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LINGUISTIC RELATIVITY

John A. Lucy

Committee on Human Development, The University of Chicago, Chicago, Illinois 60637; e-mail: jlucy@ccp.uchicago.edu

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ABSTRACT

The linguistic relativity hypothesis, the proposal that the particular language we speak influences the way we think about reality, forms one part of the broader question of how language influences thought. Despite long-standing historical interest in the hypothesis, there is relatively little empirical research directly addressing it. Existing empirical approaches are classified into three types. 1. Structure-centered approaches begin with language differences and ask about their implications for thought. 2. Domain-centered approaches begin with experienced reality and ask how different languages encode it. 3. Behavior-centered approaches begin with some practical concern and seek an explanation in language. These approaches are compared, and recent methodological improvements highlighted. Despite empirical advances, a theoretical account needs to articulate exactly how languages interpret experiences and how those interpretations influence thought. This will entail integrating theory and data concerning both the general relation of language and thought and the shaping influence of specific discursive structures and practices.

INTRODUCTION

Few ideas generate as much interest and controversy as the linguistic relativity hypothesis, the proposal that the particular language we speak influences the way we think about reality. The reasons are obvious: If valid it would have widespread implications for understanding psychological and cultural life, for the conduct of research itself, and for public policy. Yet through most of this century, interest and controversy have not given rise to sustained programs of

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empirical research in any of the concerned disciplines and, as a result, the validity of the proposal has remained largely in the realm of speculation. This situation has begun to change over the past decade, hence the occasion for this review.

The linguistic relativity proposal forms part of the general question of how language influences thought. Potential influences can be classed into three types or levels (Lucy 1996). The first, or semiotic, level concerns how speaking any natural language at all may influence thinking. The question is whether having a code with a symbolic component (versus one confined to iconic-indexical elements) transforms thinking. If so, we can speak of a semiotic relativity of thought with respect to other species lacking such a code. The second, or structural, level concerns how speaking one or more particular natural languages (e.g. Hopi versus English) may influence thinking. The question is whether quite different morphosyntactic configurations of meaning affect thinking about reality. If so, we can speak of a structural relativity of thought with respect to speakers using a different language. This has been the level traditionally associated with the term linguistic relativity, and this usage will be employed here. The third, or functional, level concerns whether using language in a particular way (e.g. schooled) may influence thinking. The question is whether discursive practices affect thinking either by modulating structural influences or by directly influencing the interpretation of the interactional context. If so, we can speak of a functional relativity of thought with respect to speakers using language differently. This level has been of particular interest during the second half of this century with the increasing interest in discourse-level analyses of language and can, therefore, also be conveniently referred to as discursive relativity.

Although this review concentrates on the second level—whether structural differences among languages influence thinking—it should be stressed that the other two levels are ultimately involved. Any claims about linguistic relativity of the structural sort depend on accepting a loose isofunctionality across speakers in the psychological mechanisms linking language to thinking and across languages in the everyday use of speech to accomplish acts of descriptive reference (Hymes 1966, Lucy 1996). More importantly, an adequate theoretical treatment of the second level necessarily involves engaging substantively with the other two levels (Lucy 1996; Gumperz & Levinson 1996; cf Silverstein 1976, 1979, 1981, 1985, 1993).

A number of recent publications have extensively reviewed the relevant social-science literature on linguistic relativity. Lucy (1992a) examines the historical and conceptual development of empirical research on the relation of language diversity and thought within the fields of linguistic anthropology and comparative psycholinguistics. Hill & Mannheim (1992) survey work on lan-

guage and world view in anthropology, sorting out the main traditions (especially new work centered on interpretation and discourse) and indicating their connections with broader trends in anthropology. Hunt & Agnoli (1991) provide an overview of current concerns from the perspective of cognitive psychology. Finally, Gumperz & Levinson (1996) provide an eclectic overview and sampling of many of the newest directions of inquiry, again with substantial attention to discourse-level issues.

The appearance of abundance given by the long lists of references in these reviews is deceptive. Although the majority of the studies cited have some relevance to evaluating the relation between language and thought, few address the relativity proposal directly or well. In this context, there is little reason to re-inventory all these materials here. Rather, the current review provides a conceptual framework for interpreting current research by clarifying the sources and internal structure of the hypothesis, characterizing the logic of the major empirical approaches, and analyzing the needs of future research.

