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BOOK REVIEW

Contemporary Approaches to Concept Development

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In the past several years, developmental researchers have begun to transform the vantage points from which we study concepts and their development. This essay begins with a brief and selective critique of two major psychological theories concerning the structure, representation, and development of concepts (the classical view and the prototype view). This is followed by a discussion of fundamental problems inherent in measuring concepts and other intangible products of the mind. Contemporary approaches to conceptual development and organization are then outlined, with a particular focus on two recently published monographs, *Categorization and Naming in Children: Problems of Induction* (Markman, 1989) and *Concepts, Kinds, and Cognitive Development* (Keil, 1989).

Questions concerning the development of concepts have played a pivotal role throughout the history of psychology and have had important ramifications for our theories of development. For decades, developmental psychology was dominated by the view that children's thought differs profoundly from that of adults in its composition, structure, and mode of operation. Although there are undoubtedly important differences in the particulars of the theories they espoused, Piaget, Bruner, and Vygotsky each proved himself strongly committed to the notion of a 'representational developmental shift' (cf. Kosslyn, 1978). Essentially, this position entails the following tenets: (a) that the form of young children's thought (and therefore the concepts they are capable of constructing) undergoes radical and qualitative changes over the course of development; (b) that the developmentally later forms of representation are more powerful than the earlier forms, which are incapable of supporting abstract, symbolic thought; and (c) that the later, more advanced forms of thought lead inevitably to a conceptual structure that conforms to the classical view, in which concepts are defined logically by necessary and sufficient criteria.

Each of these tenets has been the subject of serious criticism over the last two

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decades. Arguments against the "stage theory" of cognitive development have been eloquently summarized elsewhere (Flavell, 1982; Gelman & Baillargeon, 1983). For the present purposes, however, it is worthwhile to point out that to the extent that the classical view of concepts is challenged, so too is the representational developmental shift proposed by the traditional developmental theorists (see Carey, 1985b, for further discussion).

According to the classical view, concepts are defined logically by a set of elementary features that are singly necessary and jointly sufficient. The definition (or intension of the concept) is meant to distinguish precisely the members from the nonmembers of the concept (or the extension of the concept). Concept formation is thus presumed to be a simple logical process in which the necessary and sufficient features that comprise the definition (and the rules which combine them) are abstracted from the concept members. As a consequence, membership in a classical concept is categorical and all members must, by definition, share all the defining features.

The classical view was favored for many years and generated research activity in several different fields of psychology. Under the classical view, all concepts, however complex, were presumed to be fundamentally similar in structure and, hence, in inductive power. Moreover, concept development was envisioned as a basic cognitive process that could be exercised by members of many different species. Further, its developmental commitments were straightforward. It was assumed that with development, children accrued more and more features and thereby established increasingly precise systems of conceptual organization. In sum, the classical view held great promise both for its precision and for its power.

However, as the evidence accumulated, serious shortcomings emerged as well. First, the search for a suitable set of elementary features and the rules for combining them was not entirely successful. Second, reasonable candidates for features did not seem to be any more elementary than the concepts themselves. Consider, for example, the concept *square,* which may be defined by the following necessary and sufficient features: four-sided, equilateral, closed, and all angles measure 90°. The problem lies in the discovery (or insight) that the features appear to be learned later in development than the concept itself. Therefore, to claim that features are somehow more primitive than the concepts they define is to stand on tenuous grounds.

A further shortcoming of the classical view was more specifically developmental. Most of the laboratory studies of concept formation involved rule-learning, hypothesis-generation, and model testing, tasks on which children performed with meager success. Yet children are exceptionally talented when it comes to acquiring natural concepts. The discrepancy between children's difficulty on classic concept formation task and their facility in learning natural concepts cast doubt on the adequacy of the classical view as an account of early conceptual development and fostered the notion that there must be alternative means by which children establish concepts.

Perhaps most troubling, however, was the realization that the classical view was insufficient in its characterization of adult conceptual representation. While it had accounted reasonably well for artificial concepts used in laboratory tasks, this was not the case for the more natural, everyday concepts, most of which appear to have no identifiable set of necessary and sufficient features.

