Semantic Factors in the Acquisition of Rules For Word Use and Sentence Construction

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That general intellectual development—particularly during the sensorimotor period described by Piaget (1952)—provides the basis for single-word acquisition and the onset of multiple word utterances is generally accepted in the child language literature. Even though the correspondence between evolving cognitive and perceptual systems and language has been often noted, there is still no detailed account of what the nature of this correspondence may be. In this paper, Bowerman gives a thoughtful and penetrating analysis of categorical and relational development in early language, detailing the semantic content of both aspects. Rather than postulating an innate capacity for a hierarchy of grammatical classes (McNeill, 1970), Bowerman (1973, 1974) explores the relationship between cognitive and linguistic categories and their relative effect on word meaning and sentence construction. Her discussion of the recent literature on early language and her presentation of data from the study of her own two children follow the same measured methods that Inhelder and Piaget (1964) used in studying early logical development. Furthermore, Bowerman's descriptions of early categorical and relational linguistic development have interesting parallels to the Inhelder-Piaget descriptions of "similarity" and "belonging" in early graphic collections.

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A striking shift has taken place over the last decade in the topics that concern investigators of child language. Studies in the early and mid 1960's concentrated primarily on the acquisition of formal syntactic configurations and operations (e.g., phrase structures, transformations). More recent analyses, in contrast, reflect a growing concern for the way form is related to meaning in linguistic development, and, more generally, for the cognitive bases of language acquisition.

The recent interest in cognitive factors in language development comes in part as a reaction to the nativist position that dominated much discussion of child language in the 1960's. According to the nativist view, man's capacity for language is a specialized component of his biological makeup and does not arise directly from more general cognitive abilities. The child is seen as coming to the language learning task equipped with much inborn knowledge of language structure; he requires only a certain amount of linguistic input to activate this knowledge (Chomsky, 1965, 1968; Katz, 1966; McNeill, 1966, 1970, 1971).

Two major lines of attack on the nativist position have been mounted. According to one, the *formal structure* of language is not totally distinct from man's more general cognitive organization. Rather, it is argued, various linguistic categories, structures, and processes, such as word classes, grammatical relationships, concatenation or "adding together" of elements, the embedding of one sentence into another, and the distinction between deep and surface structure, have striking correlates in nonlinguistic modes of conceptualizing experience and acting upon the environment. Thus, the child's learning of language is facilitated by his having established certain basic cognitive abilities during the early months of life (Sinclair deZwart, 1971, 1973a and b; Greenfield, Nelson, and Saltzman, 1972; Goodson and Greenfield, 1975; see Bowerman, 1974a for discussion).

A second cognitively-based counter to the nativist position has concentrated on the possible role played in language acquisition by the kinds of *meanings* children are capable and desirous of expressing at various stages of development. Much of the recent theorizing and research on the role of meaning in language development was foreshadowed by a statement made in 1966 by Slobin, in an argument against the need to ascribe extensive foreknowledge of grammatical categories to the child. Slobin pointed out that many language categories are based on semantic features and that such features are learnable through experience. He went on to suggest that an impor-

tant component of the child's capacity to acquire language may be the "ability to learn certain types of semantic or conceptual categories, the knowledge that learnable semantic criteria can be the basis for grammatical categories, and... the formal knowledge that such categories can be expressed by such morphological devices as affixing, sound alternation, and so on" (1966, p. 89).

Studies undertaken in the late 1960's began to reflect the growing conviction that the acquisition of syntax cannot be adequately explained without reference to the kinds of meanings children attempt to express in their early utterances (e.g., Bloom, 1970; Schlesinger, 1971b; Kernan, 1969; Bowerman, 1973a). Comparisons of data collected in different language communities revealed striking similarities in the semantic content of children's utterances across languages (Slobin, 1970; Brown, 1973; Bowerman, 1973a, 1975b). Ervin-Tripp (1971), reviewing the early crop of the semantically-based studies, summed up a prevalent viewpoint in her statement that "the findings [from child language data] of universal, or even of common semantic features specifying subcategories or characterizing sentential relations is more than a mere curiosity, an addition to what we know... these semantic features may provide a crucial link in our understanding of how sentences develop" (p. 208). She then pointed out that knowledge of the kinds of semantic categories, features, and relationships that are available to children at various stages of language acquisition can help to account for the *order* in which different aspects of language develop and also aid in determining "which properties of input are irrelevant because incomprehensible to children on the basis of their cognitive development" (p. 209).

After several years of considering the semantic properties of young children's utterances in conjunction with their forms, many investigators have come to a kind of consensus on the early course of language acquisition which may be summarized briefly as follows: during the period before he speaks, the child is busy building up a repertoire of basic cognitive concepts—ways of organizing and understanding his experiences. His task in acquiring language is to discover the linguistic devices by means of which such concepts can be expressed. In other words, acquiring language consists in large part of learning how to map or translate from one representational system (the child's prelinguistic conceptual notions) into another (language) (Schlesinger, 1971b; Slobin, 1973; Bloom, 1973; Nelson, 1974; Clark, 1974a; Wells, 1974). Important mechanisms for expressing meaning to which the child must attend include not only the

morphological processes mentioned by Slobin in the quote given above but also *words* as devices for representing various kinds of conceptual material and contrastive *word orders* and *intonation patterns* that signal distinctions in meaning, e.g., "the cat bites the dog" vs. "the dog bites the cat," and "Mommy is going out?" (rising intonation) vs. "Mommy is going out" (falling intonation).

The view that a central process in language acquisition is the child's search for links between cognitive concepts and linguistic forms and operations has been strengthened and encouraged by recent developments in linguistics. Many linguists now argue, on grounds quite independent of child language, that the most basic elements of language are not abstract syntactic configurations like grammatical relations but rather a universal set of prime semantic concepts that combine according to general and language-specific constraints to yield both words and sentences (e.g., Fillmore, 1968, 1971; Postal, 1971; Lakoff, 1971; McCawley, 1971). Attention to the role of meaning in language has led to the realization that many syntactic classes, configurations, and operations which were once assumed to be semantically arbitrary—i.e., not constrained by any particular meaning—are in fact governed by various subtle semantic distinctions (e.g., Postal, 1971, p. 252ff; Zwicky, 1968).[1] To the extent that linguistic phenomena are semantically motivated, the proposal that the child's primary concern is to discover consistencies linking variations in meaning to variations in formal structure is an appealing one.

The goal of the present chapter is to discuss and integrate research on the kinds of meanings that appear to play an important role in the initial stages of language acquisition. Specifically, the chapter deals with the way in which children ascribe meanings to words at the

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[1]For example, Zwicky (1968) argues that English verbs which take an infinitive in their complement (e. g., "*want* to get," "*persuade* John to come") are semantically distinguishable from those that take a present participle (e.g., "*find* John going downtown," "*imagine* yourself flying") in that verbs of the former type refer to events that temporally precede the events specified in their complements while those of the latter type refer to events that are contemporaneous with the events of the complements. A number of investigators have noted that there is a semantic distinction between verbs that can occur either in intransitive contexts or in transitive contexts with a *causative* sense ("the door opened," "John opened the door") and those that cannot (e.g., "sing," "eat") (e.g., Zwicky, 1968; Binnick, 1971). Other illustrations of semantic constraints on possible linguistic structures are found in Zwicky, 1968; Postal, 1971; p. 267; McCawley, 1971. In an earlier era, Whorf (1956) made related arguments about "cryptotypes," or covert semantic categories that constrain the ways in which various linguistic forms can combine.

one-word stage and with the nature of the relational concepts—concepts involving *relationships* between objects and other objects or events—that underlie children's early rules for word combination.

To put the discussions to follow into perspective, it must be noted that although the ability to perceive or construct various kinds of meanings and to link these with appropriate expressive devices is clearly a basic component of the child's language capacity, an adequate account of language acquisition must deal with more than semantic factors. First, many aspects of language structure are purely formal, in the sense that they are apparently not linked to meaning at all. For example, consider the restriction in English that renders sentences like "put the hat on," "put it on," and "put on the hat" grammatical while those like "put on it" are not (McCawley, 1974).[2] Since such constraints are not governed by semantic distinctions, their ultimate mastery by the child cannot be explained by reference to his semantic development. Possibly acquiring such knowledge depends on all-purpose inductive strategies that enable the child to recognize and abstract out regularities in linguistic and nonlinquistic input alike (Dore, 1975; Reber, 1973); alternatively, as the nativist position states and as Cromer (1974a and b) has continued to caution, there may be specifically linguistic (as opposed to cognitive) abilities involved.

A second way in which an account of semantic development is insufficient in itself is that it does not explain how the child takes the step from formulating language-relevant concepts to linking these up with the appropriate expressive devices of his language. Different devices (e.g., word order, affixation) are not equally easy for a child to master; sometimes the expression of a given semantic content must wait not on the child's development of the concept itself but on his ability to figure out how to express it once he has acquired it (Slobin, 1973). In short, an adequate account of language acquisition must take into consideration not only the nature of early semantic development but also the way in which children deal with the formal characteristics of language. These matters are outside the scope of this chapter, however.

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[2]Most investigators would include basic grammatical relations such as "subject of the sentence" and "predicate of the sentence" as examples of purely formal, nonsemantically based aspects of language (see Fillmore, 1968; Brown, 1973; Bowerman, 1973a and b). Schlesinger (1974), however, has argued that although technically these may appear to be independent of conceptual content, psychologically they are assimilated to various semantic notions, e.g., "subject" to "agent."

The contents of the chapter are organized in the following way. The first major section takes up the role of *categorization* in language acquisition. The role of categorization as a prerequisite for creativity in language use is considered here, followed by discussions of the relationship between semantic and cognitive categories and of the origin of the categories children use in the early period of language acquisition (i.e., are they introduced through language or do they arise in the child on grounds quite independent of language?). The second major section investigates the kinds of categories that govern children's early understanding and use of words. The third major section explores the nature of the relational categories that underlie children's early word combinations. In the final section some remarks about possible clinical significance are offered.

LINGUISTIC AND NONLINGUISTIC CATEGORIES: SOME BASIC ISSUES

Categorization and Productivity

The most fundamental ability with which a theory of language acquisition must come to terms is a speaker's capacity to use language in a creative or productive way. In this chapter we will be concerned with two aspects of creativity in language use: the speaker's parallel abilities to use *words* to refer to objects or events that he has never heard them applied to before and to put together words to form novel *sentences*.[3] The development of both these abilities requires that the child be able to perceive similarities between new experiences and the familiar situations in which he has heard or produced particular words and sentences.

The child's attempts to apply known forms or patterns to novel situations along lines of perceived similarity are reflected most obviously in the way he uses known words in connection with new

[3]The focus will thus be on *production*, although much of the material to be discussed is relevant for *comprehension* as well. While both production and comprehension can be assumed to tap ultimately into the same conceptual system, the developmental relationship between the two performance modalities is complex (cf. Bloom, 1974; Huttenlocher, 1974, for discussion). In particular, the young child often uses different kinds of information in interpreting utterances than in producing them. For example, his interpretations of language forms that he does not yet completely understand are apparently swayed both by general nonlinguistic strategies (Clark, 1973a) and by the specific characteristics of the settings in which the forms are heard (Donaldson, McGarrigle, 1974).

referents, e.g., the extension of "doggie" from dogs to all four-legged animals and "open" from opening doors and boxes to taking pieces out of jigsaw puzzles. A similar phenomenon is found in the child's extension of patterns for combining words to new situations. For example, a child who has heard a number of sentences of the type "that's Mommy's coat" (Daddy's hat, the baby's shoe, the man's car, etc.) will eventually begin to produce his own version of these, e.g., "Mommy coat," "Daddy hat," etc. As long as these sentences refer to familiar and often-talked-about pairings between a person and an object that the person owns, controls, or typically uses, one cannot be sure that the child really sees any similarity among the various specific relationships involved (e.g., the relationship between Mommy and her coat, Daddy and his hat, etc.). But when the child starts to produce similar sentences that have never been modeled to him, e.g., "Mommy keys," "baby book," and "Grandpa spoon," while in the context of an object owned, controlled, or used by the person mentioned, one may plausibly assume that he has figured out a systematic way (a consistent word order, in this case) to encode an abstract relational notion which might be called "possession." It is abstract in the sense that it is not tied to any particular situational realization (e.g., the relationship between Mommy and her coat). Rather, the child sees the relationship between Mommy and her coat as similar to that which holds between Daddy and his hat, the baby and its book, Grandpa and the spoon he uses, and so on.