THE LINGUISTIC RELATIVITY HYPOTHESIS

Historical Development of Interest

Interest in the intellectual significance of the diversity of language categories has deep roots in the European tradition. Formulations recognizably related to our contemporary ones appear in England (Locke), France (Condillac, Diderot), and Germany (Hamman, Herder) during the late seventeenth and early eighteenth centuries (Aarsleff 1982, 1988; Gumperz & Levinson 1996; see also Friedrich 1986 on Vico in Italy). They were stimulated by theoretical concerns (opposition to the tenets of universal grammarians regarding the origin and status of different languages), methodological concerns (the reliability of language-based knowledge in religion and science), and practical social concerns (European efforts to consolidate national identities and cope with colonial expansion). Later, nineteenth-century work, notably that of Humboldt in Germany and Saussure in Switzerland and France, drew heavily on this earlier tradition and set the stage for twentieth-century approaches (Aarsleff 1982, 1988).

This European work was known and criticized by scholars in North America (Aarsleff 1988, Koerner 1992), and the same impulses found historically—the patent relevance of language to human sociality and intellect, the reflexive concern with the role of language in intellectual method, and the practical encounter with diversity—remain important today in motivating attention to the problem. But the linguistic relativity proposal received new impetus and reformulation there in the early twentieth century, particularly in the work of anthropological linguists Edward Sapir (1949a,b, 1964) and Benjamin

L Whorf (1956a,b) (hence the common designation of the linguistic relativity hypothesis as "the Sapir-Whorf hypothesis"). Following Boas (1966), both Sapir and Whorf emphasized direct firsthand explorations of diverse languages and rejected hierarchical, quasi-evolutionary rankings of languages and cultures—in particular the European, especially Humboldtian, obsession with the superior value of inflectional languages for the cultural or mental advancement of a people. Whorf also provided the first empirical work of consequence from a contemporary standpoint.

Surprisingly, there has been an almost complete absence of direct empirical research through most of the present century—perhaps half a dozen studies up to a decade ago (Lucy 1992a). The neglect of empirical work is so conspicuous that it must be regarded as one of the central characteristics of this area of research and warrants brief comment. One source of the neglect surely lies in the interdisciplinary nature of the problem itself which is compounded by increasing disciplinary specialization. But other, broader concerns play a role in discouraging research. Some worry that accepting linguistic relativism would effectively undermine the conduct of most of the social sciences (but see Lucy 1993a). Others fear that accepting linguistic relativism opens the door to ethical relativism (but see Fishman 1982; Lakoff 1987, p. 337). Others equate linguistic relativity with absolute linguistic determinism and dislike the implied limits to individual freedom of thought (but see Gumperz & Levinson 1996, p. 22). Anyone working on the relativity problem must be prepared to face these complicated issues and the passions and prejudices they arouse. In sum, despite long and well motivated interest in the issue, concrete research and even practical approaches to research remain remarkably undeveloped.

Formal Structure of the Hypothesis

There are a variety of specific linguistic relativity proposals, but all share three key elements linked in two relations. They all claim that certain properties of a given *language* have consequences for patterns of *thought* about *reality.* The properties of language at issue are usually morphosyntactic (but may be phonological or pragmatic) and are taken to vary in important respects. The pattern of *thought* may have to do with immediate perception and attention, with personal and social-cultural systems of classification, inference, and memory, or with aesthetic judgment and creativity. The reality may be the world of everyday experience, of specialized contexts, or of ideational tradition. These three key elements are linked by two relations: Language embodies *an interpretation* of reality and language can *influence* thought about that reality. The interpretation arises from the selection of substantive aspects of experience and their formal arrangement in the verbal code. Such selection and arrangement is, of course, necessary for language, so the crucial emphasis here is that each

language involves a particular interpretation, not a common, universal one. An influence on thought ensues when the particular language interpretation guides or supports cognitive activity and hence the beliefs and behaviors dependent on it. Accounts vary in the specificity of the proposed mechanism of influence and in the degree of power attributed to it—the strongest version being a strict linguistic determinism (based, ultimately, on the identity of language and thought). A proposal of linguistic relativity thus claims that diverse interpretations of reality embodied in languages yield demonstrable influences on thought. [Hill & Mannheim (1992, pp. 383–87) discuss and endorse various criticisms of treating the relativity issue as a "hypothesis" about three discrete, identifiable, and orthogonal "variables." But if there is any interesting claim here, it is about discoverable relations between distinguishable phenomena. They implicitly acknowledge this by adopting a formulation that fits the model given here (cf Levinson 1996, p. 196).]

Such a full linguistic relativity proposal should be distinguished from several partial or more encompassing formulations that are widely prevalent. First, linguistic relativity is not the same as linguistic diversity. Without the relation to thought more generally (i.e. beyond that necessary for the act of speaking itself), it is merely linguistic diversity. Second, linguistic relativity is not the same as any influence of language on thought. Without the relation to differences among languages, we just have a common psychological mechanism shared by all (an effect at the semiotic level). Third, linguistic relativity is not the same as cultural relativity, which encompasses the full range of patterned, historically transmitted differences among communities. Linguistic relativity proposals emphasize a distinctive role for language structure in interpreting experience and influencing thought. Although such a relativity may contribute to a broader cultural relativity, it may also crosscut it. Sometimes the various elements can be technically present in a formulation but inappropriately filled. One can take as representative of language some aspect so bleached of meaning value (e.g. prefixing versus postfixing) that no interesting semantic differences suggest themselves. Or one can confound the elements by using verbal responses to assess thought or verbal stimulus materials to represent reality. Thus, in evaluating research, it is important to ask whether the various components of the hypothesis have all been represented and appropriately filled. Most existing research fails in this regard and therefore cannot address the hypothesis directly and decisively.

