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# Language and Mind: Let's Get the Issues Straight!

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## 2.1 Introduction

Current discourse on the topic of language and mind is at about the intellectual level of a chat show on the merits of democracy. Ideological nonsense, issued by famous scholars, fills the air, even the scientific journals. Serious scholars tend to leave well enough alone, since such exchanges reveal a banal underlying lack of analysis. It is as if the topic of “Whorfianism” is a domain where anybody can let off steam, go on mental holiday, or pounce upon an ideological enemy. This is a pity, because the issues are deeply relevant to understanding our place in nature, and how we should understand our unique language capacity. Further, the issues are entirely open to careful analysis and empirical investigation, using the normal methods of the linguistic and psychological sciences.

In this chapter, I try to spell out in the simplest terms what the underlying issues are (but see Levinson 1996, 1997a, 2000, 2001, in press, for deeper discussion). We have to establish some kind of sensible mode of discourse before empirical results can be appreciated for what they are. As I outline at the end of the chapter, there is an accumulated body of such results, but first we had better try to establish the foundations for rational discourse.

## 2.2 The Doctrine of Simple Nativism and Its Coevolutionary Alternative

There is a widespread presumption in the cognitive sciences that language is essentially innate. All the other species have innate communication systems, so why not humans too? Of course, languages don't all

sound alike, but that's a matter of superficial clothing. Underneath, it's the very same flesh and blood. There are two basic tenets to the doctrine. The first holds that the syntax of language is fundamentally universal and innate, a view of course associated with Chomsky. The second (of central interest to this chapter) holds that the semantics is given by an innate "language of thought," a view ably defended by Fodor (1975). Put them together and one has the widespread presumption, which I will dub *Simple Nativism*, which curiously enough is not generally associated with any adaptational or evolutionary argument for language (see Levinson 2000). The central property of Simple Nativism is the claim that all the major properties of language, the object of study, are dictated by inbuilt mental apparatus. The observable variation is simply "noise," and nothing much can be learned from it. Protagonists of this view can be found across the cognitive sciences, including linguists like Jackendoff (see Landau and Jackendoff 1993), cognitive psychologists like Pinker (1994) or Gleitman (see, e.g., Li and Gleitman 2002), and the so-called evolutionary psychologists like Tooby and Cosmides (1992).

Despite its prominence, this doctrine is peculiar. First, it is impossible to reconcile with the facts of variation across languages. Second, it is a theory of innate (thus biological) endowment outside biology. There is no biological mechanism that could be responsible for providing us with all the meanings of all possible words in all possible languages—there are only 30,000 genes after all (about the number of the most basic words in just one language), and brain tissue is not functionally specific at remotely that kind of level. Third, it misses the most fundamental biological specialization of our species: the species has coevolved with culture—we cannot survive without it, but with it we have evolved a method of adapting to new ecological niches with much greater rapidity than our genome.

This last point is worth developing a little further. Human evolution has been shaped by the development of two distinct types of information transfer across generations, genetic and cultural, with systematic interactions between them (Durham 1991). Just look at the evolution of our hands and the progression of the tools to be found in the archaeological record. Language is an obvious central part of this gene-culture coevolution—it is culture, responding to its particular ecological niche,

that provides the bulk of the conceptual packages that are coded in any particular language. The contents of language, and much of its form, are thus largely the products of cultural tradition—but at the same time those cultural elements are constrained in many different ways by the biological nature of the organism, particularly its learning capacity. Rather precise information about this kind of interaction has now been provided by the study of infant speech perception. Infants are highly sensitive to the initial speech sounds around them, and they seem to have an innate fine-grained categorical system of perception shared with monkeys and other mammals. But by six months after birth infants have done something no monkey can do: they have warped this system of categories into line with the local language they are hearing around them. In that short time, they have acquired a cultural acoustic landscape. It is hard to escape the conclusion that human infants are “built” to expect linguistic diversity and have special mechanisms for “tuning in” to the local variety (Kuhl and Meltzoff 1996, 1997). We can expect to find exactly the same sort of interaction between prelinguistic perceptual distinctions and linguistically variable semantic distinctions. Thus, Choi et al. (2000; see also McDonough, Choi, and Mandler, in press; Bowerman and Choi, this volume) have shown that 9-month-old infants have equal facility to make, for example, English versus Korean spatial distinctions, while by 18 months they are tuned into the local language-specific distinctions. By the time we reach adulthood, just as we find alien language distinctions hard to hear, so English-speaking adults have lost the ability to make Korean distinctions even in nonlinguistic implicit categorization. Infants, unlike monkeys, are preadapted for cultural variation, for discovering the local system and specializing in it.