Things that are not identical but which are treated as if they were equivalent, at least under certain circumstances, constitute a *category*, or, alternatively, a concept or a class.[4] (By the unsatisfactory word "things" is meant here virtually anything an organism is capable of perceiving or experiencing, such as objects, properties of objects, actions, processes, mental states, relationships between objects and other objects or actions, etc.). The ability to categorize is regarded as one of the most basic cognitive capacities. According to Bruner, Goodnow, and Austin, for example, "virtually all cognitive activity involves and is dependent on the process of categorizing" (1956, p. 246). The grouping of discriminably different stimuli into categories on the basis of shared features is an adaptive way of deal-

[4]There are certain problems involved in defining concepts in terms of "equivalence responses" ("similar or identical reactions to different environmental input," Flavell, 1970, p. 983), as Flavell (1970) has outlined. However, even though the definition is not ideal, it will do for purposes of discussing the concepts underlying words and sentence structures.

ing with what would otherwise be an overwhelming array of unique experiences. As Tyler puts it, ". . . . life in a world where nothing was the same would be intolerable. It is through . . . classification that the whole rich world of infinite variability shrinks to manipulable size" (1969, p. 7).

In asking how children learn to use language in novel situations, we are in essence asking what kinds of concepts they have formulated with which to associate words and syntactic devices such as word orders, inflections, and intonation patterns. What kinds of similarities across experiences are children sensitive to in the early stages of language acquisition, for purposes of extending known words to new referents or using familiar structural patterns to build novel sentences? Put more generally, how do children come to construct, from their general experiences (both linguistic and nonlinguistic), those categories that underlie their emerging ability to use language? How do they organize their perceptions of and interactions with the world into the kinds of conceptual chunks or units to which morphemes (words and inflections) may be attached and upon which rules for combining and ordering those morphemes can operate?

These questions have been the focus, either explicitly or implicitly, of a large number of semantically oriented investigations of the early phases of language development. For example, studies of the acquisition of word meaning have investigated children's grounds for referring to a given set of items by the same word and how initial classifications change over time (e.g., Clark, 1973b; Nelson, 1974). Studies of children's early word combinations have explored the nature of the relational categories that underlie children's early rules for combining words (e.g., Schlesinger, 1971b; Bloom, 1970; Brown, 1973; Bowerman, 1973a and b; Braine, in press). The findings of such studies will be reviewed in the sections on word meaning and word combination.

Although most studies have treated children's knowledge of word meaning and of rules for word combination as two separate areas of investigation, acquiring both kinds of knowledge requires that the child be able to associate aspects of language with concepts that specify similarities or invariances across diverse experiences. While the kinds of concepts that underlie children's word meanings are not necessarily the same as those that govern their word combinations, there is no obvious dividing line between them; sometimes, in fact, it is clear the related notions are involved in the two kinds of knowledge. For example, the creative use of the words "my" and

"mine" requires that the child be capable of perceiving a type of invariance in his relationship to a number of different objects that is quite similar to the invariance which he must recognize in order to achieve a systematic formula for producing sentences like "Mommy keys" and "Grandpa spoon." Similarly, the child's ability to say "in" in connection with a variety of different stiuations (e.g., someone's getting into a tub, putting a doll into a drawer, or pouring juice into a cup) requires an awareness of an abstract similarity in the way pairs of objects can be spatially related, just as does his ability to produce sentences like "baby tub," "doll drawer," and "juice cup" in a systematic way. In short, the semantic developments affecting the acquisition of word meanings and of rules for sentence construction are related, and similar questions about the nature and origins of the relevant concepts can be asked about both. For this reason they are treated within a common framework in this chapter.

Cognitive vs. Semantic Categories

The search for the semantic categories that constitute children's early word meanings and that underlie their rules for word combination is clearly related to the study of children's developing cognitive structures. However, many investigators have felt a need to distinguish knowledge that can properly be called "semantic" from the child's general understanding of the world. Yet there is little agreement as to exactly how the distinction should be drawn.[5]

Most of the debate over whether particular behaviors of the child reflect "semantic" knowledge or are simply due to the child's cognitive apprehension of a situation has focused on whether simple utterances consisting of one or two words can contract a relational semantic meaning with an aspect of the situational context that is not explicitly mentioned. For example, can the child's word "Mommy," uttered while the child points to Mommy's coat, be considered to express a relational semantic meaning of "possession," in addition to whatever lexical meaning the word "Mommy" may have? Similarly, can "Mommy," uttered while the child observes his mother opening a door, be considered "agentive" in relation to a contextually given but not linguistically specified action? A number of researchers have answered this question affirmatively, documenting with various

[5]What counts as "semantic" knowledge is as much at issue in the case of adult speakers as it is for children. Contrast, for example, the views of Katz and Fodor (1963) with those of Bolinger (1965) and Olson (1970b).

kinds of evidence (e.g., Ingram, 1971; Antinucci and Parisi, 1973; Greenfield and Smith, in press).

Such proposals sometimes identify the term "semantic" with the notion of what the child intends to *communicate,* in order to distinguish between the "semantic" knowledge reflected in an utterance and the child's general cognitive understanding of the situation about which he speaks. For example, Parisi (1974), in discussing his and Antinucci's (1973) model (which postulates complex semantic structures underlying even one-word utterances), states that "by semantic structure we mean a cognitive structure which is constructed with the intent to communicate it. Therefore semantic structures are a subclass of cognitive structures" (p. 102).

While recognizing the importance of the child's developing cognitive structures for his ultimate linguistic knowledge, many investigators are nevertheless reluctant to assign a relational *semantic* structure to a single word on the basis of the way in which it is embedded in a nonlinguistic context (e.g., Bloom, 1973; Schlesinger, 1974; Dore, 1975. Brown, 1973, p. 151ff. feels that the kind of evidence that has been advanced so far is not adequate but leaves the matters open). Bloom (1973, p. 2), for example, distinguishes sharply between *semantic* knowledge, which she defines as involving the meanings of particular words and of meaning relations between words, and *conceptual* knowledge, or the underlying cognitive structures that the child uses to represent to himself the relations among persons, objects, and events in the word. Like Bloom, Dore (1975) argues against assigning linguistic significance to such nonlinguistic aspects of context as crying, gestures, etc. He recommends maintaining a clear distinction between "knowledge of language and knowledge of the world" to "prevent basing claims about the former on data about the latter" (p. 34). Similar arguments have been made by Bowerman (1974b) about the need to make a clear distinction between the general conceptual knowledge that is reflected in a child's behavior at the time of speech and knowledge of the internal structure (i.e., semantic components) of words.

The matter of distinguishing semantic knowledge from cognitive knowledge is clearly a complex one and cannot be analyzed in detail here. However, the position I would advocate, in line with the sorts of arguments made by Bloom (1970, 1973), Dore (1975), Schlesinger (1974), and Bowerman (1974b), is that the term "semantic" be reserved for cognitive knowledge that has demonstrably become linked to aspects of *language* for the child—i.e., that has begun to "make a

difference, linguistically," to borrow Schlesinger's useful phrase (1974, p. 144). In other words, a concept that the child grasps at the nonlinguistic level achieves semantic significance only if 1) it has an effect on the way in which he selects a word to refer to a situation, or chooses an inflection and determines the class of words to which the inflection can be applied, or selects a word order or intonation pattern, or decides whether or not a particular operation can be performed (such as using a noncausative verb in a causative sense, see Bowerman, 1974b), and so on, or, conversely, if 2) it governs the way in which he *understands* a word, inflection, word order, intonation pattern, etc.

Certain cognitive distinctions which human beings are capable of making are probably semantically significant in all languages in that they are reflected somewhere in the linguistic system, whether it be in the comprehension of or choice among competing morphemes (words, affixes), word orders, intonations, or whatever. Other cognitive distinctions may have semantic consequences in some languages but not in others. For example, in Japanese, the nature of the physical relationship between an article of clothing or accessory and the body part on which it is worn is semantically significant in that it governs the choice of verb used to refer to removal of the object from the body. The removal of objects that *envelop* the body part, such as shoes, gloves, pants, coats, and mittens, is referred to by *nugu*, while *toru* is used for the removal of objects like earrings, bibs, glasses, broaches, and rings that are simply "perched" on the surface of the body. (The choice among the two verbs is not learnable strictly as a matter of association between verb and object, since, for example, an object such as a shoe which ordinarily takes *nugu* would take *toru* instead if it were removed from, say, the top of the head instead of from its usual site).[6] In English, in contrast to Japanese, the distinction between enveloping and nonenveloping relations between objects and body parts is not semantically significant. It has no effect either on the selection of the verb referring to removal ("take off" is routinely used for all these operations) or on choices among other linguistic forms, patterns, or operations. Thus, a child acquiring Japanese must learn to attach semantic significance to a distinction which will remain linguistically irrelevant for an English-speaking child. Nevertheless, we can assume that the English-speaking child is

[6]I am grateful to Megumi Kameyama for acting as my informant on this and other topics in the structure of the Japanese lexicon.

just as capable of making the cognitive discrimination as his Japanese counterpart.

To summarize the arguments advanced above, cognitive discriminations are not automatically also semantic ones. They assume significance only when they become linked to one or another aspect of language. (Whether or not the link made by the child is appropriate from the adult's point of view is irrelevant.) When cognitive and semantic knowledge are carefully distinguished, the study of children's semantic development becomes a two-step process. First, we must understand the nature of children's general cognitive development in order to know what kinds of cognitive discriminations and groupings they routinely make or are capable of making at a given point in development. In other words, what is the cognitive repertoire upon which meaning in language can draw? Piagetian theory has provided investigators of child language with invaluable insights into these matters, as is evidenced in the work of Brown, 1973; Bloom, 1970, 1973; Edwards, 1974; Morehead and Morehead, 1974; Sinclair-deZwart, 1971, 1973a and b; and Wells, 1974, among others. Second, we must determine how, out of all the cognitive discriminations a child is potentially capable of making at a given time, some begin to get connected to language and hence to take on semantic significance while others do not. An important question that must be considered in connection with this is the extent to which the child's formulation of the specific categories that govern his use of language is influenced by the particular language he hears. To this issue we now turn.

Origin of Semantic Concepts

Social scientists have long been plagued by the question of how linguistic and cognitive development are related in a child's growth. Are concepts first introduced into a child's thoughts through language, or does language merely express concepts that are formed independently of it? More specifically, does the child come to see experiences (objects, events, etc.) as similar if the language he is learning treats them as equivalent, as instances of the same concept, and as different if different words or different syntactic structures are applied to them? Or does he initially judge similarity or lack of it for himself, on the basis of his own nonlinguistic experiences?

