*`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*	*kagáíhiái*	*so*	*kopaíyai*	*`isaitaógi*
	here	marked (jaguar)	only	panther	foreign:name [not DLE]
	hi	*í*	*k*	*-ob*	*-ai*
	he	it	undergoer	-see	-do
	hi	*ab*	*-ii*	*-g*	-á
	he	not	-continuative	-incompletive	-declarative
	"Here jaguars [he has seen], only panthers the foreigner [not DLE] has not yet see."				

39.	*pi`ái*	*so`óá*	*hiaitíihí*	*k*	*-ap*	*-í*
	now	already	Pirahã	undergoer	-expel	-away/sudden
	-kwi	*pi`ái*	*-'iga/*			
	-temporary quality	right	-now			
	"Now, the Pirahã have just now shot [a jaguar]."					

40.	*`aí*	*hiaitíihí*	*baai*	*-owí*	*baóhoipaí*	*kopaíyaihi*	*`igíai*
	then	Pirahã	fear	-intensive permanent quality	cat	panther	OK (text ending)
	"Then the Pirahãs are intensely afraid of panthers. The end."						

Appendix F

Some examples of complex verbs are given below:

a.	*`akí,*	*`akí*	*ti*	*kagái*	*-hi-aí*	*kagi*	*#ab*	*-á*	*-i*

	here,	here	I	mark (jaguar)	-he-be	partner	#grab	-move	-into
	-p	*-i*	*k*	*-o*	*-á*	*-i*			
	-down	-sudden	undergoer	-die	-move	-into			
	"Here the jaguar pounced upon my dog."								

b.	*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	-intend	-certainty			
	"There the jaguar killed the dog by pouncing on it."								

c.	*kagi*	*ab*	*-o*	*-í*	*-boí*	*-ta*	*-á*	*-sog*
	partner	not	-move	-into	-move quickly down	-iterative	-move	desiderative
	-ab	*-ai*	*-sai*	*'oo*	*-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."							

The complex verbs underlined in these examples are formed, as described in Everett (1986), by combining verb roots (nonhierarchically, 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. After a verb is formed, a combination of Pirahã's 16 classes of suffixes is added. The number of possible verb forms based on suffixal combinations alone (there are no verbal prefixes, only pronominal proclitics) is 2^{16}, and therefore it would be erroneous to suppose that Pirahã is in some way less complex than better-known languages. Pirahã simply distributes the complexity in ways that are surprising in purely formal linguistic terms but understandable in what we can label "ethnogrammatical" terms.

Comments

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Everett argues that Pirahã violates three of Hockett's (1960) universal design features of language—

interchangeability, displacement, and productivity. As important as this suggestion might be, the major thrust of his article is that "culture can be causally implicated in the linguistic structure of the language." Seen in this light, his paper is the most recent contribution to a growing literature that challenges the dogma that there is no causal correlation of "a language's gross grammatical properties with sociocultural facts about its speakers" (Newmeyer 2002:361).

The sociocultural facts in this case are drawn from the Pirahã, a small indigenous society that exhibits one of the simplest cultures reported for lowland South America. This cultural simplicity, Everett proposes, is manifest linguistically by what he calls "gaps" in the Pirahã language—for example, absence of a concept for counting and terms for quantification, of linguistically simple terms for color of syntactic subordination, and of perfect tense. These features, among others, are commonly marked in the languages of societies considered culturally complex in terms of standard measures such as those of Carneiro (1970), Murdock and Provost (1973), Naroll (1956), Hays (2000), and Marsh (1956). However, Everett is careful to point out that "no one should draw the conclusion from this paper that the Pirahã language is in any way `primitive,'" calling attention to its highly complex verbal morphology and prosody (features that he fails to note are also typical of the languages of small, local societies with simple cultures).

Everett's proposals make his paper one of the most controversial to be published in anthropological linguistics in many years, perhaps since the appearance of Swadesh's *The Origin and Diversification of Language* (1971). However, his general hypothesis has a long history that can be traced to much of the nineteenth- and twentieth-century literature on the languages of so-called primitive peoples. Lévy-Bruhl's chapter on numeration in *How Natives Think*, for example, opens with the observation that "in a great many primitive peoples ... the only names for numbers are one and two, and occasionally three. Beyond these, the native says `many, a crowd, a multitude'" (1926:181). The multiple cases he cites closely mirror the system described by Everett for Pirahã and confirmed by Gordon (2004). Thus, Everett's claim that "Pirahã is the only language known without number, numerals, or a concept of counting" is probably an overstatement. What is important is that Everett's and Gordon's research is sure to lead to field studies aimed at replicating it, providing new experimental (versus anecdotal) evidence on numerical cognition in preliterate societies.

Pirahã is also not the only language known without embedding. Foley (1986:177) describes the absence of recursion in Iatmul (New Guinea), where verbs "do not function as embedded parts within a whole, but are linked to a fully inflected verb in a linear string, much like beads on a necklace. ... Linking of clauses is at the same structural level [nonhierarchical] rather than as part within whole." This grammatical feature has also been noted to be correlated with cultural complexity. The best-known work is Givón's proposal of "pragmatic" and "syntactic" modes of speech that reflect changing functions of language with cultural evolution, leading him to conclude that "certain types of languages—those which have only coordination (`clause chaining') but no subordination—are found only in preliterate `societies of intimates'" (Givón 1979:306; for detailed discussion see Kay 1972; Mithun 1984; Kalmár 1985; Pawley 1987; Desalles 2004; Newmeyer 2002, 2004; Wray and Grace n.d.).

A final example of research that firmly supports Everett's conclusions on the correlation of cultural complexity and specific properties of grammar is Perkins's (1992) important work on deixis. In a wide-ranging cross-linguistic study, Perkins demonstrates conclusively that languages spoken in simpler societies commonly mark deictic distinctions by complex internal grammatical processes while languages spoken by more complex societies mark deictic distinctions syntactically.