This alternative coevolutionary account, with psychology and cultural variation locked in mutual adaptation, is much better suited than Simple Nativism to understanding linguistic and cultural variation. It makes us think differently about what the biological endowment for language must be like. Instead of expecting that endowment to predict all the interesting properties of observable languages, we need rather to think about it as a learning mechanism wonderfully adapted to discerning the variability of culturally distinctive systems—a mechanism that simultaneously puts limits on the variation that those systems can throw at

it. On this account, the essential properties of language are divided between two inheritance systems, biological and cultural, and the long-term interactions between them.

Simple Nativism has blocked sensible and informed discussion of the relation between language and thought for decades. Once the facts about linguistic diversity are properly appreciated, it will be clear that Simple Nativism ceases to be of any real interest.

### 2.3 Linguistic Variation

Simple Nativists hold that linguistic categories are a direct projection of universal concepts that are native to the species:

Knowing a language, then, is knowing how to translate mentalese into strings of words and vice versa. People without a language would still have mentalese, and babies and many nonhuman animals presumably have simpler dialects. (Pinker 1994, 82)

Learning a language is on this view simply a matter of learning the local projection, that is, finding the local phonetic clothing for the preexisting concepts. Or as Li and Gleitman (2002, 266) put it:

Language has means for making reference to the objects, relations, properties, and events that populate our everyday world. It is possible to suppose that these linguistic categories and structures are more or less straightforward mappings from a preexisting conceptual space, programmed into our biological nature: Humans invent words that label their concepts.

Hence, they hold, “the grammars and lexicons of all languages are broadly similar.”

The view just sketched is simply ill informed. There is no sense of “broad” under which “the grammars and lexicons of all languages are broadly similar.” If there were, linguists could produce a huge range of absolute linguistic universals—but they cannot do so. As Greenberg (1986, 14) has put it, either language universals are trivial (“All spoken languages have vowels”), or they are conditional generalizations with statistical generality. It is fundamentally important to cognitive science that the true range of human language variation is not lost sight of.

It may be useful to review some of the fundamental parameters of variation. Natural languages may or may not be in the vocal-auditory

channel—they can be shifted to the visual-manual one, as in sign languages. When they are broadcast in an acoustic medium, they may have as few as 11 or as many as 141 distinctive sounds or phonemes (Maddieson 1984). Languages may or may not have morphology, that is, inflection or derivation. Languages may or may not use constituent structure (as in the familiar tree-diagrams) to encode fundamental grammatical relations (Austin and Bresnan 1996; Levinson 1987). Thus, they may or may not have syntactic constraints on word or phrase order. Languages may or may not make use of such basic word class distinctions as adjective, adverb, or even, arguably, noun and verb (Mithun 1999, 60–67). If they do, the kind of denotation assigned to each may be alien from an English point of view. Languages force quite different sets of conceptual distinctions in almost every sentence: some languages express aspect, others don't; some have seven tenses, some have none; some force marking of visibility or honorific status of each noun phrase in a sentence, others don't; and so on and so forth. Linguists talk so often about universals that nonlinguists may be forgiven for thinking that they have a huge list of absolute universals in the bag; but in fact they have hardly any that have even been tested against all of the 5%–10% of languages for which we have good descriptions. Almost every new language that is studied falsifies some existing generalization—the serious comparative study of languages, and especially their semantic structures, is unfortunately still in its infancy.

I emphasize the range of linguistic variation because *that's the fundamentally interesting thing* about language from a comparative point of view. We are the only known species whose communication system is profoundly variable in both form and content (thus setting aside, e.g., minor dialects in bird song form; Hauser 1997, 275–276). So we can't have the same kind of theory for human communication that we have for bee or even monkey communication; fixed innate schemas are not going to give us a full explanation of language. Of course, the human innate system must be superbly equipped to expect and deal with the variation—and so it is. This is what Kuhl (1991) has so nicely shown in the realm of speech sounds, as noted above: infants, unlike monkeys, are built to specialize early in the local sound-system.

Let us now pursue the subject of special interest to this chapter: semantic variation across languages. Take the spatial domain. On first principles, this is a conceptual domain where we would least expect major semantic variation; after all, every higher animal has to be able to find its way home, and mammals share a great many specialized anatomical and neurophysiological systems dedicated to telling them where they are and where things are with respect to them. So if the Fodor, Pinker, or Gleitman story is correct anywhere, it should be so here: spatial categories in language should be direct projections of shared innate conceptual categories. But it turns out that there is not the slightest bit of evidence for this.