Earlier in this century there was a tendency to regard a child's conceptual development as strongly influenced by or even completely determined by the language to which he is exposed. According

to this view, categories—groupings of things that are similar in some way—neither pre-exist in nature, only awaiting discovery, nor unfold naturally as part of man's biologically given way of organizing his experience. Rather, they are arbitrarily imposed on reality and can take almost any form. The evidence advanced for this position, known in its strongest form as the Sapir-Whorf or Whorfian hypothesis, was that there is little correspondence among the semantic categories employed in the lexicons and grammars of different natural languages. Given domains such as colors, relatives, actions, etc. are classified in a variety of contrasting and incongruent ways, such that distinctions that are important in the structure of one language may play no role at all in the structure of another. According to the Whorfian hypothesis, the child's acquisition of his native language not only is the means by which he is initiated into the particular concepts his culture considers meaningful, but also is the medium through which he imposes a basic structure on reality.

The Whorfian hypothesis was heavily debated prior to the mid 1960's (see Carroll, 1964, for a review), but recent years have seen a growing movement away from extreme or even moderate Whorfian views on the relationship between language and cognition. Many investigators now regard cognition as relatively independent of language. Lenneberg (1967), for example, has argued that "the modes of conceptualization that happen to be tagged by a given natural language need not, and apparently do not, exert restrictions upon an individual's freedom of conceptualizing" (p. 334). What limits there are on modes of conceptualizing are seen as resulting from biologically-given restrictions on cognitive organization rather than from knowledge of language. MacNamara (1972), for example, argues that there are cognitive constraints on what will be grouped together, reminding us that "children do not form bizarre concepts to include foot and floor and exclude all else" (pp. 3–4). He suggests that selective attention to certain aspects of the environment may play a role in constraining patterns of concept formation. Related arguments are made by Olson (1970a), who proposes that the structure of the human nervous system gives priority to certain kinds of perceptual cues over others, presumably because of their evolutionary usefulness. Some concrete evidence of restrictions in concept development is offered by Rosch (1973a and b), who found that certain physical stimuli (shapes, colors) are classified similarly by people from different cultures regardless of major differences in their languages.

The currently prevalent view that cognitive development is rela-

tively independent of language is clearly reflected in recent studies of child language, many of which treat Whorfian notions with little sympathy. As noted in the introduction to this chapter, the child is now commonly viewed as coming to the language-learning task well equipped with a stock of basic concepts that he has built up through his interactions with the world. His problem is to discover how these concepts can be mapped into language rather than to learn from language what the necessary concepts are (e.g., Slobin, 1973; Bloom, 1973; Nelson, 1974; Clark, 1974a). According to this position, the child does not learn—and probably does not even attend to—language forms or patterns which encode meanings that he has not already formulated on the nonlinguistic level. MacNamara (1972), for example, states that "it is inconceivable that the hearing of a logical term [by which he means words such as "and," "or," "more," "all," and "some"] should generate for the first time the appropriate logical operator in a child's mind. Indeed the only possibility of his learning such a word would seem to be if he experienced the need for it in his own thinking and looked for it in the linguistic usage about him" (p. 5). (See Cromer, 1974b, for further arguments and lines of supporting evidence for the cognition-first position on language development.)

A modification or softening of the strict cognition-first viewpoint is discernable in some of the most recent literature on language acquisition. A few researchers are now urging that the role played by social factors—including language—in the child's conceptual development not be discounted. Wells (1975), for example, cautions that "attempts to give substance to claims about predispositions for language acquisition in terms of prior cognitive development are seriously limited in their neglect of the social dimensions of cognition." Some of Wells' arguments and related studies will be presented in the section on the acquisition of word meaning.

A view of conceptual development which accepts the hypothesis that language input can have an influence on the child's cognitive structuring of the world from the start of his attempts to make sense of language, (e.g., before the end of his first year), while nevertheless acknowledging the role played by the child's inherent disposition to develop cognitively along certain lines, can be termed "interactionist." According to this position (towards which I shall confess my bias at the outset) there are many relationships possible between language and concept formation depending both on the kinds of concepts involved and on the type of input provided. Some early concepts undoubtedly develop autonomously (i.e., independently of

language), particularly those which are universal (e.g., object permanence; cf. Brown, 1965, pp. 314–315). Other early concepts might be considered autonomous only insofar as they require a nonlinguistic *potential* for recognizing certain sorts of similarities across experiences. However, they would start to develop primarily because the child's caretakers call his attention to the possibility of grouping along certain lines by repeatedly using the same word in superficially variable situations (a word acting as a "lure to cognition," Brown, 1956, p. 278). These possible relationships between language input and particular concepts will be illustrated and discussed further in the section on word meaning.

To summarize, this section on "Linguistic and Nonlinguistic Categories" has examined some basic issues concerning the source of productivity or creativity in language, the relationship between cognitive and semantic knowledge, and the ultimate source of a child's earliest semantic categories (independent cognitive activity or linguistic input?). These issues are relevant to studying the acquisition both of word meanings (how categories underlying word use develop) and of rules for word combination (how children formulate categories having to do with the relationships expressed by the juxtaposition of words in sentences). Let us look now in more detail at issues in the acquisition of word meaning; sentence construction is taken up in the following section.

LEARNING THE MEANINGS OF WORDS

With the exception of proper names, the words of a language are not labels for specific objects but rather are tags for concepts or categories encompassing a set, often infinitely large, of similar-yet-different items (Lenneberg, 1967, p. 322). The possession of a concept has often been equated with knowing a rule—a rule for grouping that specifies both what the relevant attributes of stimuli are and how they are to be combined for use in identifying new instances of the concept (Brown, 1965, p. 309; Bourne, 1967). Learning the meaning of a word, according to this view, can be regarded as learning a rule which specifies the conditions that must obtain before the word can be used appropriately or correctly.[7] For example, in order for the word "drip" to be used appropriately to refer to the behavior of an entity, it

[7]See Fodor, Bever, and Garrett (1974), chapter 4, for a discussion of why the acquisition of word meaning is better accounted for in terms of *rule* learning than by competing theories such as the speaker's history of conditioning.

must be the case that the entity is either a liquid or semi-liquid such as mud, it must move in a downward direction, and it must separate as it moves into discrete segments. If one or another of these conditions does not hold, the use of the word will be regarded as anomalous by fluent speakers. Of course, as Lyons (1968) points out, the referential boundaries of words are not always fully determinate, in that "it is not always clear whether a particular object or property falls within the scope of a given lexical item" (p. 426). Still, there is enough agreement among speakers that deviations from normal usage are readily recognized.

Not all words are referential in the sense that they "represent" or "stand for" some object, event, property, etc. For example, "hi," "goodnight," and "goody!" have no referents. Nevertheless, such words also are linked with governing concepts that specify the conditions under which they can be used appropriately. Thus, regardless of whether or not a word makes reference, a speaker's ability to use it productively and appropriately in a variety of nonidentical contexts depends ultimately on his ability to categorize—to perceive invariances across entities or situations that are superficially quite diverse.

The governing concept of a word—that is, the set of conditions that must obtain before the word can be used correctly—is not presented to the young child in any clear-cut way; it must be inferred. Even in the relatively straightforward case of ostensive definition, when, for example, an object is shown to the child and he is told "dog" or "that is a dog," much is left unexplained. What features are the critical ones that determine what new objects could or couldn't be called "dog"? The fur? The presence of four legs? The color? The size? The bark? People's reaction to it? (See Clark, 1974b, pp. 106–107, for more on this dilemma). As Olson (1970b) points out, "simply being shown an object does not indicate the set of alternatives from which it is differentiated. You might note a few features of the object without knowing if you'd noticed the critical ones on which recognition is to be based" (p. 265).

If even ostensive definitions leave the referent indeterminate, consider how much more ambiguity there is in the case of words whose "domain of application" (i.e., possible referents, if the word is used referentially, otherwise simply the situations in which the word is appropriate; cf., Lyons, 1968, p. 434) cannot be indicated by pointing out and labeling instances. It is not surprising, therefore, that children often show, by the way they use or understand given words in new situations, that they have misconstrued the meanings which

adults intended in their prior uses of these same words. The *ways* in which they misconstrue give valuable insights into the nature of the processes by which word meanings are acquired.

In the following two subsections on the acquisition of word meaning we will consider the "syntax and semantics of equivalence" in the concepts governing children's use of words. These terms were suggested by Olver and Hornsby (1966) to designate, respectively, the *formal structure* of conceptual groupings and the *nature of the similarities* that link the various category members. By "formal structure" is meant, for example, whether the category is "superordinate"—i.e., whether all the instances are similar to one another by virtue of one or more shared features—or whether the category has one or another of several more loosely-knit forms of organization such that there are no features common to all instances.

The Syntax of Equivalence

Superordinate Concepts According to a recent influential theory of the acquisition of word meaning proposed by Eve Clark (1973b, 1974a and b), the child learns the adult meanings of words gradually, but in such a way that he consistently associates certain meaning components with each word:

> ... the child begins by identifying the meaning of a word with only one or two of its semantic components or features of meaning, rather than with the complete combination of components used by the adult.... Once the child has attached *some* meaning to a word, however incomplete, it obviously *has that meaning* for him and is used accordingly. Whatever components or features of meaning the child has picked out as the meaning of a word (its lexical entry) will be criterial in deciding whether it can be applied or not in a particular situation (1974b, p. 108).

Because the child has fewer features associated with the word than an adult, he uses it in a broader range of contexts than the adult would. For example, if the feature "four-legged" has been picked out as criterial for the meaning of "doggie," the child will use the word in connection with cats, cows, hippopotamuses, and so on. If the criterial features attached to the word "Mommy" are "adult, female," the child will use the word for women other than his mother. This use of words in contexts which adults would divide into two or more different categories has been called *overextension* (Clark, 1973b). Clark proposes that the child's tendency to overextend words gradually diminishes as he learns additional semantic features that from his point of view restrict the contexts in which the words can be appro-

priately used. It is important to recognize that Clark's hypothesis concerns only the acquisition of *word meanings*. She does not claim that overextensions necessarily reflect a failure to *discriminate* between, say, dogs and cows or Mommy and other women; she argues only that the child does not yet realize that the discrimination is relevant for the meanings of the words in question.

A difficulty with interpreting overextensions as a result of incomplete word meanings is that, as more recent research has shown, children who overextend words in production can often pick out the correct referents for these words from an array of competing "similar" stimuli when asked to do so (Huttenlocher, 1974; Thomson and Chapman, 1975; Labov and Labov, 1974). For example, a child whose spontaneous speech suggests that she knows no more about the meaning of "Mommy" than that it refers to a family member may consistently look only at her mother when asked "where is Mommy?" (Labov and Labov, 1974). To deal with this phenomenon, Clark (1974a, 1975) suggests a modification of her original account of overextensions: a child may have several features attached to a word but overextend to new referents on the basis of only one or some of these. Clark calls this "partial" overextension, to contrast it with overextension in which a child has very few features available for a word but uses them all when he refers to a new item by that word. (For a different account of the phenomenon of overextension in production but not in comprehension see Huttenlocher, 1974, p. 367).