The concrete specificity of obligatory deictic distinctions is also a distinguishing characteristic of the grammars of the languages of nonliterate societies. Examples are seen in the Pirahã evidentials for specific knowledge *-híai*

`hearsay', *-xáagauá* `observed', *-sibiga* `deduced', *-áti* `uncertain', *-haí* `relatively certain', *-há* `certain' (Everett 1986) and in Wari spatial demonstratives *cwa'* `this:m/f', *ca'* `this:n', *ma'* `that:prox:hearer', *cwain* `that:m/f:distal', *cain* `that:n:distal' (Everett and Kern 1997, Everett n.d.).

Everett's paper will stimulate fieldwork on little-known languages spoken by societies with simple cultures. It will serve as a catalyst for new research that will contribute to nonuniformitarianist approaches of language evolution (see Newmeyer 2002, 2004; Christiansen and Kirby 2003; Hurford, Studdert-Kennedy, and Knight 1998; Knight, Studdert-Kennedy, and Hurford 2000; Wray 2002; Carstairs-McCarthy 1999) Perhaps it will also lead those engaged in investigations of the linguistic relativity-determinism hypothesis to add an evolutionary dimension to their efforts at demonstrating the constraints of culture on the grammatical properties of language. As Hymes has stated, "Only the renewal ... of an evolutionary perspective can enable linguistic theory to connect languages and lives in a way that satisfies the concerns among linguists for relevance of their intellectual work and that satisfies the needs of mankind" (1971:v–vi).

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Pursuing the issues of "cultural constraint," "universals," and "absences" would draw attention away from what I take to be the central question in Everett's article, that of the role of experience in the construction of grammar and its possible transpositions to the Amazonian cultural and cosmological context. I shall seek to engage with this question.

Seeger (1981:21), inspired by Lévi-Strauss's *Mythologiques* (especially 1964:chap. 1), identified the basis of an Amazonian cosmology as follows: "A cosmology is expressed in more than the abstract thought of idle minds; material things and human relations are also expressions of principles that may be expressed elsewhere as abstract thoughts." Viveiros de Castro (1986:252, 253; 1992) also calls attention to a possible conceptualization of cosmology specific to the Amazon, emphasizing that "cosmology" does not necessarily imply a balanced and harmonious system saturated with meaning. Therefore, the idea of "absolute postulates" that would engender fields of perception and modes of acting in and conceptualizing the world or that presuppose existence without experience would not be applicable to Amazonian culture and cosmology. Overing (1996), in translating the concept of "performative" to the Amazonian universe, proposes the term "generative" to accentuate the importance of experience for those ontologies, given that it is the appropriate act that generates relations. This is a particular mode of constructing social relations and ways of thinking about the world that is based on a specific capacity—always personalized, that is, derived from experience—to produce culturally acceptable things. Basso (1995:149) pointed out that the importance of stories for the Kalapalo consisted not in their representing collectively accepted images that animate social life but, on the contrary, in their describing the experiences of individuals exploring alternatives for their lives. Even in narratives that seem fixed, such as myths and songs, one can discern an important process of individualization that accentuates experience as the basis of this perception, frequently reflected in the first-person telling of the narrative. Other writings, such as those of Oakdale (2002:165–66) and Lagrou (1998), demonstrate that for the Kayabi and the Cashinahua understanding of the meaning of songs depends upon a contextualized interpretation of the metaphors used in them. Urban (1989:40) points out that for the Xavante the first-person narratives of myths produce a trancelike state in which the narrator begins to experience the narrative in an individualized way. My research on the Pirahã highlights the importance of experience in the way that the Pirahã represent the world. My book *Unfinished World: Action and Creation in an Amazonian*

Cosmology seeks to demonstrate that the world is constituted through action and creation, depending structurally upon experience for its construction. For the Pirahã, experience "is fundamental to constituting a perception of the cosmos because it is that which describes, links words and objects, observations and their explanations, thought and act. Within this conception, to gain the status of an organized discourse the cosmos depends upon someone who lives it, who experiences it" (Gonçalves 2001:32). The importance of experience in the constitution of Amazonian "culture" was summarized very well by Gow (1991:151): "I take literally what native people say about distant ascendant kin, which is that they do not know anything about them because they never saw them. This is noted by numerous other ethnographers of Native Amazonian culture, but usually thought to show the `shallow time frame' of these societies. ... The shallow time frame of these societies is not a product of their failure to accumulate information in deep genealogies, but rather a result of their stress on personal experience in epistemology." If the Pirahã are not a cultural exception within the Amazonian context, they most likely are not a linguistic exception either. It is up to Amazonian linguists to engage with Everett's provocative argument and to rethink the grammar of Amazonian languages in terms of the value that experience assumes in its definition.

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Despite the very broad interest of this paper, I must restrict my comments to a single aspect, color terminology. I will suggest (1) that although not all languages have a set of color terms that jointly name all the colors (Lyons 1995, Kay and Maffi 1999, Levinson 2000), given the Pirahã concern with concrete, immediate experience we might expect Pirahã to do so and (2) that Pirahã may. Thus, although I find reason to doubt Everett's conclusion that Pirahã has no color terms, I believe that their actual presence would support his broader claims regarding Pirahã predilection for immediate experience.

1. Experience of color is about as direct as experience gets. I refer here not to reified color concepts such as that figuring in a sentence like "Red is exciting" but to directly perceived color sensation, as expressed in a sentence like "I want the red apple." Everett (personal communication) states that Pirahã color expressions are used in the latter way and not the former—that is, that they are used as modifiers or predicates but not as substantives. Hence, I claim, Pirahã color expressions convey immediate sensations, not abstract concepts. Linguistically, color terms exemplify a rare, arguably unique lexical field in that its distinctions are directly traceable to complex *peripheral* neural structures—in the retina. Human color vision is probably shared throughout the catarrhine primates (De Valois et al. 1974, Sandell, Gross, and Bornstein 1979), and it is generally held that the trichromatic system of the catarrhines coevolved with red or orange ripe fruit (Mollon 1989, Regan et al. 2001). Humans' immediate experience of color is in all likelihood the same as that of apes and Old World monkeys. Color sensations would appear to qualify as exemplifying "direct, concrete experience" if anything does.