We may take a few simple examples of spatial concepts where universal agreement on spatial categories has been expected. Let us start with deixis, often presumed universal in all essentials. It has been supposed that all languages have demonstratives that make at least a contrast between 'this' and 'that', but even spoken German seems to falsify that (some German dialects arguably have no demonstratives at all, but only articles). And for languages that do have two demonstratives, it turns out that there are at least four semantic types; more generally, research shows almost as many semantic distinctions in demonstratives as languages investigated (Meira and Dunn, in preparation). Likewise, it has been supposed that all languages make a basic distinction between 'come' and 'go' verbs. But in fact not all languages handle this distinction in lexical verbs (instead, e.g., using 'hither', 'thither' particles), and, when they do, there is tremendous variation in exactly what is coded. Typically, but not always, 'go' has no deictic coding, merely pragmatically contrasting with 'come', and the 'come' verb may or may not entail arrival at the deictic center, and may or may not allow motion continued beyond this center (Wilkins and Hill 1995).

Next, let us turn to the subdomain of so-called topological spatial relations. These are relations of contact or propinquity (like English *on*, *at*, *in*, *near*), which, following Piaget and Inhelder (1956), have been taken to be the simplest kind of spatial relation. Landau and Jackendoff (1993) have suggested that closed-class spatial expressions in languages are highly restricted in conceptual type, referring only to "the very gross geometry of the coarsest level of representation of an object—whether

it is a container or a surface" (p. 227). On the basis of English prepositions, they confidently make universal claims of the following sort: no language will have spatial relators expressing specific volumetric shapes of ground objects—for example, there will be no preposition or closed-class spatial relator *sprough* meaning 'through a cigar-shaped object' (p. 226). But the Californian language Karuk has precisely such a spatial prefix, *-vara* 'in through a tubular space' (Mithun 1999, 142)! The whole set of claims is based on woeful ignorance of the crosslinguistic facts.

Still, however rich the rest of the semantic distinctions, it could be that every language encodes a notion precisely like English *on* and *in*. Not so: many languages fractionate these notions and indeed have much more specific notions, like 'in a hemispherical container' versus 'in a cylindrical container'. Tzeltal makes many such distinctions in spatial predicates (Brown 1994). But perhaps we simply need to qualify the claim: if a language encodes spatial relations in prepositions (or postpositions), then every such language encodes a notion precisely like English *on* or *in*. This is not remotely true either. In current work, Sergio Meira and I have mapped the adpositions (prepositions or postpositions) of a dozen languages of different stocks onto exactly the same set of 70 spatial scenes, each scene depicting a subtype of a topological relation.<sup>1</sup> What emerges quite clearly is that there is no basic agreement on what constitutes an 'in' scene, a spatial relation of containment, or any other basic topological relation. It is simply an empirical matter that spatial categories are almost never the same across languages, even when they are as closely related as English and Dutch.

Finally, we have also surveyed a wide sample of languages for the kinds of coordinate systems or frames of reference they use for describing the location of objects widely separated from a reference object (Levinson, in press). In these situations, some kind of angular specification on the horizontal plane is called for—as in 'The ball is behind the tree'. It turns out that although languages vary greatly in the detailed geometry employed, there are three main families of solutions: an egocentric (or more accurately viewpoint-dependent) *relative* system (as in the 'The ball is left of the tree'), a geocentric *absolute* system (as in 'The ball is north of the tree'), and an object-centered *intrinsic* system (as in 'The ball is at the front of the truck'). These three are all polar

coordinate systems and constitute the best claim for universals in the spatial domain. But there are some important caveats. First, not all languages use all three systems. Rather, they form an inventory from which languages must choose at least one—all combinations are possible, except that a relative system entails an intrinsic system. That means there are languages without words for ‘left’ or ‘right’ directions, but where all spatial directions must be specified in terms of cardinal directions like ‘east’ (so one has to say things like ‘Pass the northern cup’, ‘There’s a fly on your northern leg’, etc.). Second, as mentioned, the local instantiation of any one system may be of a unique kind. Consider for example relative systems, which if fully developed involve a ‘left’, ‘right’, ‘front’, ‘back’ set of distinctions. Now, these distinctions are very variously mapped. They involve a projection of viewer-centered coordinates onto a landmark object, so that, for example, the ball can be said to be behind the tree. In English, this projection involves a reflection of the viewer’s own left-right-front-back coordinates onto (in this case) the tree, so the tree’s *front* is the side facing us, and its *back* is the side away from us, but its *left* and *right* are on the same side as the viewer’s. In Hausa and many other languages, this projection involves translation, so ‘left’ and ‘right’ remain as in English, but ‘front’ and ‘back’ are reversed (‘The ball is behind the tree’ means it is between the viewer and the tree). In some dialects of Tamil, the projection involves rotation, so ‘front’ and ‘back’ are like in English, but ‘left’ and ‘right’ are reversed. And so on and so forth—there is plenty of semantic variation. Although the choices between different frames of reference are limited, they are quite sufficient to induce the very strongest “Whorfian” effects, as described below (and see Levinson 1996; Pederson et al. 1998).