Clark's research has focused much attention on overextension, but several researchers have noted that overextension is only one of several ways in which children can use words consistently (i.e., as if they have a stable set of features associated with them) and yet not in accordance with adult norms (Bloom, 1973; Nelson, 1974; Anglin, 1975). For example, children also sometimes *underextend* (or "underinclude" or "overrestrict") words, in that they use them only for a subset of those items which the corresponding adult concept would encompass. As Anglin (1975) notes, underextensions are hard to spot, since, unlike overextensions, they involve no overt errors of usage. However, underextensions can be ferreted out experimentally (Anglin, 1975) or by careful record-keeping. Bloom (1973, p. 72) provides an example obtained by the latter method from her daughter Allison: at 9 months, Allison used the word "car" to refer only to cars moving on the street below as she watched from the living room window, and not for cars standing still, for pictures of cars, or for cars that she was inside of. A similar example of underextended usage

comes from my daughter Eva, who from 14½ to almost 19 months systematically used "off" only in the anticipated or actual context of clothes or other objects (life jackets, safety harnesses, sleep shades, pinned-on pacifiers, bibs, etc.) being removed from her own or someone else's body. This contrasts with the *over*extended use of "off" by Eva's older sister Christy at a corresponding age. Christy's single word "off" was used in connection not only with the removal of objects from the body and in other appropriate adult English "off" situations such as climbing off her rocking horse and taking lids off jars, but also in non-"off" situations involving separation, such as pulling cups *apart*, *opening* hinged or sliding boxes, *unfolding* newspapers, and so on.

In forming an underextended word meaning, a child appears to identify the word not only with contextual features that are critical to that concept from the adult point of view but also with some that are irrelevant. Allison, for example, included extraneous material about motion and location of observation (living room window) in the concept governing her use of "car." For Eva, "off" was a relationship of separation that required the participation of a restricted set of objects: bodies and objects that can be worn on them. Achieving adult knowledge of an initially underextended word involves freeing the word from its contextual constraints, i.e., learning that certain semantic features that were once intimately linked with the word are irrelevant, or at best only probabilistically associated with it.

Still another way in which children may use given words differently from adults has been pointed out by Schlesinger (1974), who calls it a mix of overextension and overrestriction, and Anglin (1975), who calls it *overlap*. In overlap, the word is used for some referents in accordance with adult norms, but it is also used for some referents for which an adult would use other words and it is *not* applied to all the referents for which an adult would consider it appropriate. For example, one 16-month-old used "cake" for any food that he could eat himself and "eat" for all other foods, including, presumably, cake eaten by others (Segerstedt, 1947, cited in Schlesinger, 1974). Here, the word is used appropriately only for the food the child eats which is actually cake, but in addition to this area of appropriate usage the word is both *overextended* with respect to other foods eaten by the child and *overrestricted* (i.e., underextended) with respect to cake eaten by others.

Complexive Groupings Although much of the recent research on the acquisition of word meaning has been concerned with discov-

ering contextual features that recur in all the situations in which a word is produced, earlier investigators instead stressed examples in which the child had apparently failed to identify the word with a stable feature or combination of features (e.g., Vygotsky, 1962; Werner, 1948). In the famous example cited by Vygotsky (1962, p. 70), for instance, a child used "quah" first for a duck swimming in a pond, then for water in a glass and milk in his bottle, then for a coin with an eagle on it, then for any round, coinlike object. Vygotsky called such usages *chain complexes*, noting that "each new element included has some attribute in common with another element, but the attributes undergo endless changes" (p. 70). Vygotsky argued that "complex formations make up the entire first chapter of the developmental history of children's words" (p. 70). Brown (1965) appears to concur, although cautiously stating only that "it is possible that children characteristically attempt to use words as names for chain complexes" (p. 327).

Bloom (1973) attributes complexive usage of words to the child's stage of cognitive growth. She points out that according to Piaget, children do not attain a clear concept of object permanence until the second half of the second year. Because until that time the child allegedly has no firm mental representations or images of objects, the meanings of his object words are unstable and can shift. The instability of early object words is reflected not only in complexive usages, but also, according to Bloom's analyses of her daughter Allison's speech, in the infrequent use of particular words for objects and in their high "mortality rate," or tendency to drop out of use. Bloom contrasts Allison's unstable use of object words with her frequent and consistent early use of "function" words such as "away," "more," and "up." Because these latter words referred not to objects themselves but rather to their recurrent *behaviors*, they presumably did not depend for their meaning on mental representations of objects.

In studying the acquisition of word meaning by my two daughters, Christy and Eva, I found, like Bloom, that certain function words such as "off" were used early, frequently, and consistently (i.e., noncomplexively) (Bowerman, in press a; cf. examples in the discussion of underextensions). However, unlike Bloom, I also found that many of the children's earliest words for objects (e.g., "dog," "ball," "bottle") were used frequently and stably over time for objects that shared one or more properties. This finding is inconsistent with the hypothesis that the child cannot acquire a stable meaning for object-words until he has reached the final stage in his develop-

ment of the concept of object permanence in the last half of the second year. Huttenlocher (1974) presents data on word comprehension that are relevant here. She found that when she asked her young subjects "where is X?" (when X was an object with a permanent location in the house that was out of sight at the time of questioning), some children as young as 13 or 14 months were capable of responding by going to the spot. Huttenlocher argued on the basis of such data that "it certainly appears that children may possess a considerable capacity for mental representation of object properties in the period before they name many objects" (p. 365). In summary, we can only conclude that the relationship between the way in which children use their early object words and the time at which, according to Piaget's analyses, they attain the final stage of the concept of object permanence is unclear.

In analyzing data from Christy and Eva, I found evidence for a type of "complexive" usage which, unlike "chain complexes," did not reflect unstable, endlessly shifting meanings, nor was its occurrence limited to the very earliest period of the single-word stage; rather, it continued on for many months (Bowerman, in press a). In chain complexes as Vygotsky (1962) and Brown (1965) described them, the successive referents of a word are linked with each other in an end-to-end fashion such that the last referent does not necessarily have anything in common with the first. However, Vygotsky (1962) also described another kind of complex, the "associative complex," which is evidenced in the way children sometimes perform in block sorting experiments. In associative complexes, the successive blocks picked by a child to go with a first block provided by the experimenter do not necessarily share anything with each other, but all share at least one feature (e.g., size, color, shape) with the original block.

Some of Christy's and Eva's word usages were clearly associative complexes of this sort. A good example is provided by Eva's early use of "kick." She said "kick" 1) first (at 17 months, 3 weeks) in connection with herself kicking a stationary object, 2) then while looking at a picture of a cat with a ball near its paw, 3) for a fluttering moth, 4) for cartoon turtles on TV kicking their legs up, 5) as she threw an object, 6) as she bumped a ball with her trike wheel, making it roll, 7) as she pushed her chest up against a sink, and so on. These diverse situations were not related to each other through any constant shared features(s), nor were they linked end-to-end by a shifting series of similarities. Rather, all of the situations in which the word was used were characterized by one or some combination of three

features *all* of which are present at the same time in what can be considered an original or *prototypical* "kick" situation, in which the word had most often been modeled: the kicking of a ball with a foot. For instance, examples 3 and 4 are characterized by "a waving limb", example 7 by "sudden sharp contact", example 1 by "sudden sharp contact" plus a "waving limb", example 6 by "sudden sharp contact" plus "an object propelled," and example 5 by a "waving limb" plus "an object propelled." (See Bowerman, in press a, for further examples similar to "kick".)

Complexive usages of this type, where several features are probabilistically associated with a word but not all must be present before the word can be used, are not limited to child speech. Maratsos (1976), for example, cites evidence that many words as they are used by adults have no single defining feature or set of features that characterizes all referents; instead, there is simply a set of relevant features that are present in various combinations in the referents to which the words are applied (see also Wittgenstein, 1953; Rosch, Mervis, 1975). Because this type of complexive usage is not limited to children, it cannot be considered a primitive mode of conceptual organization that fades out. The particular *words* that initially are treated in this way may later receive a more constrained interpretation but the process itself remains a viable way of organizing and storing word meaning.[8]

The Semantics of Equivalence

Expressive vs. Referential Language Findings from several recent studies suggest that children may differ considerably in the kinds of similarities across experiences to which they are initially attuned for purposes of acquiring and using words. These differences may be reflected either in the particular words that they "select" to acquire

[8]The view that a word may be associated with a set of features not all of which need be present in the contexts in which a word is used is found in Clark's (1974a, 1975) concept of "partial overextension" (see p. 116, above). It gains support from data presented by Labov and Labov (1974), who observed that for one child the word "cat" appeared to be identified with a set of core features. Although the child used the word for animals that displayed only one or two of these features, she did so with hesitation, saving the more confident use of the word for animals in which many or all of the features were present. The notion that at least some words are initially learned in connection with "prototypical" exemplars is also in accord with an interpretation of word meaning offered by Fillmore (n.d.) as an alternative to theories that characterize word meanings as "checklists" of independent conditions to be satisfied. According to Fillmore, the meanings of many words even for adults are best explained by appeal to prototypes or best exemplars. Rosch (1973b) presents related arguments.

from those that are modeled or in the way in which they *use* the words that they have, or both.

In a study of how 18 children acquired their first fifty words, Nelson (1973b) found evidence that some children tend to specialize in learning general (as opposed to proper) names for objects, while others concentrate primarily on names for people and on "personal-social" words and phrases such as "no," "yes," "want," "please," "stop it," "go away," "hi," and "ouch" (pp. 21–22). The categories of experience that are tagged by words like "no," "ouch," "want," and "hi" differ from those labeled by words like "ball" and "doggie" in that they involve the recognition of similarities across particular internal states (e.g., of rejection, pain, desire) and social situations (e.g., "encounters with friendly people") as opposed to recognition of similar "objective " properties in diverse objects. Thus, to the extent that children "specialize" in learning either expressive ("personal-social") words or names of objects, they are attending to different kinds of invariances across their experiences as they acquire words.[9]

Nelson (1973b) accounted for these differences among her subjects in terms of differences in children's initial perception of the *function* of language. She hypothesized that some children see language primarily as a tool for reference while others see it as a means of expressing feelings and needs and of regulating social interactions (pp. 22–24). She proposed further that such differences in language use derive ultimately from differences in children's prelinguistic cognitive styles, or ways in which they typically organize their experience (pp. 101–102).

Rosenblatt (1975) performed an analysis similar to Nelson's on the first words of a group of English children and also found that some of the children seemed to be learning a "reference" language and others an "expressive" or "person oriented" language. She reported in addition that the children's tendency to learn words of one type or the other was correlated with the way in which they played with toys: the early learning of "general nominals" (common, as opposed to proper nouns) was "related to shorter latency to touch toys, high visual attention to toys, high task persistence, and negatively related

[9]The words a child uses cannot be taken as a direct guide to the concepts he may have, nor does the sequence in which his words come in necessarily reflect the order in which his concepts were formulated, for reasons discussed in Bloom, 1973, p. 140; Huttenlocher, 1974, p. 366; and Schlesinger, 1974, pp. 141–143.

to social attention and interaction." In contrast, learning "personal-social words" was "related to adult-oriented behaviour, and greater time spent 'not playing'." These correlations between linguistic and nonlinguistic behaviors accord well with Nelson's (1973b) interpretation of children's word selection strategies as reflecting their general cognitive style.

In an intensive study of two children, Dore (1974) came up with findings related to those of Nelson and Rosenblatt. According to his analyses, one of his subjects used language "primarily to declare things about her environment" while the other used it "mainly to manipulate other people" (p. 350). Dore called these the "code-oriented" and the "message-oriented" styles, respectively. The code-oriented child produced far more words than the message-oriented child, and most of these were used in acts which were not addressed to other people, such as labeling, repeating, and practicing. The message-oriented child produced fewer words but controlled a larger repertoire of prosodic features (intonation patterns), which he used instrumentally to influence other people, by, for example, calling, protesting, and requesting things.

In sum, the distinction between children who use language primarily to refer and those who use it primarily to interact with other people and influence their behaviors has received support from several sources and so may prove to be of some generality. Learning to refer to things appears to necessitate acquiring words, but learning linguistic ways to manipulate and interact with people can involve either learning words ("please," "want," "thank you," "bye bye") or learning intonation patterns that can be used "wordlessly" (Dore, 1974) or in conjunction with words.