2. Everett's conclusion of "no color words" is based in part on the formal complexity of the Pirahã color expressions and in part on his impression that Pirahã color naming is highly variable. With regard to syntactic complexity, an example is *a*^{3}*hoa*^{3}*s aa*^{3}*ga*^{1}, literally `immature be.temporary', which the World Color Survey field linguist Stephen Sheldon found to be a widely shared term meaning "green-or-blue with a focus in green." It is fairly common in the world's languages for a word meaning "green" (or "green-or-blue") to be closely related to a word meaning "immature" or "unripe" (for example, English and all the Celtic languages), but this pattern is not universal. One cannot *predict* that an expression meaning "immature" will also mean "green" or "grue." Everett writes *a*^{3}*hoa*^{3}*s aa*^{3}*ga*^{1} as two words; Sheldon writes it without a space, indicating that he sees it as a single word like *forget-me-*

not, *jack-in-the- pulpit*, or *burnt sienna*. The first two examples are English plant terms and the third is an English color term, their internal syntactic complexity (and the vagaries of orthography) notwithstanding.

With regard to possible variability of Pirahã color expressions, Everett cites "interspeaker variation in naming colors" in partial support for his view that the color expressions in question are "fully compositional phrases" (personal communication). Given the long and intimate experience of Dan and Keren Everett with every aspect of Pirahã life and language, this opinion merits respect. At the same time, it runs directly counter to the systematic work of Sheldon in exposing 25 Pirahã speakers to 330 colored stimuli for naming in a fixed random order and then eliciting their best-example judgments from a palette showing all the colors at once. Sheldon's results show strong consensus on the roster of Pirahã color names and equally strong consensus on the specific ranges of colors they name and on their judgments of best examples, although he notes that "there was discussion [during color-naming sessions] among everyone ... even though I asked them to do it individually with me" (personal communication).

In deciding whether the Pirahã color expressions are proper color terms, the issues are just two: (A) Are the color meanings consensual and applicable to unfamiliar objects that exhibit the color property (as well as familiar objects)? (B) Are the color meanings *not predictable* from the meanings of the words or morphemes that make up the expressions and the rules of the language? If both answers are yes, then these expressions are color terms. The results of Sheldon's investigation apparently yield a yes answer to question A. Everett plans to repeat Sheldon's field experiment to see whether the consensual result can be replicated (personal communication). With regard to question B, it is clear from the analytical glosses that Everett gives to the four Pirahã color expressions that the color meanings of these expressions do not follow from their compositional meanings: "temporarily being immature" doesn't *mean* "green-or-blue," although finding a word meaning "green or blue" that is based on an expression that originally means "immature" or "unripe" is not uncommon.

Pirahã has color terms if the Sheldon results can be replicated under better-controlled conditions. Presence of true color terms would not be surprising in view of the Pirahã preference for linguistic encoding only of direct, concrete experience.

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There is a growing interest in human diversity throughout the human sciences, but unequivocally establishing the facts is a difficult and delicate business. Everett has neither established the facts nor handled the rhetorical delicacies that would be essential to establishing a bridgehead for studies of linguistic and cultural diversity among the universalizing sciences. In a nutshell, here are the main criticisms:

1. The central proposition, roughly "Pirahã live in the present," is too vague to be supported by the ad hoc collection of cultural features adduced. Nor does the argumentation remotely approach the standard of the classic anthropology on cultural coherence (e.g., Benedict 1934, Geertz 1960), let alone those set in modern linguistic discussions (e.g., Enfield 2002).

2. Most of the features listed are not sufficiently well established to satisfy the sceptics who should be the targets of this article. One simply has to take or leave the various assertions, admitted to be "largely unreplicable," even though many of them have the weak logical character of statements of non-occurrence. Further, Everett casts doubt on the fieldworking capacities of the only other researchers who might have been marshalled in

defence of his claims. If something can be known, it can be shown, and the duty of the researcher is to document it.

3. It is far from clear that Pirahã is the only language without a counting system (cf. Aboriginal languages of Australia [Dixon 2002:67]) or the only language without colour terms (cf. the controversies with, e.g., Saunders and van Brackel 1997, Levinson 2000) or the only language without embedding (cf. again Australian languages [Hale 1976, Dixon 1995, Austin and Bresnan 1996] and Nicaraguan sign language [Pyers n.d.]). That cultures may systematically lack genealogical depth or visual art has also long been noted (Goody 1993). What is meant to count as further attestation only reveals further reason for doubt: for example, earlier-documented colour terms among the Pirahã are dismissed because the expressions are compositional (e.g., "bloodlike"), but the current work on colour terms does not treat this as exceptional (see, e.g., Kay and Maffi 1999). The danger is that by oversimplifying and claiming the uniqueness of individual Pirahã cultural features the value of genuine observations about a unique *complex* of features will be lost.

4. Blatant inconsistencies likewise do nothing to reassure the reader. For example, we are told that the Pirahã are monolingual, but we find that "often this or that Pirahã informant would tell me (in Portuguese) that ..." and that Pirahã "have long intermarried with outsiders," suggesting sustained bilingualism. Elsewhere it is stated that there are bilingual informants, although their Portuguese is poor.

5. Having made the Pirahã sound like the mindless bearers of an almost subhumanly simple culture, Everett ends with a paean to "this beautiful language and culture" with "so much to teach us." As one of the few spokespersons for a small, unempowered group, he surely has some obligation to have presented a more balanced picture throughout.