To sum up: the Simple Nativist idea (as voiced by Pinker and Gleitman) that universal concepts are directly mapped onto natural language words and morphemes, so that all a child-learner has to do is find the local name as it were, is simply false. There are vanishingly few universal notions, if any, that every language denotes with a simple expression. Even the renowned case of the color words only substantiates this fact: languages vary substantially in the number of color words they have, and what they actually denote (Kay and McDaniel 1978; Kay, Berlin, and Merrifield 1991). A term glossed as ‘red’ may—according to the



standard theory—actually include brown, yellow, and related hues, and ‘black’ may include blue and green. But some languages have at best only incipient color words (Levinson 2000), and this has required substantial weakening of the standard theory (Kay and Maffi 1999). There is really no excuse for continued existence of the myth of a rich set of lexically packaged semantic universals. Removing that myth opens the way for entertaining seriously a heretical idea.

#### 2.4 The Very Thought: Could the Language We Speak Influence the Way We Think?

There is an ideological overtone to Simple Nativism: the independence of thought from language opens up to us the freedom of will and action (“[S]ince mental life goes on independently of particular languages, concepts of freedom and equality will be thinkable even if they are nameless” Pinker 1994, 82). So Whorfianism and linguistic determinism *have* to be impossible! This moral imperative is beside the point, not only because we are not in the preaching business, but also because, despite some incautious language, no one, not even Whorf, ever held that our thought was in the infernal grip of our language. Whorf’s own idea was that certain grammatical patterns, through making obligatory semantic distinctions, might induce corresponding categories in habitual or non-reflective thought in just the relevant domains (see Lucy 1992b for careful exposition). Now that idea, generalized also to lexical patterns, seems neither anti-American nor necessarily false. More generally still, it seems fairly self-evident that the language one happens to speak affords, or conversely makes less accessible, certain complex concepts. There are languages with no or very few number words, and without a generative system of numerals—it seems unlikely that the speakers of such a language would ever entertain the notion ‘seventy-three’, let alone that of a logarithm, and certainly their fellows would never know if they did. As mentioned, there are languages that only use cardinal direction terms for spatial directions, where one must constantly be able to unerringly locate the center of a quadrant at, say, 15 degrees east of north—speakers of such languages can be shown to have a developed sense of direction of a different order of magnitude from speakers of languages that lack such

constant reference to geocentric coordinates (Levinson, in press). If they didn't have such competence, they couldn't communicate; the language affords, even requires, certain underlying computations (see section 2.5). In this sort of way, languages can differentially impede, facilitate, or require underlying mental operations.

In this section, I want to show that the web of theoretical commitments we already have in the linguistic and psychological sciences seem to converge on the presumption that speaking specific languages does indeed have cognitive consequences for the speakers of those languages.

First, take the simple question "Do we think the same way that we speak?" Making various classical assumptions (e.g., accepting the notion of a *representation*), this question can reasonably be rendered as the more specific "Are the representations we use in serious nonlinguistic thinking and reasoning the very same representations that underlie linguistic meanings?" The answer, I have shown (Levinson 1997a), has to be no. The reasons are various, but conclusive: semantic representations have to be decoupled from conceptual representations to allow for various properties of linguistic meaning like deixis, anaphora, very limited lexica, linearization, and so on, which are clearly not properties of conceptual representations. Besides, there are many different kinds of conceptual representation, from the imagistic to the propositional. But there are also quite persuasive arguments to the effect that though linguistic and nonlinguistic representations are distinct, there must be at least one level of conceptual representation that is closely aligned to a semantic level; otherwise, we couldn't transform the one into the other with the facility we have, as shown by the speed of language encoding and comprehension. Further, any semantic distinctions must be supported by the underlying conceptual distinctions and processes that are necessary to compute them (if you have a lexical concept 'seven'—and not all languages do—you had better be able to count to 7 if you are going to use it correctly). So, overall, that level of conceptual representation is close to, but not identical to, a level of semantic representation.