It must be stressed that the "expressive" or "message-oriented" style and the "referential" or "code-oriented" style are not mutually exclusive. All of the children studied combined elements of both, but simply leaned in one direction or another. Ultimately, deciding which way a child leans must depend not only on classifying the early words he produces, as Nelson (1973b) and Rosenblatt (1975) did, but on observing closely *how* he uses these words in a variety of situations. Words that are initially used in an expressive way can develop referential properties as well. For example, my daughter Christy used "bye bye" expressively at 14 months, either when people left or when she was playing a game in which she announced her own intended departure. By 17½ months, however, she was using it most often as a *comment*, equivalent to "allgone," on "departures" of all kinds: for

example, as she closed a drawer after putting an object into it, as she put a lid on a teapot after filling it with peg dolls, after she stuffed dominoes under her legs as she sat on the couch. In a similar example of shift from expressive to referential meaning, Ferrier (1975) reports that her daughter used "phew!" first as a greeting when her mother entered her room in the morning (derived from her mother's reaction to the smell that met her), but later applied it to diapers, whether soiled or not. Just as words that appear to be expressive can also be used referentially, words that "look" purely referential (e.g., labels for objects) can be used exclusively in situations in which the child is trying to influence adult behavior (see Bates, this volume, for some examples). In short, then, distinguishing between referential and expressive usage is a complicated matter that requires close attention to the contexts in which words are used.

Categorizing Objects: Perceptual or Functional Similarities? When children learn words that refer to classes of objects, how do they classify the objects? Are some bases for categorizing objects for purposes of word use more available to them than others? That is, are children predisposed towards seeing certain kinds of similarities and not others among the objects they encounter? This question has aroused strong but conflicting opinions in the recent literature on the acquisition of word meaning.

After a careful examination of overextensions reported in diary studies from many countries, Clark (1973b, 1974b) concluded that the similarities children primarily respond to in applying words to new objects are *perceptual* properties, particularly shape, then size, sound, movement, texture, and, to a much lesser extent, taste. (Color was notable for its absence as a basis for extension). For example, a word such as "button" would be extended to anything small and round, such as a collar-stud, a door handle, and a light switch (Pavlovitch, 1920). Or a word for "cat" would be extended to cotton or any soft material (Shvachkin, 1973).

Nelson's (1974) position on how children form the categories that underlie their early use of words for objects contrasts sharply with Clark's. According to Nelson, perception plays a secondary rather than a primary role in concept formation, not only in childhood but throughout life. More basic than perception is *function*. Thus, she argues, children do not start out by analyzing the objects they encounter into perceptual components such as "round" or "four-legged" and using such components as a basis for classifying those objects with other objects. Rather, they experience objects as

wholes, in terms of the sets of dynamic relationships and actions they can enter into. Objects are regarded as similar not because they look similar but because they enter into the same relationships, or, put more simply, because they function (act or can be acted upon) in the same way (Nelson, 1974, p. 274).

Perception is secondary, in this view, because it is used not as a basis for categorizing but simply to *identify* an object as a probable instance of a concept even when the object is experienced apart from the relationships and actions that are concept-defining. For example, a child forms a concept of "ball" on the basis of the kinds of activities he engages in with balls (e.g., rolling, bouncing). At any time after the concept is formed, he begins to analyze the individual exemplars of the concept to find recurrent perceptual attributes that will allow him to recognize new objects as balls even when they are not experienced in action. Perceptual features that help him identify instances of a concept are only probabilistically correlated with the concept. An object can still be considered an instance of the category even when one or more of the expected perceptual features is absent as long as the object satisfies the function-based defining criteria for the concept.[10]

The theories of Clark and Nelson make clear-cut but divergent predictions about how children initially use words for objects. Clark's theory predicts that a given word will be used to refer to objects that *look* (or, less frequently, sound, taste, or feel) alike, regardless of function, while Nelson's theory predicts that the word will be used to refer to objects that either function in the same way, regardless of looks, or that the child *predicts* would function in the same way on the basis of their appearance. Both the functional and the perceptual

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[10]A difficulty with Nelson's function-based theory of concept formation is that the kinds of shared functions which she hypothesizes the child uses in classifying objects as equivalent are *themselves* categories, and Nelson does not account for how the child acquires *these*. For example, Nelson proposes that the child initially classifies as "balls" those objects that behave in a certain way characterizable as "bouncing" and "rolling." But bouncing and rolling are *categories* that sum across infinitely many slightly different events. That is, the ways in which different balls—e.g., ones that are big, little, textured, smooth, irregular, etc.—bounce and roll are *not identical*. If we assume, with Nelson, that the child's first basis for classifying objects is shared *function*, we must explain the acts of categorization that must take place prior to this—acts through which different behaviors, by different objects, of rolling, bouncing (or opening, barking, etc., to think of other behaviors or functions that could be used to classify objects) are rendered cognitively equivalent and so become available as cues for grouping the objects that perform them (see Brown, 1956, p. 288, for a discussion of this problem in a different context).

accounts of categorization are in agreement on the salience of *spontaneous motion* as a basis for classifying animate creatures, vehicles, etc. Thus, the conflict is primarily over the relative importance of static perceptual features like shape in classifying either animate or inanimate objects.

Which theory appears to account better for the data? Nelson (1973a) has provided some supporting experimental evidence for her function-based theory, but the bulk of evidence seems to favor Clark's perception-based theory. For example, in an explicit test of the two theories I analyzed previously collected data (both taped and hand-noted) on the way in which my two children extended each of their object-words to novel referents from the start of the one-word stage on (Bowerman, in press a). I looked only at usages that were erroneous from the adult point of view, since correct usages could have been learned through modeling. Many errors involved objects that were similar both perceptually *and* functionally (e.g., "cherry" for both cherries and grapes); for these, of course, either or both kinds of similarities may have contributed to the categorization. The only errors that were useful for comparing the accuracy of the two theories' predictions were those involving objects that are clearly perceptually dissimilar but functionally similar or *vice versa*. Among these, there was only a tiny handful in which the error was based on *shared function* in the absence of perceptual similarity, while there were scores involving perceptual similarities, particularly, shape, in the absence of functional similarities.[11]

What is particularly significant for purposes of evaluating the two theories is that the children's overextensions based on shared perceptual attributes often *cut across* functional differences among the objects involved which were *well known* to the child. In other words, known functional differences were overlooked in the interests of classifying on the basis of a perceptual similarity such as shape. For example, Eva used "moon" from 15;4 (15 months, 4 weeks) on to refer to the real moon, to half-grapefruits and slices of lemon she was looking at or handling, to tiny flat circular green leaves she had

[11]Examples of overextensions based purely on function in the absence of perceptual similarity are rarely reported in the literature, so two are given here to illustrate the genre. At 16 months, 3 weeks, Eva watched Christy blowing on a harmonica, then she herself picked up a tiny bead bracelet and blew on it, saying "balloon." At about 25 months Eva began to say "wastebasket" (usually in a sentence) to refer to any place she was dropping or putting scraps of waste paper (e.g., the floor, under a sofa cushion).

picked, to a ball of spinach she was about to eat, to a magnetic letter D she was putting on the refrigerator, to hangnails she was pulling off, to crescent-shaped bits of paper she had torn, etc.

Naming behavior of this kind obviously was not predictive in nature. That is, Eva was not using perceptual features (round, half-moon, or crescent-shaped) as a means of identifying probable instances of a concept "moon" which had a core meaning involving functional relationships. Use of perceptual similarities as a clue to probable function did occur at times (as when Eva at 17;1 said "barrette" *while trying to fasten a small stapler into her hair*), but it cannot account for the majority of perceptually based overextensions in the Christy and Eva data.

Experimental studies of somewhat older children also suggest that the early classification of objects is more often based on perceptual than on functional similarities, although the studies perhaps do not provide a fair test of the two theories because the "functional" similarities among the stimulus objects had to be inferred from pictures rather than experienced in action. In one study, Press (1974) asked children from 2 years, 8 months to 6 years to look at a picture of an object and then find "another one" or "another BORK" (or other word), depending on the condition, from an array of three pictured objects. The children's choices, especially those of the younger subjects, were based more on perceptual similarities such as shape and pattern than on inferrable functional similarities. Anglin (1975) reported that young children (exact ages not given) overextended words to pictured objects that were "perceptually similar" to the objects normally referred to by those words far more often than they overextended words to objects that were "functionally similar." (Perceptual and functional similarity had been determined previously by the ratings of judges). For example, errors such as calling a balloon "apple" predominated over errors like calling a sled "car"; in fact, there were almost no errors of the latter type.

The above discussion presented evidence indicating that perceptual similarities are stronger determinants than functional similarities of children's judgments of equivalence among objects. However, the potential that objects have for acting and being acted upon is evidently an important determinant of *which* objects children initially "select" to learn names for. Studies of children's first words have revealed that children tend to ignore names for items that are "just there" and do not do anything, like furniture, trees, and rooms, in favor of names for objects that act or which they can act on, like pets

and other animals, cars, shoes, foods, and toys (Nelson, 1973b, 1974; Anglin, 1975). For example, Huttenlocher (1974) discusses a boy who, despite his emerging ability to understand other words, apparently did not learn the referents of "kitchen" and "refrigerator" even after extensive and persistent maternal modeling and demonstration. It seems, then, that children's attention is drawn to objects with potentials for acting or being acted on, and they will tend to learn names for such objects earlier than names for more static objects. However, classifying such objects as equivalent for purposes of word use appears to depend more upon their perceptual qualities than upon their functions.

Nonobject Concepts Most investigators have made a sharp distinction between words that refer to objects and those that refer to actions, attributes, processes, etc. (e.g., Bloom, 1973, pp. 68–70; Nelson, 1974, p. 281). However, the grounds for determining which words refer to objects and which do not have never been made entirely clear. For example, when a child says "ball" only in connection with objects that he throws (or rolls, etc.), is he naming the object or the action he is performing on it? When one child (my daughter Eva) says "close" while closing a door or a barrette or while pushing a chair up to a table, and another (a friend named Rachel) says "door" in exactly these same contexts, should we assume that the former is naming the actions that she is performing while the latter is naming the objects, which she has classified together because they are acted upon in the same way? When a child says "allgone," are we to assume, with Bloom (1973), that she is referring to an event of disappearance, or could she perhaps be using disappearance as a "functional relationship" by means of which objects can be classified, such that she is really naming the departed object as a member of the category defined by the transitory function "allgoneness"? Before we can confidently determine whether a child's words refer to objects themselves or to the actions, behaviors, or attributes associated with them, we must determine the principles by which a child might be expected to decide that some actions, behaviors, and attributes (e.g., rolling, bouncing, opening, sitting on, being round, etc.) are useful for classifying objects as members of the same category while others (e.g., disappearance, upward motion, color, etc.) are not. Having registered this need for caution in classifying children's words according to the nature of their putative referents, however, I want to proceed to consider some types of words children use in the early stages of word acquisition that are most *plausibly*

described in terms of concepts of action and the like rather than objects.