APPROACHES TO EMPIRICAL RESEARCH

Among the studies meeting the above criteria, there have been three approaches to research depending on which among the three key elements at is-

sue (language, reality, thought) serves as the central orientation or point of departure for the investigation: *structure-centered, domain-centered,* and *behavior-centered.* With enough thought and labor, any of these approaches is capable of leading to a useful body of work on the hypothesis, but each also is susceptible to characteristic difficulties and derailments. The following sections characterize each approach and provide key examples that illustrate their strengths and weaknesses.

Structure-Centered Approaches

GENERAL APPROACH A structure-centered approach begins with an observed difference between languages in their structure of meaning. The analysis characterizes the structure of meaning and elaborates the interpretations of reality implicit in them. Then evidence for the influence of these interpretations on thought is sought in speakers' behavior. The strength of the approach lies in its interpretive validity: It makes minimal assumptions beforehand about possible meanings in language and to that extent remains open to new and unexpected interpretations of reality. In a sense, this approach "listens" closely to what the language forms volunteer, pursuing various structured, crosscutting patterns of meaning and attempting to make sense of how the world must appear to someone using such categories; ideally it makes possible the characterization of the distinctive way a language interprets the world. The search for language influences likewise tends to be interpretive, searching for widespread, habitual patterns of thought and behavior—although this is not essential to the approach.

Structure-centered approaches are susceptible to several characteristic weaknesses. It is difficult to establish terms of comparison because one of the aims is to avoid taking any language or its construal of reality as a privileged frame of reference. This often leaves the proper characterization of the language pattern and of the reality at issue very underdetermined. Second, the complexity and specificity of the linguistic analysis can make comparison beyond the initial languages difficult. One practical remedy to these problems is to adopt a typological approach from the outset in characterizing the language structures and to focus particularly on referential structures where the recurrent meaning values can be more readily operationalized. In demonstrating an influence on thought, studies adopting this approach also often have difficulty providing rigorous demonstrations of significant effects, not because it is not possible but because the whole approach favors a more ethnographically rich and fluid interpretive approach.

TEMPORAL MARKING The classic example of a language-centered approach is Whorf's pioneering work comparing Hopi and English in the 1930s (1956a;

Lucy 1985, 1992a; Lee 1991, 1996; see also Schultz 1990). Whorf argued that speakers of English treat cyclic experiences of various sorts (e.g. the passage of a day or a year) in the same grammatical frame used for ordinary object nouns. Thus, English speakers treat these cycles as object-like, as though they can be measured and counted just like tangible objects that have a form and a substance. English speakers are led by this pattern to seek the substance associated with a day, a year, and so forth, and our global, abstract notion of 'time' as a continuous, homogeneous, formless something arises to fill in the blank in this linguistic analogy. By contrast, Hopi speakers do not treat these cycles as objects but as recurrent events. Thus, although they have, as Whorf acknowledged, words for what we would recognize as temporal cycles (e.g. days, years), their formal structuration in the grammar does not give rise to the abstract notion of 'time' that we have. In Whorf's view, grouping referents and concepts as analogically "the same" for the purposes of speech leads speakers to group those referents and concepts as "the same" for thought generally as evidenced by related cultural patterns of habitual belief and behavior.

Whorf's work illustrates the characteristic analytic complexity and specificity of the linguistic analysis in a structure-centered approach. It also shows the typical tendencies to deal in an ad hoc way with providing a neutral description of reality (Whorf 1956a, pp. 141–43) and the somewhat anecdotal ethnographic evidence for linguistic influences on thought (Whorf 1956a, pp. 147–59). Despite this, his effort is exemplary in addressing all the key elements of the hypothesis.

NUMBER MARKING The most extensive recent effort to extend and improve a structure-centered approach is my comparative study of the relation between grammatical number marking and cognition among speakers of American English and Yucatec Maya (Lucy 1992b). The study develops the linguistic analysis within a broad typological framework and provides systematic comparative assessments of individual cognition (following Carroll & Casagrande 1958).