Our next simple question is, "Do all humans think alike?" Given that there are multiple representation systems (for vision, touch, smell, etc.), many of them specialized to the sensory modalities, and given that many human sensory experiences are basically similar (given the world we all

inhabit), there is no doubt that there is a broad base of “psychic unity” in the species. But we are interested in the more abstract representations in which we think and reason, which are closest to language. We can transform the basic question then into the more specific “Is the conceptual representation system closest to semantic representation universal in character?” The answer to that question is—perhaps surprisingly—almost certainly no. The answer can be derived from both first principles and empirical investigation. Here I concentrate on the reasoning from first principles, postponing the empirical arguments to the following section.

Why must the conceptual representations closest to semantic representations be nonuniversal? Because languages vary in their semantic structure, as we saw in section 2.3. Simply put, the fact is that there are few if any lexical concepts that universally occur in all the languages of the world; not all languages have a word (or other expression) for ‘red’ or ‘father’ or ‘in’ or ‘come’ or even ‘if’. Now the consequences of that basic fact are easily enough appreciated. Let us pursue a *reductio*. We have established that semantic representations map fairly directly, but not exactly, onto the closest level of conceptual representation (CR). Assume now that CR is universal. Then, allowing for some slippage, semantic representations (SR) must be roughly universal too. But they are not. Therefore, we must abandon the assumption that CR is universal.

Approaching the problem from the other direction, we know that languages code different concepts at the lexical level. Now assume—as Fodor and many psychologists do—that corresponding to a lexical item is a single holistic concept (Fodor, Fodor, and Garrett 1975). Further assume, as they do, that SR and CR are coextensive. Then, since we think in CR, users of different languages think differently. So, it follows that “nondecompositionists” (i.e., those who do not think that lexical concepts decompose into subconcepts) are implicit Whorfians—a fact that they do not seem to have appreciated.<sup>2</sup>

Linguists tend to be decompositionists—they tend to think that lexical concepts are complex, composed out of atomic concepts. Naturally, they are not always so naive about semantic variation as the psychologists. But they think they can escape the immediate Whorfian consequence: languages encode different concepts at the lexical level, but

they “compose” those semantical concepts from a universal inventory of atomic concepts. Even assuming that SR and CR are closely related, as seems to be the case, it no longer seems to follow that different languages require different conceptual relations, or that speaking a language would induce different ways of thinking: both SR and CR could be universal at the level of conceptual primes or primitives. So we can cook our varied semantic cakes out of the same old universal flour and sugar.

Though I am sympathetic with the decompositional move, it is hardly the intellectual triumph that it may seem. Suppose I hypothesize a universal inventory of 20 or 100 primes, and now I come across a language that has words that won’t decompose into those primes. What will I do? Add to the universal inventory the features we need for that language, of course. So what makes them universal? At least one language uses them! How would you falsify such a theory? There isn’t any way to falsify a theory of universals that consists in an augmentable list of features that any one language may freely select from. It’s the weakest possible kind of theory—it would need to be supplemented with a theory that tells us why *just those features* and no others are in the inventory, and we are in no position to do that because we have as yet no idea of the real extent of semantic variation.

But there’s another problem with decomposition. Psycholinguistic evidence shows that when words are activated, the concept as a whole is activated, not little bits of it. And the psychologists have compelling evidence that we don’t think at that atomic level—we think at the macro-level of conceptual wholes, the level reflected in lexical concepts. The reasons for this lie partly in properties of short-term memory, the major bottleneck in our computing system. For short-term memory is limited to, say, five chunks at a time, while not caring a jot about how complex the underlying chunks are—or, put another way, what they can be decomposed into (Miller 1956; Cowan 2001). We don’t have to think about a *hundred* as ‘ten tens’ when doing mental arithmetic, or *aunt* as ‘mother’s sister, or father’s sister, or father’s brother’s wife, or mother’s brother’s wife’ when greeting Aunt Mathilda. Composing complex concepts gives enormous power to our mental computations, and most of those complex concepts are inherited from the language we happen to speak. So the linguists are wrong to think that lexical decomposition

will let them off the Whorfian hook. Sure, it allows them to hold a remoter level of universal concepts, and it might help to explain how we can learn complex cultural concepts, but the conceptual level closest to the semantic representations, and the level in which we compute, seems likely to be heavily culture specific.