All this is a pity, as I have little doubt that, due allowances made, this human group lacks some of the complexities that we think of as distinctive of the species. One of the dubious truisms enshrined in the textbooks is that all human languages are equally complex and equally expressive. Recently there has been extensive discussion of what we should mean by complexity in language and what the sources of variable complexity might be (e.g., McWhorter 2001, Trudgill 2004). Embedding the Pirahã case in this wider discussion raises the question whether Pirahã, represented (according to the *Ethnologue*) by just 150 individuals, is not a creolized, stripped-down remnant of some earlier, more complex set of systems (as discussed in the literature on language attrition and death [e.g., Sasse 1992]). Everett tries to head off this interpretation but notes that the Pirahã were once part of a powerful "Mura nation," and the idea that the pronoun system is borrowed indeed suggests some intensive contact or language-shift situation.

Everett suggests that his analysis undercuts the neo-Whorfian emphasis on the importance of language in cognition (as in Lucy 1992*b*, Levinson 2003*a*, Majid et al. 2004, and Gordon 2004), since he prefers an account in terms of the causal efficacy of culture, but no one interested in language diversity would make a simple dichotomy between language and culture: a language of course is a crucial part of a culture and is adapted to the rest of it (see Levinson 2003*a*:316–25). The question that neo-Whorfians are interested in is how culture gets into the head, so to speak, and here language appears to play a crucial role: it is learnt far earlier than most aspects of culture, is the most highly practiced set of cultural skills, and is a representation system that is at once public and private, cultural and mental. It is hard to explain non-ecologically induced uniformities in cognitive style without invoking language as a causal factor (see Levinson 2003*a*:chap. 7; 2003*b*).

Everett has missed an opportunity here to follow up on interest generated by Gordon's (2004) persuasive analysis of the Pirahã absence of numeracy: only with a sober catalogue of carefully documented features would we

be in a position to ask whether they formed a larger pattern and what the origins of that pattern might be.

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Everett's thought-provoking paper makes several strong claims. I will first address those that seem to me to have little merit and then turn to those to which I am more sympathetic.

I don't think Pirahã is a serious threat to Hockett's universal design features. Everett has misinterpreted two of Hockett's key terms. He takes "interchangeability" to mean "intertranslatability"—that what can said in one language can be said in any other. However, Hockett (1958:578) defines "interchangeability" as a relation between speakers and hearers: any speaker of language X can understand what someone else says in X and can say the same things. Intertranslatability was not one of Hockett's universals. The point has been made very forcefully by Grace (1987) and others that natural languages are far from fully intertranslatable. People cannot readily talk about a subject matter when they do not have the words, formulas, etc., that define the substance of discourse about that subject matter. The more different two cultures are, the fewer subject matters they will have in common.

By "productivity" Hockett means being able to say things that have never been said before. Pirahã clearly has productivity in this sense. But Everett uses "productivity" in a way that links it to full intertranslatability ("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"), and languages are not fully intertranslatable.

Pirahã speech is said to exhibit only one degree of displacement. The arguments for this claim are problematic. It would seem that Pirahã has considerable apparatus for talking about non-immediate experience but that there is a strong cultural preference not to do so. To assess the linguistic basis of the one-degree-of-displacement claim would require a well-founded scale of abstractness and careful examination of polysemy and various kinds of discourses by various speakers.

I am sympathetic to the view that parts of a language are shaped by cultural values and practices. This is uncontroversial when it comes to lexical semantics, metaphor, pragmatics, and discourse structure but harder to demonstrate in morpho-syntax (Enfield 2002). It is not clear that the lexico-grammatical properties of Pirahã that Everett refers to are due specifically to the immediacy-of-experience constraint. The stock of Pirahã verbs can be extended by combining verb roots but only if the sequence refers to a culturally accepted event. This constraint seems to be true of verb compounding and serialization in all languages. It reflects a universal cultural-cum-linguistic tendency for conventional concepts to get lexicalized; people develop streamlined ways of saying familiar things. Whether constraints on what it is conventional to say are a matter of grammar, lexicon, or idiomaticity depends on how one chooses to define these constructs (Pawley 1986).

Some other languages, for example, Warlpiri, have very limited counting systems (one, two, many) and/or only two basic color terms (light, dark), and/or no clear cases of embedding, but in such cases there has been no suggestion of an immediate-experience constraint (as speakers have rich mythologies, easily learn European counting systems, and so on). It is usual to give a utilitarian explanation of these limitations. Here we run into the perennial problem of functionalist explanations: How to falsify them? How to avoid the suggestion of teleology?

If Pirahã behavior and thought are as Everett says—and one craves a detailed ethnography of Pirahã speech and social psychology, including documentation of individual variation—it may well be that something like the

immediate-experience constraint does underlie the absence of myths, lack of interest in remote things, etc. Compare the mind-set that makes many urban dwellers indifferent to the plant species of their vicinity: a sample of San Francisco Bay area residents had a range of from just 10 to 34 tree/shrub names (Witkowski and Burris 1981) even though many more species were present. Why do some people pay close attention to certain parts of their environment and others not? It is too easy to say, in this case, that "people attend to what is useful." Typically, tribal peoples (and some others) know the salient attributes not only of useful species but also of many that are not useful. Established expertise in a domain gives people a mind-set to be curious about many things in that domain (see Berlin 1991 and Hays 1991 on "utilitarian" versus "intellectualist" explanations of folk taxonomies).

Everett's claims about the connections between culture, subject matter preferences, and linguistic resources raise a cluster of important issues of conceptual framework and method. One conclusion of his I agree with entirely. If linguists want reliable descriptions of ordinary spoken languages, they need to do extended fieldwork and immerse themselves in the cultural contexts of language use.