English and Yucatec differ in their number marking patterns. First, English speakers *obligatorily* signal plural for a large number of lexical nouns, whereas Yucatec speakers *optionally* signal plural for a comparatively small number of lexical nouns. These patterns fit easily into a typological pattern visible across many languages. In nonverbal experimental tasks involving remembering and sorting, American and Yucatec speakers were sensitive to the number of various types of objects in accordance with the patterns in their grammar. Second, whereas English numerals often directly modify their associated nouns (e.g. *one candle*), Yucatec numerals must always be accompa-

nied by a form referred to as a *numeral classifier* which provides essential information needed to count the referent [e.g. *un-tz'iit kib* 'one **long thin** wax (i.e. one candle)']. The classifiers reflect the fact that all lexical nouns in Yucatec are semantically unspecified as to essential unit. (Where our pattern is like the Maya, we use the functional equivalent of a classifier ourselves: *a cube of sugar.*) Numeral classifiers occur in a wide variety of languages throughout world, perhaps most notably in the languages of Asia—Chinese, Japanese, Thai, etc. In nonverbal experimental tasks involving classifying triads of objects that should contrast maximally in the two lexical systems, English speakers showed a corresponding preference for shape-based classifications whereas Yucatec speakers showed a corresponding preference for material-based classifications—results in line with the expectations based on the lexical structures of the two languages. In more recent research these cognitive findings have been replicated with a wider array of informants and materials, their development in childhood traced, and similar patterns found in other classifier languages (Lucy & Gaskins 1997).

This research remedies some of the traditional difficulties of structure-centered approaches by framing the linguistic analysis typologically so as to enhance comparison and by supplementing ethnographic observation with a rigorous assessment of individual thought. This then makes possible the realization of the benefits of the structure-centered approach: placing the languages at issue on an equal footing, exploring semantically significant lexical and grammatical patterns, and developing connections to related semantic patterns in the languages.

Domain-Centered Approaches

GENERAL APPROACH A domain-centered approach begins with a certain domain of experienced reality and asks how various languages encode or construe it. Usually the analysis attempts to characterize the domain independently of language(s) and then determine how each language selects from and organizes the domain. Typically, speakers of different languages are asked to refer to "the same" materials or situations so that the different linguistic construals become clear. In a sense, this approach "asks" of each language how it would handle a given referential problem so as to reveal the distinctiveness of its functioning; ideally it makes clear the various elaborations and gaps characteristic of each language's coding of a common reality. The strength of the approach lies in its precision and control: It facilitates rapid, sure comparison among a large set of languages. The search for language influences on thought likewise tends to be focused and highly controlled, searching for detailed cog-

nitive effects in experimental tasks—though this is not essential to the approach.

Domain-centered approaches are susceptible to several characteristic weaknesses. First, there is strong pressure to focus on domains that can be easily defined rather than on what languages typically encode. This can result in a rigorous comparison of a domain of marginal semantic relevance (e.g. a few select lexical items). Second, the high degree of domain focus, especially in elicitation procedures, tends to give a very narrow and distorted view of a language's semantic approach to a situation. Analysts typically concentrate only on those aspects of meaning that seem relevant to the domain, including or discarding elements of meaning that various languages bring to bear by applying criteria arising from the analysts' own semantic or cultural understandings of the domain. Thus the key question for any domain-centered approach is how the domain has been delineated in the first place and what the warrant is for including or excluding particular forms and meanings. Once again, a typological perspective can help establish what domains make sense to compare and what elements of meaning are routinely intercalated with them. Third, this approach tends to create bogus structures. Components of a language that lack structural unity or significance but that happen to be deployed together functionally in referring to the domain are treated as unified properties of the language. Apparent unity is often an artifact of the elicitation process. The remedy is to demonstrate structural coherence on language-internal grounds. Finally, in seeking influences on thought, studies adopting this approach often have difficulty establishing the significance of purported effects, because the approach emphasizes what it is possible to say, not what is structurally salient or habitually said.

COLOR CATEGORIES The classic example of a domain-centered approach was developed in a series of studies of the lexical codability of colors by Eric Lenneberg and his colleagues (Brown & Lenneberg 1954, Lenneberg 1953, Lenneberg & Roberts 1956, Lucy 1992a). They showed that some colors were more codable than others in English (and later Zuni) and that the more codable colors were recognized and remembered more readily in nonlinguistic tasks. This approach to color was later continued in the well-known work on universals of basic color terms by anthropologists Brent Berlin, Paul Kay, and their collaborators (Berlin & Kay 1969, Kay & McDaniel 1978). They argued that there are cross-linguistic regularities in the encoding of color such that a small number of "basic" color terms emerge in a fairly constrained way in many languages and that these patterns stem ultimately from biological sources. This research has been widely accepted as evidence against the linguistic relativity hypothesis. In fact, the basic color term thesis deals with constraints on lin-

guistic diversity. Addressing linguistic relativity would require assessing the impact of differences in color term systems on cognition. Despite some initial evidence that differences in color term systems do not yield differences in color cognition (Heider 1972), restudies correcting methodological flaws in this work have instead found significant language effects on memory (Lucy & Shweder 1979, 1988). Other studies reveal effects on perceptual categorization as a function of color category boundaries (Kay & Kempton 1984).