This fundamental break with the classical view, which had also been revealed in the philosophical literature (cf. Wittgenstein's (1953) discussion of the concept 'game'), was pioneered in the psychological literature by Eleanor Rosch and her colleagues (Rosch & Mervis, 1975; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976). Rosch's now-classic findings revealed robust prototypicality effects in the concepts of adults as well as children. Her program of research lent support to the view that human concepts may be structured more like family resemblances, with fuzzy category boundaries and graded membership, than as definitions.

This argument had powerful implications for developmental theory, for Rosch's description of conceptual organization in the adult was very much like those invoked by developmental theorists to characterize childhood thought. Rosch's prototypes bore a resemblance to modes of thought that developmental theorists had considered to be less sophisticated than 'true' definitional concepts.

The twin insights that (a) the classical view did not adequately describe adult concepts, and (b) the supposed precursors to 'true' (definitional) concepts were neither unique to children nor developmentally and logically inferior to definitional concepts, seriously undermined the classical view, and along with it, the argument for a 'developmental representational shift.' For if most adult concepts are better described by family resemblances than by definitions, there was no need to posit qualitative changes in conceptual development.

The prototype view[1] was advanced largely as an alternative to the classical view and it successfully resolved some of the criticisms raised against it. It retained both the featural aspect of the classical view as well as its commitment to a succinct, abstract form of representation. However, according to the prototype view, a concept is represented by a set of features which are abstracted from concept members on the basis of their probability of occurrence, rather than on the strict criteria of necessity and sufficiency. Because a concept is represented by a central tendency, which is determined by a weighted sum of the features, it has a family resemblance, or prototype structure. Concept development was therefore presumed to be a matter of assessing a new item's similarity to the central tendency.

The prototype view made no claims for a developmental shift in the nature or

[1]The prototype view is the best known of a series of probabilistic models of conceptual representation. There are several different variants of the probabilistic view, all of which are treated thoroughly in Smith and Medin (1981).

structure of the concept, and gained empirical support from research with adults, children (Anglin, 1977; Rosch, 1973; Rosch et al., 1976), and perhaps even infants (Bornstein, 1984; Husaim & Cohen, 1981; Younger & Cohen, 1983). Furthermore, it accommodated several of the criticisms raised against the classical view. For instance, it accounted well for graded membership and unclear or shifting category boundaries.

However, prototype theory also inherited some of the most recalcitrant problems of the classical view, those problems associated with features. To reiterate, we have yet to discover a set of elementary features, to determine the sense in which they are primitive, to understand the mechanisms by which they are acquired, or to derive their rules of combination. Also, it is difficult to determine whether infants actually attend to correlated sets of features (e.g., body shape and neck length) or to a single, salient dimension (e.g., overall size) (Kemler, 1981).

Moreover, while the classical view suffered because it could be applied to so few natural concepts, the prototype view suffers from the opposite problem. It is difficult to find concepts for which subjects do not readily generate prototypes. In fact, subjects will go so far as to assign prototypicality ratings to concepts that are definitional (e.g., *odd number, female*) (Armstrong, Gleitman, & Gleitman, 1983). Thus, the experimental techniques currently available do not allow us to differentiate between those concepts that are definitional and those that are ill-defined. As a consequence, much of the work generated by the prototype view may tell us less about the structure and representation of concepts than had been hoped (see Lakoff, 1987, for a discussion). Instead, this work illustrates the flexibility with which subjects operate in various experimental tasks. The work suggests that infants, children, and adults may perform in similar ways on a variety of concept-learning tasks, but there is certainly no assurance that their performance reveals the structure and representation of the concepts under consideration.

Another problem, common to both the classical and prototype views, concerns the notion of a concept's summary representation. Under both views, the assumption is that the summary representation (be it a definition or a prototype) for a given concept is abstracted from a set of exemplars. However, this argument is circular, for one is left wondering how the child managed to cull the appropriate exemplars in the first place. What keeps the child (or adult) from trying to abstract a summary representation for a 'concept' that includes dogs, sugarbowls, and hailstorms? Without some prior assumptions regarding similarity, how are summary representations generated? One radical response to this question was offered by Fodor and his colleagues (Fodor, Garrett, Walker, & Parkes, 1980). A less drastic explanation is that children may start out with some initial scaffolding, and subsequently develop more complex, theory-laden concepts (e.g., Carey, 1985a; Gentner & Rattermann, in press; Murphy & Medin, 1985; Quine, 1960).