So, given the facts of semantic variation, and what we know about mental computation, it is hard to escape the conclusion that, yes, the ways we speak—the kinds of concepts lexically or grammatically encoded in a specific language—are bound to have an effect on the ways we think. And this conclusion is going to be general over all the different kinds of theory scholars are likely to espouse: noncompositional or compositional representational theories, and equally of course connectionist theories, where activation patterns are a direct reflection of input patterns.

## 2.5 The Issues in the Light of Empirical Evidence

So now at last we might be prepared to accept the idea that it is worth empirically investigating the kinds of influence a specific language might have on our mental coding of scenes and events, our nonlinguistic memory and inference. In fact, there is already a quite impressive body of evidence that demonstrates significant effects here. I will review a few examples, concentrating on our own work.

Curiously enough, the color work in the tradition of Berlin and Kay (1969), which has been taken to indicate simple universals of lexical coding, has also yielded evidence for the impact of linguistic categories on memory and perceptual discriminations. As noted above, the lexical universals are of a conditional sort; for example, if a language has just three color words, one will cover the “cool” range (black, green, blue), another the “warm” range (red, yellow, orange), and another the “bright” range (white, pink, pale blue, etc.) (see Kay and McDaniel 1978). So it is easy to find languages that differ in their color coding. Lenneberg and Roberts (1956) had earlier shown that having specific terms for, say, ‘yellow’ versus ‘orange’, helped English speakers memorize colors, compared to Zuni speakers who have no such lexical discrimination. Lucy (1981) showed similar effects for Yucatec versus Spanish versus English

speakers, and Davidoff, Davies, and Roberson (1999) did the same for English versus Berinmo. Kay and Kempton (1984) explored the effects of linguistic coding on perceptual discriminability and found that if a language like English discriminates 'blue' and 'green', while another like Tarahumara does not, English speakers but not Tarahumara speakers will exaggerate the perceptual differences on the boundary. This suggests that our visual perception may be biased by linguistic categorization just as our auditory perception clearly is by the specific phonemes in a language (which is why of course late second language learners have difficulty perceiving and producing the alien speech sounds).

Turning to our own work, in a large-scale long-term collaborative enterprise involving two score researchers, we have researched linguistic differences in the spatial domain. Our goals have been first, to understand the linguistic differences here, and second, to then explore the relation of those linguistic differences to nonlinguistic cognition. I have already outlined above some of the quite surprising linguistic differences to be found across languages; in general, it is hard to find any pair of spatial descriptors with the same denotation across languages (see, e.g., Levinson and Wilkins, *in press*). In the subdomain of frames of reference, we have pursued the nonlinguistic correlates in detail. The following is a synopsis of much detailed work (see Levinson 1996, 1997b, *in press*; Pederson et al. 1998; and references therein).

As mentioned above, languages make different use of the three basic frames of reference. Some languages, like English or other European languages, employ the relative frame of reference (involving left/right/front/back terms projected from a viewpoint) along with the intrinsic (involving properties of the landmark or reference object, e.g., its intrinsic top, back, sides, etc.). Other languages, like Tzeltal or Arrernte, use no relative frame of reference, but instead supplement an intrinsic system with an absolute one—that is, a cardinal-direction type system. In languages like these, speakers can't say 'Pass me the cup to your left', or 'Take the first right', or 'He's hiding behind the tree'—the relevant spatial expressions simply don't exist. Instead, they have to say 'Pass me the cup to the west', or 'Take the first turn to the south', or 'He's hiding east of the tree', as appropriate. Such cardinal-direction systems are actually quite diverse (e.g., they may have arbitrary directions unrelated to the

earth's poles) and are always different from the English speaker's use of map coordinates (e.g., in the English system there is no linguistic convention about how many degrees on either side of grid-north still constitutes 'north', and English speakers only use this system on a geographic scale).