The basic color term thesis itself has come under strong criticism from the outset for having weak descriptive linguistics, a flawed elicitation methodology, and an untenable biological argument (see references in Lucy 1997, Saunders 1992, Saunders & van Brakel 1997, van Brakel 1994). Recent research has concentrated on extending and improving the cross-linguistic comparison, refining the typology, and strengthening the biological argument (Hardin & Maffi 1997; Kay et al 1991, 1997; MacLaury 1992, 1997). But little has been done to improve the quality of linguistic description.

This research reflects the typical weaknesses of domain-centered approaches: choosing a domain more for its ease of study than for its linguistic significance, being unreflective about the appropriateness of the domain for other languages, ignoring routine usage in favor of performance in a controlled task, and creating the appearance of examining a linguistic structure when none has been demonstrated on internal grounds. Because of these limitations, the studies essentially end up showing the distribution of the world's languages relative to a fixed set of parameters drawn from the Western European scientific tradition. Any gains in comparability are purchased by virtually eliminating the possibility of detecting genuine or interesting linguistic variability. Language becomes a dependent variable, a device for coding or mapping a pregiven reality, rather than a substantive contributor to its interpretation or constitution.

SPATIAL ORIENTATION The most successful effort at a domain-centered approach has been undertaken by a research team under the direction of Stephen Levinson at the Max Planck Institute for Psycholinguistics that has been exploring the domain of space. The larger agenda of the project has been to critique the excessive reliance on English and other European languages in the field of cognitive science. Space was chosen as a domain because it has been widely regarded as invariant within philosophical, psychological, and linguistic circles and yet appeared to exhibit cross-linguistic variation (Haviland 1993, Levinson 1996a; see also Brown & Levinson 1993b, Levinson & Brown 1994). For example, speakers of modern European languages tend to favor the use of body coordinates to describe arrangements of objects (e.g. *the man is to the left of the tree*). For similar situations, speakers of other languages such as

Guugu Yiimithirr (Australian) and Tzeltal (Mayan) favor systems anchored as cardinal direction terms or topographic features respectively (e.g. *the man is to the east/uphill of the tree*).

There are, of course, other ways to refer to space both in these languages and in others, so the first task of the group was to describe the range of linguistic variation—which has turned out to be considerable (Danziger 1997, Levinson 1996a, Pederson et al 1997). The project included a dozen different languages, and for each, a linguist familiar with the language worked with informants on half a dozen elicitation tasks designed to probe spatial reference (de León 1991, Levinson 1992, Senft 1994) to compare "the meaning patterns that consistently emerge from domain-directed interactive discourse" (Pederson et al 1997, p. 9).

The second task of the project was to see whether variation in linguistic use corresponded to variation in cognition. To do this the group has exploited the sensitivity of the various spatial reference systems to rotation. If something is to the left and I turn around, it is now to the right, but if I conceive of it as to the east, then turn around, it remains to the east. Using many nonlinguistic tasks sensitive to this rotation, they find that speakers of different languages respond in ways congruent with their verbal practices (Brown & Levinson 1993a; Levinson 1992; Pederson 1993, 1995; Pederson et al 1997). Further, speakers of languages preferring extensive use of fixed coordinates show more accurate dead reckoning skills when asked to indicate the direction of familiar locations from an unfamiliar site (Levinson 1996c), suggesting that the results found in the controlled contexts may have everyday correlates.

This research has attempted to gain the advantages of precise, extensive comparison characteristic of a domain-centered approach while simultaneously avoiding its chief pitfalls by incorporating extensive linguistic description and typology into the project. Consequently, the project has achieved more serious and thorough linguistic analysis than other domain-centered approaches. The group has also supplemented controlled cognitive experimentation with naturalistic measures.

Behavior-Centered Approaches

GENERAL APPROACH Behavior-centered approaches begin with an encounter with a marked difference in behavior, usually one that is initially inexplicable but which the researcher comes to believe has its roots in a pattern of thought arising from language practices [cf Whorf's (1956a) well-known examples of how patterns of talking contribute to accidental fires]. Ethnographic analyses that appeal heavily to language structure can be considered behavior-centered if they are also comparative (e.g. Martin 1988). Since the research does not

necessarily begin with the intention of addressing the linguistic relativity question, but with a practical problem and the mode of thought giving rise to it, these studies form a heterogeneous lot. The strength of the approach lies in the significance of the behavior, which typically has clear practical consequences either for theory or to native speakers. The behavioral difference requires some explanation; if one rejects the proposed linguistic sources, another must be found.