THE PROBLEM OF MEASUREMENT

The preceding review cannot do justice to the depth, precision, and clarity of the various theoretical positions or to the force of their contributions. The rigorous investigations of the past several decades have yielded inventive assessments and original insights. Nonetheless, many fundamental controversies that engaged philosophers, linguists, and psychologists for over 2,000 years remain with us today. This impasse may be an inescapable consequence of the inferential nature of the pursuit. Because concepts and mental representations are intangible products of the human mind, they cannot be measured directly or observed spontaneously. Instead, we must depend upon overt behaviors, such as reaction times, object labelling, classification, or typicality judgments in order to make inferences about covert psychological phenomena. To elicit these overt behaviors, we introduce our subjects to events or problems of one kind or another. Although we have developed increasingly sophisticated methods of elicitation and precise tools of measurement, inferences of this sort pose a serious challenge to modern cognitive scientists, as they did to our predecessors.

This is because one can never be certain whether and how the effects we obtain and the behaviors we observe are related to the ever-intangible underlying cognitive processes and mental representations. Our measurements are like maps; they describe the contours and boundaries of the rich, diverse territory underlying psychological phenomena. The challenge for the psychologist is not to mistake this map for the territory itself.

This challenge, which is not specific to psychology, is sometimes known as the 'measurement problem', and scientists have discussed two distinct senses in which measurement problems may arise. One is essentially a practical matter; the other reflects deeper uncertainties regarding the nature of knowledge.

To illustrate the first sense of the measurement problem, Hofstadter (1985) describes "a feeling we all know: that striving for something can have the effect of reducing that thing's availability."

> A good friend is visiting from far away and before she returns home, you want to capture her infectious smile on film. But she is terribly camera-shy. The instant you bring out your camera, she freezes: spontaneity is lost, and there is no way to record that smile. The act of trying to capture this elusive phenomenon completely destroys the phenomenon. (p. 455)

In this example, there is indeed a phenomenon to be captured (the smile); the problem is that the observer (the photographer) interferes with the phenomenon. However, this obstacle is a surmountable one, in principle. But "by investing sufficient effort and time and ingenuity—and most likely money—into a revised version, you will find you *can* isolated the phenomenon, you *can* render it impervious to the fact that you are observing it." (Hofstadter, 1985, p. 456)

Psychologists who have devoted themselves to this aspect of the measurement

problem for concepts have made great strides in designing sensitive, surreptitious methods and have brought us closer to an understanding of the complexity and elusive quality of human conceptual representation. However, there may be a deeper measurement problem in studying concepts, one that has little to do with by-products of experimentation, like observer-interference. It is now widely recognized, for example, that for certain quantum mechanical phenomena, observation itself (no matter how surreptitious) necessarily imposes a change in a system and therefore inevitably alters the phenomenon under consideration (see Hofstadter's (1985) discussion of the Heisenberg uncertainty principle). To be sure, the measurements and phenomena under investigation in psychology are radically different from those encountered in physics. Nonetheless, there may be one striking parallel between these disparate fields: For certain phenomena, measurement (no matter how precise) may introduce insurmountable observational consequences.

Conceptual representation may be just such a phenomenon. In order to observe this covert mental phenomenon, one must introduce a perturbation (in the form of a psychological task), and then observe the consequences of that particular perturbation. However, it is very likely that the task, which is meant to simply elicit some observable behavior related to the underlying phenomenon, actually alters that phenomenon. This is not only a question of task demands, where the problem is to determine *which* measure most accurately reflects an underlying psychological phenomenon. The question is whether *any* measurement can be made without distorting the phenomenon. It is now well-known that subjects' responses differ, depending upon the nature of the task. On some tasks, subjects' responses suggest that concepts are definitional in structure. In others, concepts appear to be organized around prototypes (Armstrong, Gleitman, & Gleitman, 1983). It is certainly not possible, on the basis of current data, to resolve the dichotomy between the classical and prototype view. Moreover, the possibility exists that we may never be able to ascertain precisely the internal structure and representation of concepts.