Bloom has highlighted children's early acquisition of words encoding the notions of *recurrence* ("more") and *disappearance, nonexistence,* and *cessation* ("allgone," "no more," "away," "no," "stop") with data from both her own daughter during the one-word stage (Bloom, 1973) and from three somewhat older subjects who were just beginning to combine words (Bloom, 1970). Data from my children at the one-word stage support the salience of these particular notions and confirm the early availability of other concepts that Bloom and/or others have discussed, such as various directional movements ("up," "down," "in," "out," "on," "off," "back," etc.), sharp or sudden impacts, often associated with falling ("bonk," "bump," "boom," "uh oh," "fall," etc.), and manipulations of objects ("open," "close," "break," "push," etc.). The concept of "existence" of an object is reflected in the deictic use of "this," "that," "there" (Leopold, 1939; Bloom, 1973, p. 71), and, for one of my children, in "find!" (when an unexpected object was suddenly encountered). Early labels for *properties* of objects primarily designate changeable and transitory states like "hot," "wet," and "dirty" rather than permanent qualities like "round" or "red" (MacNamara, 1972; Wells, 1974).

Some investigators (e.g., MacNamara, 1972) have hypothesized that names for objects are learned before names for actions, states, and properties, but there seems to be some variability among children in this regard. For example, as noted earlier, Bloom's (1973) daughter used a number of words referring to actions or behaviors (e.g., "away," "up," etc.) productively and consistently *before* she knew many object names, and she often used them in connection with the behaviors of objects for which she had no words. On the other hand, Huttenlocher (1974) found that the three children she studied both understood and produced object words before nonobject words. Such differences among children might be due to variations in cognitive style of the kind discussed earlier in connection with children's differential attentiveness to "personal-social" words vs. "referential" words.

Like words for objects, words for actions, behaviors, properties, etc. may initially be linked to a somewhat different configuration of nonlinguistic properties than they are later in a child's development. Sometimes they are overextended. For example, Christy's "off," described earlier, at first seemed to encode any kind of separation of

two objects or two parts of the same object. Similarly, but for the reverse operation, Velten's (1943) daughter Joan had a word "ba" (from "bang") which applied to things which had "moveable parts that may be joined together, such as boxes with hinged covers, doors and books to be slammed shut, napkins and papers that can be folded over, and all kinds of fasteners like buckles, snaps, safety pins, and zippers" (p. 283). The breadth of application of such words is subsequently narrowed down as children acquire words that subcategorize the semantic domain, as when Joan Velten learned "shut," "snap," and [bat] ("button, buckle").

Initial restriction of a nonobject word to a limited range of contexts (underextension), which indicates that the child has identified the word with a set of rather specific contextual features, is possibly even more common than overextension. For example, Leopold's daughter Hildegard first used "up" only in connection with her own movements, and not until 2 months later in connection with movements upon inanimate objects (Ingram, 1971). Similarly, both Christy and Eva used "up" and "down" initially for their own activities (as requests and comments), then for those of other people, and finally for inanimate objects. Christy and Eva also used "more" in connection with a restricted set of objects at first—food and drink. Bloom's (1973) daughter Allison likewise first produced "up" in connection with herself and "more" as a request for an additional serving of food or drink, although within only a few days she began to use these words across a range of more varied contexts. It is not clear, of course, whether a child's underextended use of a word stems from his not having yet *formulated* the broader concept (e.g., the upward motion of any object, the recurrence of any object or action) or from his failure to *use* a concept that he has formulated on the nonlinguistic level as a linguistic category.

Unlike "more," "up," "down," and related words that adults can apply to the behaviors of almost any entity, many words in adult usage *must* be restricted to the activities of particular kinds of objects, e.g., animate beings. Christy and Eva treated some of these words exactly as they did "up" and "down," in that they initially used them only in connection with themselves and other animate beings and later extended them to inanimate objects (e.g., "walk" for slow-moving cars and airplanes, "night night" for normally vertical objects like bottles and Christmas trees seen in a horizontal position, "sit" when the child plopped a handful of toys on the floor). Changes over time in the use of these words was thus the same as for "up,"

"down," etc. However, notice that while "up" and "down" were initially *underextended* from the adult viewpoint and later used appropriately, "walk," "sit," etc. were initially used appropriately and later *overextended*.

To sum up, the data presented in the last two subsections ("The Syntax of Equivalence" and "The Semantics of Equivalence") indicate that getting a word hooked up to exactly the right set of contextual properties is an extremely complicated matter. Every setting in which a child hears a word is composed of a complex configuration of discriminable components. Some of these components have to do with directly observable phenomena (e.g., objects, actions, and their properties), others with the speaker's feelings, reactions, beliefs about the feelings of others, and intention or purpose in speaking (e.g., to command, register a reaction ("phew!"), interrogate, etc.). The child learning language is faced with the task of trying to discover which of the innumerable aspects of the contexts in which he hears words used are the relevant ones. It is hard to imagine how he ever arrives at the right solutions, and correspondingly easy to see how he might pick out components or combinations of components that are salient to him but incomplete or irrelevant from the adult's point of view.

Origins of Children's Word-Concepts

Cognition or Language First? According to a traditional account of the acquisition of word meaning, a child learns the meaning of a word by hearing it paired with a number of different referents and gradually abstracting out a concept consisting of all of the attributes which the referents have in common (see Nelson, 1974, for a description of this account, which she terms "abstraction theory"). Many investigators currently studying the acquisition of word meaning take issue with this view, however. For example, Nelson (1974) argues that initially, at least, words are learned as labels for concepts that have already been formed on a nonlinguistic basis rather than themselves serving to introduce new concepts to the child. The evidence she advances for this hypothesis includes the child's "selectivity [of words to learn] from a larger set of parent words" (see the discussions of Nelson's (1973b) study in this regard in the section on "The Semantics of Equivalence") and the fact that children sometimes invent words for idiosyncratic concepts if they have not encountered suitable lexical items in the adult input to them (1974, p. 269).

Like Nelson, Huttenlocher (1974) stresses the language-

independent origins of the early concepts to which words are attached: "... the 'meanings' which became linked to word-sounds formed unitary cohesive elements of experience before that linkage occurred.... The existence of salient unitary 'meanings' (schemas) may even have been a prerequisite for the child to attend to the accompanying word-sound" (p. 356).

Clark (1974a) also theorizes that the meanings children initially attach to words depend upon nonlinguistic categorization processes.[12] Specifically, she proposes that children extend words to novel referents on the basis of perceptual categories that are formed prior to the learning of those words. Where do these perceptual categories come from? Clark (1974a) argues that at least some of them reflect a universal way of organizing experiences. In formulating this hypothesis, Clark notes that the properties which children use as a basis for extending words to new objects are very similar to the properties encoded by the obligatory classifiers found in many natural languages. Classifiers are words or particles used when objects are being counted (e.g., "nine *round-things* balls") or with verb stems (e.g., "he caused-*round-solid-thing*-to-move upwards stone" [he picked up the stone]). According to Clark, "visual perception appears to play a central role both in children's overextensions and in the semantics of classifier systems. In both, objects are categorized on the basis of perceptible properties of shape which may be combined with other secondary characteristics. Furthermore, the same basic properties of shape appear to be selected as relevant to categorization in both the acquisition data and in classifier systems. Roundness and length... appear to be the most salient of all." Clark concludes that children's emerging semantic distinctions and the classifier systems of natural languages are similar because both depend on a universal "*a priori*, nonlinguistic categorization process" (Clark, 1974a).

In a somewhat earlier era of research, Brown (1965) stressed the problem that cross-linguistic variation creates for a concept-precedes-word theory of cognitive development. He noted that certain concepts (e.g., object permanence, conservation) appear to de-

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[12]Nelson criticizes Clark's theory as being "no more or no less than a revised version of the abstraction of critical attributes plus hypothesis testing" (1974, p. 272), but in fact the postulation of hypothesis-testing on the part of the child distinguishes Clark's view sharply from the one Nelson is challenging. According to Clark (1974a and b, 1975), the hypothesis the child forms about the meaning of a word in fact derives directly from his nonlinguistic conceptualization of the world. I cannot see an essential difference between Nelson and Clark on this point.

velop universally and therefore probably do not depend on language. However, he argued, "the ubiquity of linguistic nonequivalence suggests that reality can be variously construed and, therefore, that the child's manipulations and observations are not alone likely to yield the stock of conceptions that prevail in his society" (1965, p. 317). He concluded, therefore, that many concepts are introduced through language rather than acquired first on a nonlinguistic basis. In particular, he proposed that "the recurrent word [as heard by the child] . . . serves to attract relevant experiences, to sum them over time into a conception governing the use of the word" (1965, p. 311).

There is not necessarily a conflict between Brown's view and those of Nelson, Clark, and Huttenlocher. One way of reconciling the two positions would be to suppose that the latter three investigators are talking about the very earliest stage of word acquisition while Brown's arguments may be more relevant for a slightly later period. Not even staunch advocates of the cognition-first position argue that language *never* plays a role in introducing concepts. Nelson (1973b) specifically suggests, in fact, that "the child acquires his first *n* (productive) words by matching environmental labels to his own concepts (*n* is some unknown number between 10 and perhaps 100). . . . After the child has acquired *n* words that match his own concepts he may reverse the process and build a concept to match a word that others use to him" (pp. 114 and 115). There is another possibility, however, which is that linguistic input can play a part *from the start* in shaping children's conceptual development. Some lines of argument and evidence for this position will be reviewed.

Role of Linguistic Input As noted in an earlier section entitled "Origin of Semantic Concepts," some researchers have begun to question whether the child's prelinguistic conceptual development is totally uninfluenced by the kind of language directed to him. Wells (1974), for example, argues that there are a number of different determinants of how children come to structure and interpret their experiences and that their conceptualizations undergo constant revision. In the early stages of development, suggests Wells, the child uses criteria for classification that "are derived directly from his actions upon and his perceptions of the people, objects, and events in his environment" (p. 254). However, the particular structuring of the environment, both physical and verbal, provided by the child's caretakers begins to have an increasing effect on what the child attends to and tries to make sense of. Thus, according to Wells,

"language is an important means of discriminating and giving salience to those aspects of the environment that are considered important, but even before the child acquires language, the meanings that he constructs will be influenced by his attention being selectively directed by those around him" (p. 254). Wells concludes that "it would be surprising if the frequency of occurrence of different kinds of meanings in the adult linguistic input to the child did not have some influence on what the child attended to and sought to communicate about," over and above the effects of very general cognitive developments of the type of Piaget has investigated (p. 268).

Wells' comments about the role of social interaction in general and linguistic input in particular are in accord with Bruner's (1975) analyses of the roots of language in the shared activities and ritualized play interactions of the mother and child. Bruner studied the way in which 6 mothers interacted with their babies (who were initially approximately 7 months old) for a period of about 6 months. He found that a large proportion of the interactions involved the mothers' efforts to verbally *interpret* their child's actions by inferring his intentions or other "directive states" (p. 12). Moreover, each mother sought to " 'standardize' certain forms of joint action with the child" in such a way as to allow the child to bring his attention into line with her own, predict her intentions, and develop "more or less standard ways of signalling his intent" (p. 12). It seems highly unlikely that a child's developing cognitive understanding of the world would remain totally uninfluenced by such a barrage of repetitive interactions with caretakers who verbally label and describe his activities and intentions according to their own interpretations.

A second line of argument for the view that the verbal input to a child may influence his conceptual development can be made by drawing on a study by Brown (1958a, 1965) on the way in which parents *select* the words that they use with their offspring. Brown pointed out that every object or event can be referred to in a variety of ways, at different levels of generality. For example, "the dime in my pocket is not only a *dime*. It is also *money*, a *metal object*, a *thing*, and, moving to subordinates, it is a *1952 dime*, in fact a *particular 1952 dime* with a unique pattern of scratches, discolorations, and smooth places" (1958a, p. 4). How do parents decide on the level of generality at which to refer to things? Should they call the dime a *dime*, a *coin*, *money*, a *thing*, or what? Brown noted that parents do not always choose the same words they would use to other adults, but they tend to agree in the particular choices they make. What accounts for this

phenomenon? According to Brown, parents name at the level of generality that categorizes objects and events at their "level of probable nonlinguistic equivalence" for the child (1965, p. 319). In other words, parents "anticipate the functional structure of the child's world" (1958a, p. 8) by providing names at the level of generality that categorizes objects or events in a way that they assume the child will find meaningful. For example, the mother selects "dog" instead of "collie" because she knows that as far as the child is concerned there is no sense in distinguishing between breeds of dogs; all are the "same" in terms of how the child is expected to behave toward them. Conversely, however, the mother does not choose "animal" as a label for a dog because it is too general: behaviors that are appropriate for the child to produce in response to dogs are not appropriate for lizards, horses, squirrels, etc.