We made the following predictions. First, speakers of languages with absolute coordinates should have a better sense of direction than speakers of relative languages: they not only have to know where, say, 'south' is at any one moment (otherwise they couldn't speak the language), but they also need to know, for example, that place B is south of A, because they may have a verb 'go-south' properly used for any motion from A to B. We transported people from three absolute communities to novel locations and got them to point to a range of other locations at varying distances. They can do this with remarkable accuracy, but speakers of relative languages cannot (Levinson, in press). We have also examined unreflective gesture while speaking: for absolute speakers, gestures to places are geographically accurate; for relative speakers, are not. Second, we supposed that speakers of absolute languages would have to maintain internal representations of space in terms of fixed bearings, rather than egocentric coordinates. That is because if memories were coded in egocentric coordinates, there would be no way to describe them in the relevant language: there is no translation algorithm from egocentric coordinates to geocentric ones, or vice versa (you can't get from the description 'The knife was north of the fork' to the description 'The knife was left of the fork', or vice versa). Since one might want to talk about any observed situation, it had better be memorized in coordinates appropriate to the language. To test this, we invented a rotation paradigm, with which it is possible to distinguish nonlinguistic mental coding in any of the frames of reference. For example, subjects see an arrow on a table pointing to their left, or south. They are now rotated 180 degrees and are asked to place the arrow on another table so it is just as before. If they point it to their left, they thought about it in terms of egocentric coordinates; if to their right (i.e., south), in geocentric coordinates. This paradigm allows examination of different psychological capacities, and we designed a battery of tests exploring recognition memory, recall, and inference of different kinds, all conducted under rotation. The tasks were

carried out in four relative and six absolute language communities. The results are quite startling: overwhelmingly, subjects follow the coding pattern in their language when performing these entirely nonlinguistic tasks (Levinson 1996, in press).

We find these results to be convincing evidence that linguistic coding is both a facilitator of a specific cognitive style and a bottleneck, constraining mental representations in line with the output modality. It seems that preferred frames of reference in language deeply affect our mental life. They affect the kind of mental coding of spatial relations in memory, and the way in which we reason about space, since the different frames of reference have different logical properties (see Levinson 1996). They affect the kinds of mental maps we maintain (as shown by the navigation experiments mentioned above), even the kind of mental imagery we use when we gesture. These are anything but superficial correlates of a mode of linguistic coding.

In a recent paper, Li and Gleitman (2002) try to resist these conclusions and reassert a Simple Nativist perspective. They carried out one simplified version of one of our tasks with an American student population and claimed that they could induce absolute or relative coding by manipulating the conditions of the task. First, the task yielded a relative result indoors, but a mixed relative/absolute result outdoors. Second, by placing salient landmarks or spatial cues at alternate ends of the stimulus and response tables, subjects could be made to construct the response in line with the landmark cue. Li and Gleitman conclude that we all think equally in relative or absolute frames of reference; it just depends on the conditions under which one coding system or another becomes more appropriate. Unfortunately, their results are either not replicable (the outdoors condition) or betray a misunderstanding of the nature of the three frames of reference (the landmark cues condition). When they used salient spatial cues on the stimulus and response tables, what they were actually doing was invoking a response in the intrinsic frame of reference, not the absolute one. We showed this by reproducing their experiment and introducing a new condition: subjects were now rotated 90 degrees instead of 180 degrees (Levinson et al. 2002). If you see a row of animals headed leftward, or south, on table 1 toward a jug, and are then rotated to face table 2 at 90 degrees, and are asked to place the animals just as they were (with an emphasis on remembering which animals were



in which order), a response that preserves them heading left or heading south or heading toward the jug can easily be distinguished. English- or Dutch-speaking subjects will place the animals so they are heading either left (relative) or toward the jug (intrinsic), not south (absolute). That's because English and Dutch offer both the relative and intrinsic frames of reference—although the relative is dominant, as can be shown by increasing the memory load (e.g., by adding to the number of animals), whereupon the relative is selected over the intrinsic. In short, pace Li and Gleitman, the evidence remains that the frames of reference used in people's language match those used in their nonlinguistic cognition.

There are many other results that support the idea that linguistic coding has an effect on nonlinguistic cognition. Special mention should be made of the work of John Lucy (1992a; see also Lucy and Gaskins, this volume), which demonstrates that the original ideas of Whorf can be verified—namely, the idea that grammatical patterning with semantic correlates may have an especially powerful effect on implicit categorization. English has obligatory number marking (singular vs. plural) on countable nominals, while Yucatec has only optional number marking, mostly only on animates. Following the hypothesis that this insistent number marking in English might have nonlinguistic effects, Lucy showed that English speakers are better at remembering number in nonlinguistic stimuli. In work with Suzanne Gaskins, he has gone on to show that this lack of number marking in Yucatec is associated with nominals whose semantics are unspecified for quantificational unit (Lucy and Gaskins 2001). They tend to denote not bounded units, but essence or “stuff”; thus, the term used for ‘banana’ actually denotes any entity made of banana-essence (e.g., the tree or the leaf or the fruit). On sorting tasks, Yucatec speakers behave differently than English speakers: English speakers tend to sort by shape or function, Yucatec speakers by the material out of which things are made. The suggestion is that the pattern in the grammar has far-reaching correlations with implicit mental categories.