CONTEMPORARY DEVELOPMENTAL APPROACHES

If this elusive quality has been an anathema to some, it has been a welcome challenge to others who seek to transcend the limitations of existing controversies and to set a new agenda for research in conceptual development. Contemporary researchers, who vary as widely in their particular theoretical leanings as in the experimental methods they employ, speak in one voice as they set aside the familiar approach of scrutinizing conceptual representation and structure directly. They now endorse new paradigms in which concepts are studied not in isolation, but rather as they articulate with other mental phenomena. Gone is the direct focus on capturing the internal representation of a given concept or set of concepts; also gone is the notion that all concepts are alike in their representation, development, and inductive power. Instead, we have the techniques of contemporary developmental psychology at the service of observing children's concepts as they manifest themselves within the larger context of language, perceptual, and logical development. Contemporary researchers have endorsed a truly developmental approach, observing the process(es) by which conceptual development proceeds in infants, children, and novices (e.g., Chi, 1983; Murphy & Wright, 1984). Some have tackled directly the dialectic between perceptual and conceptual similarity (Gentner & Rattermann, in press; Neisser, 1987) and the notion that concepts are embedded in theories (Carey, 1985a; Lakoff, 1987; Murphy & Medin, 1985). Others have begun to explore the nature of the inductions supported by early concepts (Gelman, 1988; Keil, 1989; Shipley, 1989), the optimal conditions under which concepts develop (Bruner & Haste, 1987; Callanan, 1989; Mervis, 1987) and the powerful role of language in conceptual development and organization (Clark, in press; Markman, 1989; Waxman, 1990).

These contemporary concerns have been treated with insight in several recent edited volumes (Demopoulos & Marras, 1986; Gelman & Byrnes, in press; Kuczaj & Barrett, 1986; Neisser, 1987) and journal issues (cf. *Mind and Language*, Volumes 1 & 2, M. Davies, Ed., 1990). The past year has also witnessed the addition of two important monographs, written by two researchers, Ellen Markman and Frank Keil, who have contributed substantially to shaping this new perspective.

In *Categorization and Naming in Children: Problems of Induction* (1989), Ellen Markman surveys her inventive research enterprise. The book opens with a concise presentation of the central issues under debate in conceptual development, with a particular focus on the acquisition of individual categories and ways in which these categories are interrelated. Demonstrations of children's remarkable cognitive abilities are now standard in developmental psychology. In *Categorization and Naming in Children,* Markman goes beyond this observation to ask how children's advances inform our theories of development. She reveals, at once, the remarkable lexical and conceptual advances made by very young children, and the recalcitrant problems they almost invariably encounter. Markman interprets children's accomplishments as well as their difficulties as reflections of constraints on lexical and conceptual organization.

In the introduction, Markman states her problem clearly. She asks how, when faced with the myriad possible ways to organize objects in the world or to interpret the meaning of words, children so quickly form concepts and learn word meanings. Her answer, consistent with the philosophical position adopted by Quine (1960), is that young children are ". . . equipped with some assumptions about the nature of categories and about the nature of category terms" (p. 7). She argues that these (presumably a priori) assumptions limit the kinds of hypotheses children will consider when ascribing meaning to a new word or determining the scope of a new concept. She then goes on to ascertain precisely the assumptions held by the developing child. In the course of the book, she

describes three of these assumptions, and with each description, she persuasively joins the mutual influences of language and conceptual organization and astutely gauges their impact.

The whole object assumption states that children are biased to interpret novel labels as referring to whole objects as opposed to properties of the objects, actions in which they may be engaged, events in which they may be participating, or any other logically possible interpretation. She marshals evidence for this assumption from her own research, and that of her students and colleagues (Au & Markman, 1987; Soja, Carey, & Spelke, in press).

The *taxonomic assumption* states that children interpret novel labels as referring to objects of the same category or kind rather than to objects that share a thematic, associative, or proximity relation. The evidence for this assumption, which has also been referred to as the noun-category bias, is quite strong and specific: Children adopt a taxonomic assumption only when ascribing meaning to novel nouns; they do not assume that novel adjectives signal attention to taxonomic relations (Waxman, 1990). Furthermore, because children as young as 2 years of age honor the taxonomic assumption (Waxman & Kosowki, 1990), it is quite likely that it plays a facilitative role in the early formation of taxonomic categories, particularly those at the basic and superordinate levels (Waxman, in press). There is, however, an unresolved tension between this argument (that children interpret nouns as referring to taxonomic categories) and Markman's earlier claim that children interpret nouns as referring to collections rather than to superordinate level classes.