The characteristic weakness of the approach is its ad hoc and inadequate approach to the language and reality elements, both theoretically and empirically. Some aspect of the language is identified as relevant to the behavior at issue. Although this aspect may be salient to the observer or even to speakers themselves, it need not be either structurally or functionally important in the language. Essentially, this approach "selects" structural features of the language according to a criterion of presumed relevance to a practical behavior at issue. Often no formal analysis of the language is undertaken and no comparison with other languages is attempted. When they are, both follow the same pattern of devoting attention only to elements that seem patently relevant regardless of their broader structural place and significance. Likewise, since the approach is not necessarily geared to referential semantics, the reality element may be absent altogether or receive only cursory treatment. Once again, a typological approach anchored in referential semantics would significantly improve approaches of this sort. Usually these research projects are not primarily interested in exploring the question of linguistic relativity, but rather in accounting for the noteworthy (often "deficient") behavior at issue.

COUNTERFACTUAL REASONING A well-known example of a behavior-centered approach is Alfred Bloom's (1981, 1984) study of the relation between counterfactual markers and speakers' facility with counterfactual or hypothetical reasoning. In the course of doing research on moral reasoning, Bloom noticed that Chinese speakers had difficulty with the counterfactual questions used in such research. In searching for a reason, Bloom came to suspect that the difficulty stemmed from the way counterfactuals were marked in the Chinese language. He then designed several counterfactual reasoning experiments where he presented various controlled stories to English and Chinese speakers (with the Chinese receiving Chinese versions of the English texts) and concluded that systematic marking of counterfactuals (along with other linguistic resources) aided sustaining a theoretical mode of thought. He also discussed the disadvantages of this mode of thought from a Chinese perspective.

However, since Bloom's stimulus materials were not absolutely identical in the two cases, his approach led to a number of ambiguities. Critics (Au 1983, 1984, Liu 1985, Takano 1989; see also Cara & Politzer 1993) raised questions

about the accuracy and fairness of the Chinese translations. There is no way to resolve such disputes except by appeal to what speakers would typically say about a concrete everyday situation; but this can not be tested, since the counterfactual stories by definition did not correspond to any independently observable events. Further, the differences in how much counterfactual discourse the two groups engage in and how they value it seem much more telling than any structural differences. Bloom is actually comparing a discursive register that operates over a variety of structural features and, as such, requires a discursively oriented approach (Lucy 1992a).

This study illustrates the ad hoc quality of the behavior-centered approach: The various linguistic devices have been selected because they seem relevant to the initial behavior, not because they form a coherent or salient structural aspect of the language but because of their common use in a certain discourse mode. Further, there is no anchor to reality outside of the texts. Ultimately, in such an unanchored context, it is difficult to establish that language structure contributes to the observed behavioral differences. Yet despite the ambiguity of Bloom's results, his approach succeeded in bringing together experimental work and broader cultural analysis for the first time on a problem of general interest.

OCCUPATIONAL ACCIDENTS A recent set of studies has explored the relation between language and the incidence of occupational accidents in Finland. Occupational accident rates are substantially lower in Sweden than in Finland and among the Swedish-speaking minority within Finland despite working in the same regions with similar laws and regulations (Salminen & Hiltunen 1993, 1995; Salminen & Johansson 1996). This difference emerges even when controlling for the type, status, or hazard of the occupation or the rate or language of accident report. Researchers have attempted to account for this difference by reference to structural differences between Swedish and Finnish (Johansson & Strømnes 1995, Salminen & Hiltunen 1993).

These language differences were first analyzed by Frode J Strømnes, a Swedish experimental psychologist who became interested in why it was so difficult for him to learn Finnish. He contrasted comparable operators in the two languages and concluded that Swedish prepositions can be represented in terms of a vector geometry in a three-dimensional space whereas Finnish cases can be represented in terms of a topology in a two-dimensional space coupled with a third dimension of time (or duration) (Strømnes 1973, 1974a, 1976). Strømnes supported this analysis with a number of ingenious experiments and observations (Strømnes 1974a,b). What emerges in practical terms is a Swedish emphasis on information about movement in three-dimensional space and a Finnish emphasis on more static, Gestalt relations between borders of fig-

ures. A later study of cinematic style found that Indo-European (Swedish, Norwegian, English) productions formed coherent temporal entities in which action could be followed from beginning to end across scenes, whereas Ural-Altaic (Finnish, Hungarian, Estonian) productions showed more emphasis on static settings with only transitory movement and formed coherent person-centered entities in which scenes were linked by the emotional Gestalts of persons (Johansson & Strømnes 1995, Johansson & Salminen 1996, Strømnes et al 1982).