Anglin (1975) reports some experimental confirmation of Brown's proposals both that parents tend to label things differently for children than for adults and that the objects classified together by the words they select are those towards which children are expected to behave in the same way ("behavioral equivalence"). Anglin asked mothers to name pictures of objects both for another adult and for their 2-year-olds. For the adults the mothers gave words like "Volkswagen," "collie," and "pigeon," but for the children they provided "car," "bird," "dog," etc. When other adults were asked to rate terms from a set of hierarchically nested category labels (e.g., vehicle, car, Volkswagen; animal, dog, collie) on the basis of the degree to which they name objects at a "behaviorally equivalent" level of generality for the 2-year-old, they rated as most behaviorally equivalent those words that mothers typically provide.

The same sort of parental selectivity of ways to refer to things undoubtedly occurs for words for attributes, actions, etc., as for words for objects, although it has not to my knowledge been documented. Have not most of us at some time or other, when speaking to a child, referred to a torn book or coming-apart teddy bear as "broken," or said of an object put away in a box that it was "going night night"—words which we would never use to an adult in these same situations? This kind of word selection anticipates what we suppose a child will be able to understand, which in turn reflects our assumptions about how he has classified events in his world.

The fact that parents modify their labels for referents in the direction of the level of abstraction at which children may already be predisposed towards categorizing experiences makes it difficult to

assume with confidence that linguistic input plays no role in helping the child formulate his initial word-concepts. Children may indeed tune out words that correspond to none of their mental constructs, but the recurrence of the same words in contexts which they are already cognitively predisposed towards regarding as similar may well aid in their construction of the relevant concepts.

Data from Christy and Eva One way to study the origin of children's word-concepts would be to examine children's use of particular words closely to assess the likelihood that the governing concepts could have been formulated totally independently of language input. In performing a preliminary analysis of this sort on data from Christy and Eva, I found evidence for several different relationships between linguistic input and concept formation (Bowerman, 1976).

In some cases there was evidence that the child had on her own firmly decided on the nature and boundaries of a concept underlying the use of a word, apparently resisting the interpretation that patterns of adult usage would call for. An example of this type is Eva's initial use of "off," mentioned earlier, which for some time was restricted to objects being removed from the body. The concept of "things coming off the body" was not implicit in the parental use of "off," as is substantiated by Christy's completely different initial interpretation of the word. When two children differ sharply in the way they first use a word despite having received similar verbal input, it seems likely that their interpretations of at least this word were determined primarily by how they had organized their experiences on the nonlinguistic level.[13]

In contrast to examples like "off," however, there were other

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[13]Of course, Eva's input was somewhat different from Christy's because she had an older sibling, which Christy did not. However, there is a 2½-year age difference between them. By the time Eva was acquiring "off," Christy was close to 4 years old and her use of "off" was indistinguishable from that of an adult.

Since adult English usage classifies all actions resulting in removal of things from the body as "take off," one must ask whether Eva was not encouraged by linguistic input to regard at least all of *these* operations as similar. One way to test this hypothesis would be to investigate the classification system of Japanese-speaking children, who do *not* receive a homogeneous input with respect to acts of removal from the body (see p. 109). If they typically use different words for different subclasses of removal right from the start, then language probably influences the child's initial classification of this domain. If, however, Japanese children tend to overextend a word to all acts of removal from the body, it would be apparent that the classification can easily be made independently of language input. Even if language may have influenced Eva to regard acts of removal from the body as similar, her "decision" to include no other kinds of separations in this category was clearly made independently of language, given the much wider adult usage of "off."

patterns of word use that seemed to reflect an interaction between the adult input and the child's own efforts to impose structure on events. A good illustration comes from Christy's data. At 18 months she began to use "hi" in a peculiar way in addition to its normal use as a greeting. For example, she said it as she balanced tiny toys or drops of milk on the end of her finger, while sliding her hands under a blanket or the hood of her snowsuit and holding them up, as she stuck her fist into the silverware holder of the dish drainer and into a mitten-shaped potholder, when a washrag drifted across her foot in the tub, and when a shirt fell over her foot in her crib.

What would cause a child to develop a concept to do with something resting on or covering her hands or feet? The most plausible assumption is that language was influential in getting this concept started, but that the particular shape the concept assumed was Christy's own invention. When playing with her I would sometimes put a finger puppet or a tiny object like the cap of a pen on my finger and pretend that it was a little person, coming to say "hi." So she heard "hi" modeled in connection with seeing something stuck on the end of a finger. What is a child to make of this modeling? Rather than construing "hi" in its known sense as a greeting, she apparently concentrated on the connection between the word and the object on the finger, and from this start managed to account for the usage she had encountered by constructing a concept around the notion of things resting on or covering the hands, or, by analogy, the feet. In this example, then, adult usage appears to have provided the germ of a concept, perhaps, as Brown suggests, by "attract[ing] relevant experiences" (1965, p. 311), but the child herself supplied the structure of the concept from her own ingenuity at making sense of events.

I have not yet done the necessary analyses to determine whether word usages like Eva's "off" tended to be early phenomena while those like Christy's "hi" were relatively late in the one-word stage. This is what would be predicted by Nelson's (1974) hypothesis that the child acquires at least his *first* words by matching modeled forms to his own independently generated concepts, only beginning to build concepts to match words somewhat later. Even if this view should turn out to be correct, however, it is apparent that a complex interaction develops quite early, before the child's vocabulary is very large, between the child's own propensities for viewing things as similar to each other and the classification schemes imposed by the language to which he is exposed.

ACQUIRING RULES FOR WORD COMBINATION

Now let us move ahead in the child's development to explore the kinds of concepts he makes use of in formulating his earliest rules for word combination. Consider Kendall, a 23-month-old girl whom I studied when she had just begun to put two words together (mean length of utterance 1.10 morphemes) (Bowerman, 1973a). Over a period of 2 days she produced 102 different nonimitated word combinations such as "horse walk," "Kimmy read," "spider move," "Daddy sit," "find Mommy," "taste cereal," "close door," "Bill book," "more lights," and "Daddy here."

The diversity of Kendall's utterances and their appropriateness to novel situations (e.g., "Melissa 'way" as I left the room) suggest that she was not just repeating memorized phrases. Moreover, the fact that she used relatively consistent word order indicates that she was not simply combining two words randomly. Rather, she had some knowledge of sentence structure. But what knowledge? There are a number of theoretical possibilities.

In 1963, Braine proposed that the productivity of children's early syntactic systems derives from their knowledge of where to position *particular words* in a sentence. (Similar proposals were made by Miller and Ervin, 1964, and Brown and Fraser, 1963). Certain words belong in first position, other words belong in second position (a given child might have only a set of first- or second-position words, or both), and still other words are free to appear in either position. For example, Kendall might have learned that when she is making up a sentence with "more" in it, "more" should go in first place.

The proposal that children's early syntactic rule systems primarily reflect knowledge about the permitted positioning of words in sentences has been challenged on both theoretical and empirical grounds. Subsequent analyses of data from a variety of children learning English or other languages have indicated that the position in which a word appears in a sentence typically depends not on the word itself but on the functional relationship(s) it contracts with the other word(s) in the sentence. That is, the young child's use of consistent patterns of word order stems from his identification of these patterns with particular relational meanings that can hold between elements in sentences (Bloom, 1970; Schlesinger, 1971b; Bowerman, 1973a, Brown, 1973). For example, "more" might appear in first position when "moreness" is being attributed to some entity ("more cookie")

but in final position when it represents the object of action or desire ("take more," "want more"). Similarly, "taste" might appear in first position if it is juxtaposed with a word for the item tasted, but in second position if it is accompanied by a name for the one who does the tasting.

Identifying regularities in sentence construction that are deeper than those manifested in consistencies in the positioning of particular words requires making interpretations of what children *mean* by what they say. This in turn requires analyses of the contexts in which the utterances are spoken. Brown (1973) has termed this approach the method of "rich interpretation." Rich interpretation has proved a fruitful approach to the study of child language in several respects. For example, it has led to the identification of basic similarities in the development of children learning a variety of native languages (Bowerman, 1973a; Brown, 1973), and it provides a much-needed route for linking children's linguistic development with their more general cognitive growth (Bloom, 1970; Schlesinger, 1971b; Brown, 1973; Bowerman, 1973a, Edwards, 1974; Wells, 1974). However, despite the usefulness of this approach and its power to explain the relevant body of data, there persists a nagging problem that is particularly resistant to investigation: to identify the *particular* relational meanings with which children's patterns of word combination are correlated.

Four aspects of this problem are considered in the subsections that follow. The first subsection discusses the very general cognitive concepts that are built up during the first 2 years of life. It is argued that while these concepts can be regarded as prerequisites for sentence construction, they cannot in themselves constitute the kinds of relational categories that are required for rules of word combination to operate upon. The second subsection illustrates a range of possible relational categories that children might hit upon. In the third subsection some empirical findings that bear on the problem are reported. And the fourth subsection considers the origins of children's relational categories.

General Cognitive Prerequisites for Sentence Construction

"If you ignore word order, and read through transcriptions of two-word utterances in the various languages we have studied, the utterances read like direct translations of one another. . . . There is a great similarity of basic vocabulary and basic meanings conveyed by the word combinations" (Slobin, 1970, p. 177). In samples from almost

every language one finds sentences that point out or name ("this (that, it) doggie," "here (there) ball," "see man," etc.), constructions that deal with recurrence ("more cookie," "'nother car"), disappearance ("no more noise," "milk allgone," "doggie away"), rejection, denial ("no truck," "no dirty soap"), location ("duck water," "sit lap," "where dollie?"), possession ("Daddy coat," "Mommy nose"), and relationships among agents, actions and objects ("Mommy push," "man dance," "bite finger," "drive car," "spank me") (Brown, 1973; Bowerman, 1973a and b, 1975b).

Attempts to explain these commonalities among children have focused on the correspondence between the semantic content of the early sentences and the general cognitive understanding of the world which a child at the start of word combination can be expected to have achieved (Brown, 1973; Edwards, 1974; Wells, 1974). For example, Brown (1973, pp. 198–201), who draws on Piagetian theory (as do the other investigators just cited), points out that the meanings of the first sentences reflect rather directly the concepts that are established during the sensorimotor period of development (birth through 18–24 months): the continuing existence of objects in space and time (object permanence), the distinction between actors and actions on the one hand and between actions and objects-acted-upon on the other, causal relationships between objects (animate or inanimate) that can initiate actions and the spatial displacements or other changes that objects undergo as a result, and so on.

The universality of the early sentence meanings, their close connections to sensorimotor intelligence, and related evidence have led Slobin to propose that "language is used to express only what the child already knows" (1973, p. 184). Slobin hypothesizes that the child is aided in his efforts to find linguistic devices for expressing his cognitive understanding of the world by a number of "universal operating principles." For example, "a basic expectation which the child brings to the task of grammatical development is that the order of elements in an utterance can be related to underlying semantic relations" (1973, p. 197).