## 2.6 Conclusion

Where are we? I have tried to establish that (1) languages vary in their semantics just as they do in their form, (2) semantic differences are

bound to engender cognitive differences, (3) these cognitive correlates of semantic differences can be empirically found on a widespread basis. As a consequence, the semantic version of Simple Nativism ought to be as dead as a dodo. But it isn't.

Why not? One reason is that its proponents think they have an argument that it *just has to be right*, so no negative evidence will be seriously entertained! The argument of course is a learnability argument. Consider what the poor child has to do: find the meaning corresponding to some acoustic signal—the child must segment the signal, find the word forms, and then hypothesize the meanings. Suppose, as Fodor, Pinker, and Gleitman hold, that the child is already provided with the relevant conceptual bundles; then all she has to do is map strings of phonemes to ready-made conceptual bundles. This is already difficult, since there are lots of those bundles. Now, suppose the picture was radically different, and the child had to construct the bundles—not a chance! Even worse, suppose that the child has not only to construct the possible meanings for words, but even to figure out how the adults *think*, since they think differently in different cultures. Now the child first has to learn the local cognitive style, and then construct the relevant meanings in line with the cognitive style, before finally being in a position to map the acoustics onto the meanings. The picture is hopeless—Simple Nativism just has to be right!

We can disarm this argument (but see Levinson 2001 for the full counterargument). First, the Fodorean picture doesn't really help. If languages only label antecedently existing concepts, the set of those concepts must include every possible concept lexicalizable in every possible language—a billion or more to be sure. So how will knowing that the needle is already in the haystack help the child find the one correct concept to match to a particular acoustic wave? Second, the picture of the child thumbing through her innate lexicon to find the right antecedently existing concept is surely absurd in the first place; once the lexicon gets to any size at all, it will be much easier to construct the concept than to find it. What the child is going to do is try and figure out what those peculiar adults or elder siblings are really preoccupied with. She will use every clue provided to her, and there are plenty. And some of the most valuable clues will be provided in many different ways by the fact that the adults *think* in a way tightly consistent with the semantics of the

language they speak. For example, suppose the adults speak a language where the relative frame of reference predominates. Every aspect of the environment will reflect that fact—the way doors or books open, the arrangement of things (knife always to the right of the fork, socks in the left drawer), the nature of gesture (pointing to the side the referent was on when they were looking at it, not where it actually is from here now), the preferred side of the sidewalk they choose to walk on. In contrast, suppose the adults speak a language where the absolute frame of reference predominates: Now they won't care about preserving ego-centric constancies; they will only care that one sleeps with one's head always to the north, builds windbreaks to the east, and, when pointing, points in the veridical direction. A thousand little details of the built environment and, more importantly, the conduct of interaction (see Tomasello, this volume) will inform the discerning toddler again and again till she gets the message. It is just *because* we think in line with how we speak, that the clues are not all in the language but are distributed throughout the context of language learning. This new picture doesn't banish the puzzles of how children perform the incredible feat of learning a language, but one thing is certain: it doesn't make it any *more* of an impossible feat than it was on the old picture given to us by the Simple Nativists.

So the overall message is that Simple Nativism has outlived its utility; it blocks a proper understanding of the biological roots of language, it introduces incoherence into our theory, it blinds us to the reality of linguistic variation and discourages interesting research on the language-cognition interface. As far as its semantic tenets go, it is simply false—semantic variation across languages is rich in every detail. We don't map words onto antecedently existing concepts, we build them according to need. That's why cognitive development in children exists, and why the history of science shows progress. The reason we have a developed vocabulary (instead of the limited repertoire of other animals) is that we have found it helps us to *think*. How it does that is explained by that foundational cornerstone of cognitive psychology, Miller's (1956) theory of recoding as a method of increasing computational power by getting around the bottleneck of short-term memory (see Cowan 2001 for an update). Linguistically motivated concepts are food for thought.

## Notes

1. The scenes were devised by Melissa Bowerman, with additions by Eric Pederson, and are available as the stimulus set Topological Relations Picture Series of the Max Planck Institute for Psycholinguistics, Nijmegen. For a preliminary report, see the Annual Report 2001, Max Planck Institute for Psycholinguistics (<http://www.mpi.nl>).
2. Fodor himself adopts the only way out of this dilemma, which is to say that every lexical concept in every language that ever has been and ever will be is already sitting there in our heads. So Cro-Magnon man already had the notions 'neutrino' and 'piano', but probably hadn't gotten around to giving them phonetic form!

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