Based on preliminary observations of factories, the hypothesis was formed that the Finns organize the workplace in a way that favors the individual worker (person) over the temporal organization of the overall production process. Lack of attention to the overall temporal organization of the process leads to frequent disruptions in production, haste, and, ultimately, accidents (Johansson & Salminen 1996, Johansson & Strømnes 1995). At the moment, concrete evidence for this interpretation is lacking, but research on production processes is under way to test the hypothesis.

This work provides an excellent example of a behavior-centered approach that, faced with a practical behavioral difference between groups, seeks to explain it in terms of a known language difference. In comparison with Bloom's work, the linguistic variable is more coherent, the control over other contributing factors much higher, and the outcome behavior can be observed independently of language use. What is less clear, however, is the linkage between language and those behaviors.

Shifting Burdens of Proof

The research reviewed here indicates that the linguistic relativity proposal can be practically and profitably investigated in a number of ways. The linguistic variables range from small sets of lexical items to broad grammatical patterns to functional aggregates of features. The cognitive variables include the functional organization of perception, memory, categorization, and inference both in experimental and everyday settings. Some of these claims may prove ill-founded or subject to later qualification, but cumulatively they suggest that a variety of language patterns may have important influences on various aspects of thought and behavior.

In the aggregate, the studies reviewed here begin to shift the burden of proof for future research. First, they indicate that it is possible to overcome previous difficulties and to investigate the hypothesis empirically. When this is done, there is some support for the hypothesis. It is no longer sufficient to retreat behind claims that there is no favorable evidence at all or that the problem is fundamentally uninvestigable. Second, the requirements of adequate research

now stand much higher. Each approach to research has its characteristic strengths: the structure-centered approach with its emphasis on linguistic form maximizes the validity of the language analysis and therefore holds the greatest potential for finding new interpretations of reality, the domain-centered approach with its emphasis on referential content maximizes the control over linguistic and cognitive comparison by anchoring both in a well-defined reality, and the behavior-centered approach with its emphasis on the everyday use or functioning of cognitive skills and orientations maximizes the real-world generalizability and practical significance of any proposed language and thought linkages. New research will have to continue the pattern of trying to achieve a workable balance among these approaches that includes an adequate representation of language, thought, and reality.

TOWARD A THEORETICAL ACCOUNT

Empirical demonstrations of the types just described move the linguistic relativity hypothesis from the realm of speculation to the realm of concrete investigation, but they are not equivalent to providing a theoretical account. Such an account must specify the conditions and mechanisms leading to relativity effects, that is, give further content to the two key relations of the hypothesis: how languages interpret reality and how languages influence thought. This involves engaging with the semiotic and discursive levels of the language and thought relation with respect to how they enable and shape structural level effects.

Interpretations of Reality

An account of how languages interpret reality constitutes an important aim of all the language sciences despite differences in opinion regarding how variable these interpretations might be (Grace 1987). To provide a general theory of how verbal categories differentially encode reality, they need to be contextualized formally, typologically, and discursively.

Formal contextualization involves assessing how meaning is distributed among the available formal resources in a language and what the implications of those placements are for the overall fashion of speaking. Traditionally the focus has been on differences such as lexical versus grammatical status, obligatoriness versus optionality, and overtness versus covertness of marking (e.g. Fishman 1960, Whorf 1956c). Future research will also have to take into account perspectival categories, such as verbal aspect, that express speaker viewpoint (Berman & Slobin 1994; cf Kay 1996, Lakoff 1987) and indexical categories, such as tense, that depend on context of use for their interpretation

(Haviland 1996, Levinson 1983, Silverstein 1976). An important issue here is whether a category type is especially salient or susceptible to secondary (or ideological) interpretation by speakers (Silverstein 1979, 1981, 1985). All these issues are fundamentally semiotic, and the significance of particular formal placement should be similar across languages.

Typological contextualization involves comparing how the system of meaning in a language compares with other languages. The distinctive quality of a given linguistic system usually only becomes clear within such a framework (Whorf 1956b). Although one might begin with only two levels, a lower, universal one and a higher language-specific one (e.g. Levinson 1997, Wierzbicka 1992), ideally such a typological framework will include a middle level where it provides substantive guidance about major patterns of structural difference across languages (Lucy 1992b).

Discursive contextualization concerns whether some patterns of use such as language standardization or schooling alter the interpretation of structural meanings (e.g. Gumperz 1982, Havránek 1964). The specific issue here is not discursive relativity as such, where the pattern of use itself embodies certain assumptions about reality (Lucy 1996), but rather the ways in which this level shapes structural meaning.

Influences on Thought

A full theory of the relation of language diversity to thought necessarily involves at least three logical components. It must distinguish between language and thought in some principled way. It must elaborate the actual mechanisms or manner of influence. And it must indicate to what extent other contextual factors affect the operation of those mechanisms.