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Everett's article confirms loud and clear what many anthropologists believe: to study language in isolation from the context in which it is produced poses a high risk of simplification. The most common is the projection of categories alien to the language under study. For example, to address colour-term systems or other classificatory systems without previously questioning the configuration or even the relevance of these categories for a given society is a practice (far too common in anthropology for us to overlook when it appears in linguistic studies) that leads to the fallacy of demonstrating the reality of these categories for that society. Everett's article illustrates that this and other universalistic reductionisms do not survive rigorous testing against the reality of the practical usage of a given language. Although I mostly agree with Everett's critical work, I have some reservations about the way it is formulated and especially about his alternative proposal. My main objection is that he stresses the deficiencies of the Pirahã language (the only positive feature of the language is a very rich prosody developed only in an appendix) and says little about how the users of this language communicate.

This could lead us to believe that the Pirahã do not have developed communication because their language does not permit it. However, I doubt that Everett believes this in view of the way he defends himself against the embarrassing impression of primitivism that his description of the Pirahã conveys. We could therefore conceive that, far from lying in the structure of the language, the problem arises from the historical conditions endured by this community. In this respect the text is somewhat contradictory. On the one hand it argues against the possibility of the language's deficiencies' constituting a *faux* archaism, a consequence of the demographic weakness and other traumas inflicted by an aggressive colonial environment, by asserting (although failing to demonstrate) that the 200 years of contact were not especially incisive. On the other hand, it presents as an argument for culture's determining role on language the fact that the Pirahã are monolingual despite all these years of regular contact with Brazilians. If indeed this contact failed to be influential, the Pirahã's monolingualism may mean not that they were unable to learn Portuguese but that they did not need to.

If Everett believes that the Pirahã have a high level of communication despite the simplicity of their language, he should demonstrate how they communicate. He provides us with a clue when he asserts the primacy of culture over language and adds that the Pirahã "restrict communication to the immediate experience of the interlocutors." However, he does not go into all the consequences of his assertions, leaving his alternative proposal to be vaguely

intuited. He fails to tell us, for instance, whether in the end the language exists for him or, as Ingold (2000:392–93), believes, that it is only because of the reification of speech, made possible through writing, that the idea of language as an entity (a collection of rules and signifiers with a generative potential) exists in Western thought. If he does not agree with this radical position, he should illustrate the use that the Pirahã make of grammatical language, the meaning that they give to it, and how they include it in other communication practices such as the body language of feeling and other sensory, polysensory, or synaesthetic forms of nonverbal communication as some of us are attempting to do in the Amazon (Surrallés 2003). These constitute ways of communication related to the notion of "immediate experience" that Everett suggests, that is, experience that can be directly perceived.

These silences can be related to a general lack of ethnographic contextualization of the Pirahã linguistic data that is surprising coming from a linguist who seeks to build bridges with anthropology. Everett devotes a number of paragraphs to the Pirahã ethnographic background, but only as an introduction. Moreover, anthropologists today work collectively on groups of societies rather than on isolated units. Everett should consider in more depth the ethnographic and linguistic descriptions of other scholars working among the Pirahã and related groups to convince us that his theses are not the result of a personal bias in his data gathering, given that he offers only his own data as evidence. In short, ethnographic and linguistic analyses should require more scrupulous integration. This void may be due to a slightly anachronistic view of anthropology and of the notion of culture associated with the discipline. Indeed, it seems that for Everett "culture" encompasses everything but language. He should bear in mind the decade of work that anthropology, particularly in the Amazon (e.g., Descola 1994, Viveiros de Castro 1998), has dedicated to criticizing the notion of culture and the dichotomy that it establishes with the notion of nature.

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The best-kept secret in modern linguistics is that we actually know where grammar comes from. Virtually all of the so-called function words in a language have their origin in content words such as nouns and verbs (demonstratives are an exception [Diessel 1999]). Case markers and agreement markers most often originate in freestanding words such as spatial prepositions, pronouns, and even nouns and verbs. The English future markers *will* and *gonna* are both derived from freestanding verbs, and the definite article *the* is derived from a demonstrative. Something similar can happen on the level of whole syntactic constructions as loose discourse sequences such as *He pulled the door and it opened* become more tightly organized syntactic constructions such as *He pulled the door open* (see Traugott and Heine 1991, Hopper and Traugott 1993, Bybee, Perkins, and Pagliuca 1994).

Basically, as people communicate about content, content words need to be "glued together" to make coherent messages fitting the cognitive and attentional capacities and predispositions of human beings: such things as force dynamic scenes (with agents and patients) to fit with human causal/intentional cognition, topic-comment structure to fit with human attentional needs, and pragmatic grounding to help identify and locate objects and actions in space and time. In other words, particular things get grammaticalized in the way that they do because human cognition and communication work the way that they do. The starting point of the process, of course, is the particular content that people choose to talk about in a particular linguistic community. And so from the point of view of this functional-typological-historical approach to language, Everett's findings and hypotheses make perfect sense. If members of a speech community do not talk about events remote in time and space, then there is no raw material to be transformed into grammatical markers for such things as tense and aspect.

I am no expert on the facts of the matter here. Perhaps Everett's specific analyses need revising in some particular ways. But the question is: from a large-scale theoretical point of view, what is the alternative? And the answer is, as Everett notes, universal grammar. In my experience, what normally happens when proponents of universal grammar hear reports like Everett's is that they simply do not believe them. The nonembedded Pirahã sentence structures reported, for example, really do have embedding, they will claim; it is just at an underlying level where we can't see it. The evidence for this claim is that one could translate these nonembedded structures into embedded structures in, for example, English. But this is just "the Latin fallacy." Sensible people stopped analyzing other European languages by analogy to Latin many years ago, and we should stop analyzing the structures of non-European languages by analogy to European languages now. One of the most thoughtful analyses along these lines is that of Comrie (1998), who argues that what we translate from Japanese as relative clauses really do not have the same structure and work quite differently. Therefore, without arguing the particularities of the case Everett presents, it is perfectly reasonable that the structures of the Pirahã language are very different from those of other languages. Because they talk about different things, different things get grammaticalized.