The *mutual exclusivity assumption* states that children expect words (within a given language) to refer to mutually exclusive classes of objects. A logical consequence of this assumption is that children should expect that only one label can be correctly applied to any one object. This is the most controversial of Markman's assumptions and a summary of challenges to it may be found elsewhere (cf. Merriman & Bowman, 1989). This assumption is unproblematic when one considers only a single hierarchical level. In fact, in this case, the assumption is identical to Miller and Johnson-Laird's (1976) contrastive principle of hierarchical organization. However, in hierarchical systems, which incorporate concepts at multiple levels, words emphatically do not refer to mutually exclusive sets. Instead, because words refer to sets bearing inclusion relations, any particular object may be described by several different names (e.g., collie, dog, mammal, animal). Markman therefore acknowledges that this assumption must necessarily be violated and that children should relinquish this ". . . assumption when confronted with clear evidence to the contrary" (p. 188).

Another unifying theme in Markman's work has been her explicit recognition of the diversity and power of human conceptual organization. She expands this theme in the monograph by exploring possible differences in the structure and inductive power of various types of concepts. For example, she discusses principled distinctions between classes and collections, implicit and explicit concepts, ad hoc and richly structured concepts, and natural kinds and artifacts. She also reviews the evidence pertaining to the developmental primacy of the basic level and explores the contexts and conditions under which children eventually acquire nonbasic level terms and concepts.

Markman's fascination with the developing mind and her extraordinary talent in experimental design are evident throughout *Categorization and Naming in Children*. This book, which traces the chronological curve of Markman's many published pieces, is testimony to the breadth of her long-standing concerns and the force of her contribution.

In *Concepts, Kinds, and Cognitive Development* (1989), Frank Keil carves a unique and complementary vantage point. In his work, concepts are treated as evolving products of the human mind and for this reason he specifically seeks out developmental changes in concepts and in their inductive power. In characteristic fashion, Keil locates his concern precisely at the nexus of philosophical and psychological inquiry and, in so doing, expands considerably the domain of conceptual development. One of Keil's most significant contributions in this monograph comes from his gift for weaving together the collective wisdom of these two fields.

A second contribution, which is based on Keil's extraordinarily well-informed and thought-provoking analysis, is more programmatic. He articulates the distinctions among various kinds of concepts (e.g., nominal kinds, artifacts, natural kinds) and uses these distinctions to generate specific, testable hypotheses about the evolution of each in the developing child. Although he concedes that ultimately, types of concepts differ in degree rather than in kind, he launches two independent sets of empirical investigations based on his analysis of these distinctions.

He first addresses himself to the development of *nominal kinds* (e.g., *circle*, *odd number*, and *island*) and invokes a contrast between defining and characteristic features (see also Landau, 1982). He argues that nominal kinds have ". . . a relatively small set of properties that are necessary and sufficient for describing an instance of a concept" (p. 59). At the same time, he acknowledges that these concepts have a host of characteristic features as well ". . . that are typically, though not necessarily, associated with most instances" (p. 59). For example, for the nominal kind *island*, there is both a definition (a body of land surrounded by water on all four sides) as well as a set of characteristic features (palm trees, sandy beaches, sea shells, etc.).

Keil uses this contrast between characteristic and defining features to generate developmental predictions. He predicts that "[f]or nominal kinds, characteristic features may predominate early on in concept acquisition but give way to defining features with increasing knowledge and conceptual sophistication" (p. 60). To test this hypothesis, Keil pits characteristic against defining features. In a series of studies using a variety of nominal kinds from a variety of semantic domains, Keil finds support for his proposed 'characteristic to defining shift.' He

claims that with development, young children's reliance on characteristic features gives way to a reliance on defining ones. There are undoubtedly alternative interpretations for these findings, and Keil acknowledges several of them. Nonetheless, Keil is persuasive in demonstrating that the tension between characteristic and defining features may never be wholly resolved, even for the adult. Moreover, this series of experiments illustrates some of the ways in which concepts within a semantic field (e.g., kinship terms, moral act terms) are closely intertwined.