Although almost everyone would agree that language and thought are distinct in some respects, there is no generally accepted set of criteria. Some even treat language and thought as identical at the level of conceptual or semantic representation. This is common, for example, in cognitive linguistics (e.g. Jackendoff 1983, Langacker 1987), although the implications for relativism are side-stepped by a universalist orientation (but see Lakoff 1987). Levinson (1997) provides a useful critique of such conflations of language and thought, as well as the inverse claims for a radical disjunction between the two. In distinguishing them, he places special emphasis on the structured (linear, obligatory) and social (indexical, pragmatic, public) nature of language categories in contrast to those of thought. In indicating their necessary interrelation, he emphasizes the natural processing economy of harmonizing the two. Perhaps the place where the distinction between language and thought is most debated is among those working on language acquisition and socialization, where the

concern is whether language can be learned with general cognitive skills or requires specific linguistic capacities. This research on acquisition has increasingly concerned itself with language variation in recent years (e.g. Bavin 1995, Berman & Slobin 1994, Gelman & Byrnes 1991). Although the research is addressed to how language is learned, and not to linguistic relativity as such, interest in the latter has begun to grow as it becomes clear just what different interpretations of experience children must form to speak properly (Bowerman 1996, Levinson & Bowerman 1997, Ochs 1996). This research should become a major source of insight into how language and thought differ from each other and how they come to interrelate during development.

The mechanisms by which language might influence thought can be analyzed into several component elements that need to be addressed as part of developing a substantive theory. First, what is the point of impact in the linear, real-time process of thinking? Is it just "thinking for speaking" (Slobin 1996b) and otherwise without serious impact on thought? Or does speaking a language set up prior expectations about what will be seen (Whorf 1956b), play a concrete role in thought processes (Vygotsky 1987), or shape how the output of thought is interpreted, stored, or retrieved (e.g. Baddeley 1990)? Second, what is the locus of impact in terms of the functional organization of mind? Are there effects on perception, concept formation and use, logical inference, recall or recognition memory, or decision making (Lucy 1992b, Pederson et al 1997)? Are the effects at the lowest levels of cognition or only at various higher, more complex conceptual and imaginative levels (Gumperz & Levinson 1996, Hunt & Agnoli 1991, Levinson 1996b, 1997, Wierzbicka 1992; cf Friedrich 1986)? Third, what is the mode of impact, the logical dynamic governing effects? Is it analogical suggestion about the contents of experience (Whorf 1956a), a form of inner speech with residual syntagmatic and paradigmatic properties (Vygotsky 1987), heightened saliency for certain options (Brown & Lenneberg 1954), the availability of preset categories with an effect of chunking or codability (Levinson 1997; see also Brown & Lenneberg 1954, Miller 1956, Simon 1986), or perhaps via ideological reflection (Rumsey 1990, Silverstein 1981)? Finally, there is the question of the significance of impact. Are the effects large or small, easy or difficult to shed or circumvent, more or less durable or malleable as a function of verbal fluency?

The inclination of a speaker to involve language categories in thought may be affected by institutionalized discursive practices in a culture. The most obvious cases here arise in schooling (Vygotsky 1987), specialized occupations (e.g. law, science, philosophy, etc) (e.g. Mertz 1994, Havránek 1964, Silverstein 1979), and certain class strata (Bernstein 1971)—but such attitudes may also characterize an entire culture. Two particular approaches have received attention in recent years. One emphasizes the importance of linguistic ideol-

ogy in shaping a community's attitude toward language structure and language practice (Hill 1985; Rumsey 1990; Silverstein 1979, 1985, 1997; Woolard & Schieffelin 1994), and the other stresses the special role of poetic or artistic works (Banfield 1978; Friedrich 1986; Lee 1985, 1993; Slobin 1996a). In both cases, structural elements are given heightened effect via reflexive activities.

CONCLUSION

The range of materials relevant to providing an adequate theoretical account of linguistic relativity is daunting. An account has to deal both with the underlying processes upon which all language and thought relations are necessarily built and with the shaping role of discourse as it is implemented in social institutions and cultural traditions. Broadening the scope of research in this way, however, should not be allowed to obscure the central reality and significance of structural differences in meaning between languages. There has long been a tendency in research on language and thought to ignore or minimize structural differences by seeing them as "mere content" either for general universal psycholinguistic processes or for the implementation of particular local discursive genres and registers. Indeed, most students receiving training in these areas today probably have little if any formal acquaintance with the details of comparative descriptive linguistics. In this context, it is important not only to reach out to other kinds of research to help formulate a theoretical account, but also to keep attending to the core problem itself, that is, the significance of differences in language structures for thought. Research on structural influences is essential both empirically and theoretically for developing a comprehensive view of the relation between language and thought at all the various levels.

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