In light of the fact that we know that languages differ greatly in their syntactic structures and we know how grammaticalization takes place in many specific instances in particular languages, how can anyone maintain the hypothesis of a universal grammar? The answer is to make the concept immune to falsification. Thus, in universal grammar analyses, the most common practice is to invoke universal grammar without specifying precisely what is intended, as if we all knew what it was. Here are examples of what is said to be in universal grammar from people who are bold enough to be specific: O'Grady (1997) proposes that it includes both lexical and functional categories. Jackendoff (2002) includes *x*-bar syntax and the linking rules NP = object and VP = action. Pinker (1994) agrees and adds "subject" and "object," movement rules, and grammatical morphology. Crain and Lillo-Martin (1999) list wh- movement, island constraints, the subset principle, head movement, c-command, the projection principle, and the empty-category principle. Hauser, Chomsky, and Fitch (2002) point to the computational procedure of recursion and Chomsky (2004) to the syntactic operation of "merge." Baker (2001), Fodor (2003), and Wunderlich (2004) all present very different lists of features and parameters. There seems to be no debate about which of these or other accounts of universal grammar should be preferred and why. This problem is particularly acute in the study of language acquisition, where there is no evidence that children begin with the abstract linguistic categories characteristic of most accounts of universal grammar (Tomasello 2003).

Universal grammar was a good try, and it really was not so implausible at the time it was proposed, but since then we have learned a lot about many different languages, and they simply do not fit one universal cookie cutter. Everett's case is extreme, but there are others that create similar problems for the theory. In science, when theory and facts conflict, given a large enough body of reliable facts, theory loses, and we must come up with something new.

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Because I fully agree with Everett's general claim that to a considerable degree culture shapes language and that meaning is central to the understanding of both languages and cultures, I deplore all the more his extravagant and unsubstantiated specific claims, which are based on deeply flawed methodology and which ignore the wide-ranging and methodologically rigorous studies reported in *Meaning and Universal Grammar* (Goddard and Wierzbicka (2002)—studies which have led to the discovery of 65 universal semantic primes lying at the heart of all languages.

Many of Everett's claims about Pirahã are in fact entirely consistent with the universals we have posited. At the same time, some of these universals are alleged by Everett to be absent from Pirahã. For reasons of space, I will focus here on "all," whose alleged absence from Australian languages I have discussed in detail (Wierzbicka (1996). The alleged absence of a word for "all" in Pirahã is clearly refuted by the material cited by Everett himself, and the failure to recognize its presence is a glaring example of the weakness of the semantic analysis in his paper.

Can one say things like "All the men went swimming" in Pirahã? The answer is clearly yes, as Everett's examples (10) and (12) show. Concepts such as "every," "most," and "few" are far from universal, but "all" does occur in all languages, and Pirahã is evidently no exception. Everett does not see this: his interlineal gloss for *hiaitíihí hi 'ogi* `all the [Pirahã] people' is "Pirahã people he big." The fact that the same segment used in one syntactic frame can mean "big" and in another "all" misleads him into thinking that there is no word for "all" in Pirahã—a conclusion clearly contradicted by his own data. The concept of polysemy is a basic tool in semantic analysis, and rejecting it altogether leads to ludicrous results such as the following "literal" gloss: "My bigness ate [at] a bigness of fish, nevertheless there was a smallness we did not eat." In using such glosses, Everett exoticizes the language rather than identifying its genuinely distinctive features. To say that *ti 'ogi* means, literally, "my bigness" (rather than "we") is like saying that in English *to understand* means, literally, "to stand under." To deny that *hi 'ogi* means "all" is to make a similar mistake.

In claiming that Pirahã has no word for "all," Everett is joining the long tradition of "primitive-thought" scholars such as Hallpike (1979), who also claimed that, for example, Australian Aborigines had no word for "all" and, accordingly, were not capable of making generalizations. Everett insists that the Pirahã language is not in any way "primitive," but the fact of the matter is that without a word (or wordlike element) meaning "all" speakers *could not* make generalizations. Accordingly, despite his protestations, Everett *is* presenting Pirahã as "primitive" language.

Despite the sensational tone of Everett's paper, most of the other "gaps" that he sees in Pirahã are insignificant. Many languages lack numerals, and, as the Australian experience shows, their speakers can readily borrow or develop them when they need them. What matters is that the language does have words for the universal semantic primes "one," "two," and "many." Out of these (and some other primes clearly present in Pirahã), all other numerals, quantifiers, and counting practices can be developed. All the pronouns currently used in Pirahã "were borrowed recently from a Tupi-Guarani language," but all languages have identifiable exponents of "I" and "you," and, whatever the source of the current inventory, Pirahã is clearly no exception in this regard. Pirahã has no colour words, but countless other languages lack colour words, and the concept of "colour" itself is culture-specific (cf. Wierzbicka 1996, n.d.). What matters is that they all have the concept of "see." Again, as the Australian experience shows, speakers of such languages can quickly build such concepts when they become interested in the relevant technologies and practices.

Pirahã is no doubt "largely incommensurate with English," but it is not *fundamentally* so: on the available evidence, it has the same set of semantic primes, out of which all other, culture-dependent, meanings can be constructed. Boas and Sapir got it right: languages can differ enormously in their semantic systems, but all evidence points to what Boas called "the psychic unity of mankind." The universal semantic primes provide the bedrock of that unity and a touchstone for linguistic semantics.

Reply

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The most important point of my paper is that evidence for language evolution can be found in living languages, and therefore hypotheses such as universal grammar are inadequate to account for the Pirahã facts because they assume that language evolution has ceased to be shaped by the social life of the species (e.g., Newmeyer 2002:361). At the same time, this does not warrant labeling different evolutionary paths more or less "primitive."