In another related kind of work, Keil addresses the distinction between artifacts and natural kinds. To pinpoint this conceptual distinction, he capitalizes on our intuitions that members of natural kinds (such as *lions* or *gold*) may be identified by virtue of their underlying essences and deep causal relations, while members of artifact kinds (such as *coffee pots* and *birdfeeders*) cohere by virtue of the functions they serve. Keil then turns his attention to the developing child, and recounts data suggesting that young children do not yet command an appreciation of the role of biological theories or deep causal relations (Carey, 1985a). Therefore, Keil reasons, an appreciation of the fundamental distinction between artifacts and natural kinds may be beyond the capacity of the young child. He translates this reasoning into the following developmental prediction: Changes in superficial features should alter adults' judgments about an object's membership in an artifact kind, but should not alter their judgments about an object's membership in a natural kind. For example, Keil predicts that an adult should judge that a tiger, which has (somehow) had its stripes removed, is still (essentially) a tiger, but that a coffee pot which has had its spout removed and sealed cannot (functionally) be a coffee pot. For children, however, changes in superficial characteristics should change their judgments about membership in both artifacts and natural kinds.

To test this hypothesis, Keil develops a method which is as ingenious as it is engaging. He presents subjects with stories about a particular object (e.g., a coffee pot or a tiger) and conveys that an alteration or a discovery has been made concerning either a deep, essential feature or a superficial, functional feature. It is obvious from the excerpted transcripts that the children were very intrigued by the stories and spoke at length about the status of various alterations and discoveries. Keil is to be applauded for harvesting so rich a data base, and for gleaning so compelling a sketch of the evolution of children's knowledge and theories.

Keil is ever-mindful of the philosophical implications of his psychological arguments and is careful to acquaint the reader with key philosophical positions and their promoters. In *Concepts, Kinds, and Cognitive Development,* he paints the landscape of conceptual development with a broad brush, and invites others to join him in filling in the essential details and contours.

The two volumes discussed previously each offer important, independent contributions to the study of concepts and their development. Furthermore, they make accessible to a developmental audience the work of other researchers,

many of whom have devoted their energies primarily to issues of conceptual organization in adulthood (e.g., Barsalou, 1983; Murphy & Medin, 1985). Both Markman and Keil submit strong support for their shared conviction that cognitive development is important not only in its own right, but also as a window into the intricate workings of the human mind. Although their research strategies and techniques differ considerably, the correspondences between them are clear. And together, they render in a thoroughly convincing manner the notion that conceptual development proceeds in close articulation with other developmental achievements.

One cannot fail to be impressed with the scope of these books and the scholarship and creativity woven into the research enterprises they describe. Nonetheless, one may find oneself wishing for still more painstaking work, of the kind portrayed in these volumes, in order to determine how conceptual systems of organization develop and how they are linked to linguistic advances, emerging theories, and increasing knowledge. Now is the time to coordinate our investigations in these important areas of development, to specify further some of the theoretical claims, and to work through more precisely the implications of others.

For example, there is common slippage between key constructs such as *word* and *concept,* and *theory* and *knowledge.* Only by articulating these constructs carefully will we derive a precise account of conceptual development. Furthermore, the hypothesis that conceptual development is guided by biases, constraints, or initial assumptions within the child will also benefit from further specification. This idea, which has served as a magnet for controversy, is especially powerful because with it we can begin to explain both the ease with which children learn some novel words and concepts and their difficulty with which they learn others. The idea, however, is not an answer in itself. Even if children are predisposed to favor one interpretation (or one class of interpretations) for a novel word, or to prefer one type of induction over another for a new concept, such a predisposition would not inevitably lead the child to the single correct interpretation. Ultimately, word learning and conceptual development must operate in conjunction with other important sources of development (Nelson, 1988; Waxman, Shipley, & Shepperson, in press).

Furthermore, just as there are differences among types of concepts, so may there be fundamental differences among the candidate constraints. Some may be innate and may exert their influences from the very earliest stages of conceptual and language development, others may be learned and may exert their influences at later points in development. Constraints may also differ with respect to the locus of their influence. For instance, some (perhaps the *taxonomic assumption* or noun-category bias) may be semantically based; the empirical results may reflect one way in which the semantic system influences conceptual organization. Others (perhaps the principle of mutual exclusivity) may be more Gricean and may derive primarily from pragmatic concerns (see Clark, in press, for other examples).

The field of conceptual development is at a provocative point of transition; the boundaries maintained by traditional inquiries have begun to shift. With conceptual development now situated at the center of the developing child's cognitive accomplishments, the challenge for psychologists is to discover the essential forces motivating conceptual development and change. The ultimate success of this approach will be measured by our ability to reach beyond the existing dichotomies to reveal the mutual influences of language, theories, and existing knowledge in human conceptual organization. If contemporary research programs are any indication, this is a landscape well worth cultivating.

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