I agree with Tomasello's assessment of the issues and Pirahã's place in the universal-grammar debate.

Berlin claims that other languages are known that lack numbers and embedding, but I must disagree. Some languages have been claimed to have only "one," "two," and "many," but those *are* numbers.

Neither Hale (1976), Dixon (1995), nor any of the other references cited by Pawley, Berlin, and Levinson claim that any language lacks recursion, although Australian, Papuan, and other languages often use nonsubordinating clause-joining strategies where English, say, might use recursion. Rachel Nordlinger's work in progress supports my point.

Gonçalves, who has spent roughly 18 months over a period of several years living among the Pirahã and written two books on Pirahã culture, accepts my claim that experience guides culture and grammar in Pirahã and connects it to more general work, initiated by Seeger (1981), on Amazonian worldview. His remarks in this regard are suggestive and useful.

Surrallés's principal objection to my paper is that it appears to portray the Pirahã as communicatively deficient. He rightly points out that there is a need for a systematic ethnography of communication for Pirahã, but his objection (shared by Levinson) that I have portrayed the Pirahã as primitive in thought is ethnocentric. That the language does not avail itself of grammatical resources used in other languages neither renders it inferior to other languages nor, as Levinson claims, makes its speakers "mindless." Surrallés warns me against dichotomizing culture and nature, but I have tried to establish the opposite, namely, that cultural values shape the language that ultimately emerges from them. My paper should be taken as an argument for his position, not against it.

Kay claims that Sheldon's experiments, if accurate and replicable, establish the existence of color terms in Pirahã and that, in fact, the existence of color terms is harmonious with my proposal that grammar is constrained by experience. Sheldon (personal communication, April 2005) says the following about his experiments: "The Pirahã like to participate together. I tried to keep things separate, but even with the small study behind the house, others come by to listen. The topic becomes of immediate interest to everyone, and there was discussion among everyone of what was being done, etc. I am quite sure they discussed things among themselves even though I asked them to do it individually with me." He adds that he agrees with the conclusion that I draw from his work, namely, that the poor experimental control raises potential problems with the interpretation of his results because we are unable to say to what degree the agreement on the color terms is the result of consensus achieved through group discussion versus repeated individual use of the same terms independently. Therefore, the experiments are contaminated and need to be rerun.

Further, Keren Everett has conducted informal tests on Pirahã ability to name colors and has observed (personal communication, 2005) that speakers frequently disagree on the description of colors. I have observed this variation independently. Moreover, different phrases can be used by the same speaker to describe the same color in the same situation. For example, the particle *'igiábií* `like' is often used: *pii 'igiábií* `blue' (like water); *bii 'igiábií* `red' (like blood), etc. In addition, color terms can vary according to what they describe, so that different descriptions may be used for different objects, rather than generalized color terms (e.g., black for animals, for humans, for inanimates):

biopaíai `black' (for a human; lit. `dirty blood'); *kopaíai* `black' (for an animal; lit. `dirty eye'); *hoigii 'igiábií* `black/dark' (usually for inanimates; lit. `like dirty').

I agree with Kay that *color* is an immediate sensation. But the naming of it is not. A property name that generalizes over immediate expressions is an abstraction, a variable. My claim is, again, that the Pirahã avoid this (hence the near absence of adjectives and adverbs). Color terms are abstractions; the descriptions of colors are not. Abstractions violate the proposed principle of immediacy; phrasal descriptions do not. My account predicts that in Pirahã colors will be described by phrases according to each experience rather than given variable-like names (the latter might be possible, but only in violation of the proposed constraint).

Pawley says that I have misunderstood Hockett's inerchangeability design feature, but what Hockett (1958:578) says it means is

> *that any participating organism equipped for the transmission of messages in the system is also equipped to receive messages in the same system, and vice versa. For language, any speaker of a language is in principle also a hearer, and is theoretically capable of saying anything he is able to understand when someone else says it. Bee dancing and gibbon calls also involve interchangeability, but our other animal systems do not. In the courtship signalling of sticklebacks, for example, it is obvious that the male and the female cannot change roles. Nor can one imagine gazelles roaring and lions fleeing.*

Hockett's gazelle-and-lion example doesn't fit Pawley's understanding. What is at issue is a system of communication *across* species, not *within* a species.

Pawley's understanding of Hockett pivots on the meaning of "same system." He thinks that it means "same language." I claim that it means "same-species communication system." This difference of opinion may be due to Hockett's tendency to shift between properties of "Language" and "A language." The function of interchangeability and his other design features is to identify something specific about *Homo sapiens.* To do that it must entail something at the species level rather than at the individual language level. The evolutionarily interesting understanding of interchangeability is therefore just this: anything one can understand from a conspecific one should be able to say to another conspecific. Bicultural, bilingual individuals will in principle (though perhaps not in practice) be able to communicate anything they hear in either language, since they have fully understood it. But Hockett's interchangeability, under my interpretation, must be abandoned if Pirahã has followed its own evolutionary path. Thus a Portuguese-fluent Pirahã could not communicate perfect tenses in Pirahã. This limitation is connected to the question I raise regarding borrowing. Why are the Pirahã unlike other groups in not borrowing number words? Further, why are they still monolingual? Because their "core grammar" lacks the resources to express certain concepts and their culture prohibits certain ways of talking. My conclusion is thus a stronger argument against intertranslatability than even Grace's (1987), which was based on general principles.

Pawley also objects to my understanding of productivity. According to Hockett (1958:576) productivity means that "a speaker may say something he has never said nor heard before and be understood perfectly by his audience, without either speaker or hearer being in the slightest aware of the novelty." On one level, this refers strictly to combinatorics, but Hockett's formulation itself must be revised, as I have argued, because it fails to consider the vast variation in resources for productivity available to individual languages. Pirahã shows that there are severe limitations on "novelty" that are not shared between languages. Although productivity is not intertranslatability per se, the inadequacy of Hockett's conception of productivity is shown by the specific restrictions on intertranslatability that we see in my paper. Interestingly, however, this reconsideration of productivity implies that there are *multiple* kinds of human grammars.

Wierzbicka's comments revolve around two assertions: (1) her theory requires all languages to have the quantifier "all" and (2) Pirahã does in fact have the word "all." Nothing she says, however, is relevant to determining whether Pirahã has "all" or not. All semanticists know that the quantificational properties of a word are revealed by its truth conditions. I have pointed out that Pirahã has no word with the truth conditions of universal quantification. Unless Wierzbicka can show that I am wrong about the truth conditions, she has no case. The same applies to her assertions on the Pirahã pronominals. Further, her assertion that I have "primitivized" or "exoticized" the Pirahã is based only on the idea that if the properties of the language do not agree with her theory it is primitive. But this is a nonsequitur. Finally, her point about "all" is not unique to her. From a much older tradition, Davidson says (2001[1997]:134–35) that the "last stage" in language development

> *requires a leap; it introduces quantification, the concepts expressed by the words "some" and "all." Once we advance to this stage, we have arrived at languages that match, or begin to match, our own in complexity. ... It is here, in my opinion, that we reach the degree of expressive sophistication that we associate with thought, for it is only at this level that there is positive evidence that the speaker of the language can predicate properties of objects and events.*

By the Pirahã evidence both Davidson and Wierzbicka are wrong. Thought need not be reflected directly in language. The fact that the Pirahã lack the word "all," using instead, say, generics, means simply that their syllogistic reasoning will nearly though not quite match our own, giving them the ability to deal well with the world around them but not to teach Western logic at this time in their cultural history.

Levinson displays deep misunderstanding of my proposed experience principle, claiming that it limits talk to the present. As I have said, this principle includes experiences over several generations. He further says that the list of properties adduced in support of the principle of immediate experience is disjointed. Whether any list coheres is a matter not of taste but of argumentation. Each feature listed is one that is highly unusual or unique to Pirahã. One can simply say that there is no link between them, or one can consider them as sharing the property that they avoid violations of the experience principle. This property creates an intensional, non-disjunctive set. Claims for disjointedness of the set of properties discussed must engage the evidence in favor of the common property. Since Levinson fails to marshal a single counterargument, his commentary makes no substantive contribution on this point.

Next, Levinson claims that my statement about the Whorf hypothesis and formal theories is incoherent, namely, that it is forced on formal theories just in case a culture-language connection like Pirahã tenses is discovered. Again, he does not say why. In fact, as I have established in some detail (1993), according to universal grammar children's core grammar is insulated from cultural influence, and therefore only a Whorfian hypothesis is acceptable.

Levinson goes on to suggest that there is sustained bilingualism among the Pirahã, based on the statement in my paper that there has long been intermarriage between the Pirahã and outsiders. Here he misunderstands my point, but this is surely my fault for not explaining "intermarriage" clearly enough. In the Pirahã case, intermarriage does not imply cohabitation; it in fact implies only sexual relations. There is no off-the-shelf anthropological term that I am aware of for sexual relations that are partly casual and partly intended to produce children with non-Pirahã fathers (children of non-Pirahã women are never raised among the Pirahã, only children of Pirahã women). In such cases the name of the Brazilian father—but a Pirahã name, not a Portuguese name—is remembered. Sometimes, jokingly, the Brazilian may be referred to as the Pirahã woman's husband, though he receives no loyalty, no favors, no relationship at all. There is not and never has been any sustained cohabitation between Pirahã and Brazilians or other ethnic groups. There is certainly no bilingualism, sustained or otherwise. Readers need not take my

unsupported word for this; Peter Ladefoged, who visited the Pirahãs with me in 1995 to conduct phonetic research, had this to say about them, after conducting field research on at least 50 other languages from around the world (Ladefoged 2005:154):

> *The only completely monolingual community I have ever known are the speakers of Pirahã, a small group of about 300 people who live in the Amazonian rain forest. They ignore strangers and have as little to do with the outside world as possible. You have to learn their language to speak to them, a tedious and difficult process involving hours of patient observation and trial and error.*

Levinson closes by asserting the persuasiveness of Gordon's (2004) results. Here again I think that perhaps my argument was insufficiently clear. Without wishing to be unfair to Gordon, who certainly made a serious effort to overcome the difficulties inherent in research with a monolingual community, I must emphasize one crucial point: on the videotape he made of his experimental setting, the Pirahãs say repeatedly that they do not know what he wants them to do, and they have repeated these comments since Gordon's visits. Gordon did not realize that they were confused because he was unable to communicate with them directly, and he did not request help in interpreting the Pirahãs' comments on his experiments. In addition, his experimental design was culturally insensitive. Even aside from methodological flaws, there is an additional serious problem with Gordon's interpretation of his results: he does not attempt to account for the fact that the Pirahã can and do fill other gaps in their lexicon by borrowing words from other languages.

Levinson takes me to task for not discussing the work of McWhorter (2001) and Trudgill (2004). Trudgill (2004) was not available at the time I submitted my manuscript, but now that I have read it, I can report that Trudgill's thesis and McWhorter's where it is relevant are falsified by the Pirahã data. Trudgill claims that simplification (e.g., the Pirahã phonemic system) is more likely in "communities involved in large amounts of language contact." This would mean, for example, that Pirahã's unusual features could be due to disintegration through contact. However, since Pirahã fits Trudgill's (2004:306) description of a "small, isolated, low-contact community with tight social network structures," it should have more rather than less complexity. What this means is that Trudgill is wrong. Better reasons for the simplicity of Pirahã grammar and phonology have been presented above.

Finally, Levinson exclaims that there is not enough detail to assess my claims and that my claims are unreplicable. First, almost all these claims have been independently established in publications listed in the paper. Second, the claims are replicable—but only through the Pirahã language.

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