The recognition that there are close links between the meanings of children's early sentences and their more general cognitive capacities has constituted an important advance in the study of child language. However, it is essential to realize that what is still lacking in our knowledge of how children learn to construct sentences is an account of how a child's very general grasp of object permanence, causality, the location of objects in time and space, etc., becomes

organized or transformed into the more specific sorts of relational categories which could constitute the conceptual building blocks for rules of world combinations to operate on (cf. Nelson, 1974, p. 273; Bloom, Lightbown, and Hood, 1975b, for similar observations). The questions that arise when this issue is not dealt with can be illustrated with a proposal by MacNamara (1972). Like Slobin (1973), MacNamara argues that the child's task is to relate semantic intentions that are worked out independently of language to syntactic structures and devices. He suggests that

> ... children initially take the main lexical items in the sentences they hear, determine referents for these items, and then use their knowledge of the referents to decide what the semantic structures intended by the speaker must be.... Once the children have determined the semantic structures, their final task is to note the syntactic devices, such as word order, prepositions, number affixes, etc., which correlate with the semantic structures. Such a strategy will yield most of the main syntactic devices in the language (1972, p. 7).

What is missing here is an explanation of how the child determines the *scope* of the semantic category that goes with the syntactic device he has noted in a particular sentence. To *understand* sentences expressing events in the immediate context, a child need not have formulated any relational semantic categories at all, since, as MacNamara observes, he can simply identify the referents of the lexical items and see for himself how they are related (cf. Bloom, 1974, for discussion of this theme). But to be able to *produce* sentences other than those he has already heard, the child must link the syntactic devices of the input sentences with relational categories broad enough to include not only the specific relationships encoded in those sentences (e.g., between "Mommy" and "cut," "baby" and "mittens," "cup" and "table") but also the many particular *novel* relationships with which he will be confronted.

To how wide a range of "similar" situations will a child assume that he can extend a syntactic device he has registered in a particular input sentence? Suppose that the child has noticed that when Mommy said "Mommy is cutting the meat," Mommy was performing the action of cutting. Now he can perhaps conclude that when he wants to talk about Mommy cutting meat he should put the word "Mommy" first. But what if Mommy is cutting not meat but paper, and using scissors instead of a knife? Should the rule apply here too? Possibly he will assume that whenever he wants to talk about Mommy performing the variety of activities that he would categorize as "cut-

ting," he should put the word "Mommy" first. But what if Daddy is doing the cutting? Can he assume that whenever one is talking about an act of cutting and a cutter, the name for the cutter should go first? And what about breaking? Is this similar enough to cutting that the child will decide that any syntactic device that applies to the relationship between cutter and cutting will also apply to that between breaker and breaking? How about kissing, running, eating, shouting, spilling, etc.? These activities are not very much like either cutting or breaking, but at a rather abstract level their meanings are similar because they all involve an *action* of some kind. Is the child aware of this similarity?

In trying to account for how children get from their understanding of sentences in concrete situations to more abstract relational categories, it is not possible to appeal directly to the child's general sensorimotor understanding of notions of causality, location, and the like. Having a practical knowledge that objects can be located in space in a variety of ways, or that the child himself or others are capable of initiating actions which have effects on other objects, or that people have territorial rights over certain objects does not directly translate into having *categories* like "location," "action," "agent" or "possessor" upon which rules for generating sentences can operate. As Schlesinger (1974) has pointed out, it is quite possible that the young child initially has only an understanding of the specific relationships involved in concrete situations of cutting, spilling, owning mittens, etc. He has not yet identified higher-order similarities across these experiences and coalesced them into the kinds of categories that are needed in a system of rules for sentence construction that allows for productivity, or the extension of existing information about patterns of word order and the like to new situations.

Possible Varieties of Relational Categories

What kinds of relational categories might a child formulate as the bases of his first productive rules for word combination? Little evidence bearing on this problem is yet available, so it is perhaps particularly important to envision as wide a range of possibilities as we can so that preconceptions will not limit the ways in which we approach the analysis of data either as investigators or as critics. This section of this chapter is primarily devoted to a discussion of possibilities that are semantically based, but first an alternate possibility is briefly noted.

Are the Relations Semantic or Syntactic? Relationships between

the words or phrases in a sentence can be specified either on the basis of the way in which the referents of these words are related to each other in the nonlinguistic situation or in terms of the way the words themselves function within the sentence, regardless of their referents. Relationships of the former kind are commonly called "semantic"; those of the latter kind, like "subject-predicate" and "verb-direct object," are called "grammatical" or "syntactic." Semantic categories tend to be correlated with syntactic categories—e.g., most relationships between agents and actions are encoded with a subject-predicate structure—but there is by no means a perfect correspondence between the two. For example, the subject-predicate relationship in English encodes not only relations between agents and their actions (e.g., "the boy is running") but also between experiencers and the states they experience ("Daddy wants that," "Mommy sees a doggie"), locations and events associated with them ("This boat sleeps five"), and so on. Thus, syntactic relations are more abstract than semantic ones because they subsume a number of semantic distinctions that could be made (see Brown, 1973, pp. 120–123; Bowerman, 1973a and b, 1975a, for further discussion).

Syntactic relations have often been invoked in accounts of children's early ability to position words consistently in sentences, even well before the method of "rich interpretation" (using context to interpret children's intentions) was accorded formal recognition. For example, McNeill (1966, 1970, 1971) argued that knowledge of the basic grammatical relations is innate and guides the child's understanding and production of utterances from the beginning of language development. Like McNeill, Bloom (1970) posited an early understanding of syntactic relations such as subject-predicate and verb-direct object, although she did not believe the knowledge to be innate.

A number of researchers have taken issue with the position that children's early two- and three-word utterances reflect knowledge of syntactic relations. For example, in Bowerman (1973a and b), I argued that the structural phenomena that motivate the description of adult speech in terms of syntactic relations are missing in child speech; hence, there is no clear evidence that children in fact have made these abstractions. I concluded that the characteristics of the early utterances are more compatible with an alternative hypothesis first proposed by Schlesinger (1971b): the knowledge underlying children's early two- and three-word utterances might be simple order rules for combining words that are understood as performing various

semantic roles such as *agent, action, location,* etc., or perhaps other semantic roles that are even less abstract.

The debate about whether or not children have knowledge of syntactic relations during the early period of word combining is not yet resolved (see Schlesinger, 1974; Bloom, Lightbown, and Hood, 1975b, Bloom, Miller, and Hood, 1975; Bowerman, 1975a; and Braine, in press, for further arguments pro and con). However, in the meantime, research goes on that takes us further into the possible semantic underpinnings of children's early rule systems.

Relational Semantic Categories: Which Ones Are "Psychologically Real?" A given set of two- and three-word utterances can be classified semantically in a number of different ways. How can we know which way is "right," in the sense that it classifies according to semantic distinctions which are functional in the child's own system of rules for combining words and which therefore determine the kinds of novel constructions the child is able to make?

The problem of trying to identify the level of abstraction at which children might formulate semantic rules for sentence construction has been discussed by Brown (1973). He pointed out that although the sets of relational meanings that different investigators have selected for describing and classifying children's utterances overlap to an extent, they are not identical. For example, Bloom (1970) distinguished sentences with "more" (e.g., "more cookie") both from those with other attributives ("pretty," "hot," etc.) and from possessive constructions like "Mommy sock," while Schlesinger (1971b) lumped all of these together in a "modifier-head" relation. Similarly, Bloom subdivided negative constructions (negative word + X) into three semantic categories while Schlesinger's category of negative constructions did not differentiate these.

Differences such as these make it clear, observed Brown, "that the relations [which have been used]... are abstract taxonomies applied to child utterances. That it is not known how finely the abstractions should be sliced and that no proof exists that the semantic levels hit on by any theorist, whether Bloom, Schlesinger, Fillmore, or whomever, are psychologically functional" (1973, p. 146). In short, concluded Brown, "description in terms of a set of prevalent semantic relations may be little more than a technique of data reduction, a way of describing the meanings of early sentences short of listing them all" (1973, p. 173).

As studies aimed at identifying the semantic bases of word com-

bination or at outlining the order in which children learn to produce sentences in various semantic categories proliferate, it is important to bear in mind that the problem of how best to classify sentences semantically has not yet been solved. Different investigators continue to divide up the utterances in corpora of children's speech in various noncongruent, overlapping ways, such that particular utterances that are grouped together as semantically similar in one study may appear in separate categories in another study (compare, for example, Bloom, Lightbown, and Hood, 1975b, and Wells, 1974).

The problem can be illustrated by showing some alternate ways of classifying a given set of data. Let us look at children's sentences with verbs, as these offer a particularly large number of possibilities for semantic groupings.

The verbs present in a typical 2-year-old's vocabulary each have their own lexical meaning and so at the most fundamental level are all unique. Suppose that the child initially sees no similarities at all among the events to which his verbs refer. That is, as far as he is concerned, carrying, opening, cutting, hitting, seeing, wanting, etc., are all discrete categories of events with no shared characteristics. In considering this possibility, Brown (1973, p. 122), pointed out that a child does not really need to form semantic categories at an intermediate level of abstraction like "agent," "action," "experiencer," "state," etc., at all. He could simply learn piecemeal the position associated with each semantic role of each verb. For example, he could learn that the name for the one who opens (*or* cuts, throws, sees, wants, etc.) goes first while the name for the object opened (*or* cut, thrown, seen, wanted, etc.) goes last. Each one of these rules could generate subject-verb or verb-object strings involving one particular verb only (e.g., "Mommy/Daddy/monkey, etc. *throw*," "*throw* ball/book/block, etc."). However, noted Brown, "there is a potential economy or advantage" in forming semantic abstractions like "agent" in that the child who does so is spared having to learn, one by one, the position for each particular semantic role associated with each verb. Instead, he can simply refer to the verb's semantic class membership. If the verb designates an *action*, for example, he can assume that the name for the one who performs the action will go in initial position, and he will usually be right (1973, p. 122).

The semantic category of "action" has an air of plausibility about it, and it has been used in a number of classification systems (e.g., Brown, 1973; Schlesinger, 1971b). But notice that "action" is only one possible feature shared by two or more verbs in a list of

"action" verbs. It is theoretically quite possible that a child might not recognize any property linking *all* action verbs, but nevertheless would regard certain subsets of actions as similar on less abstract grounds. In this case he might formulate rules for expressing the relationships between particular classes of agents, actions, and objects but have no superordinate "action" concept subsuming them all.

For example, consider how one might divide up the following set of verbs on the basis of various kinds of similarities among them: "carry," "put," "throw," "give," "walk," "run," "go," "fly," "break," "open," "cut," "touch," "hit," "poke," "watch," "listen," "look at," "draw," "make," and "build." "Carry," "put," "throw," "give," "walk," "run," "go," and "fly" are all similar, and distinct from other verbs, in that they refer to actions that result in a *change of location*. "Carry," "put," "throw," and "give" can be differentiated from "walk," "run," "go," and "fly," however, because the former verbs involve an agent who changes the location of some other object while the latter verbs involve an agent who changes his *own* location. "Break," "open," and "cut" have ties to "carry," "put," "throw," "give," "walk," etc., in that they all refer to a *change of state* of some kind, whether the change is locational or attributive. And both change of location verbs involving an agent and another object and change of attributive state verbs are similar to "hit," "touch," and "poke" in that they all involve *physical action* upon an object. Yet "hit," "touch," and "poke" constitute a semantic subclass by virtue of the *kind* of physical action specified: *surface contact* (see Fillmore, 1970, for a discussion of syntactic as well as semantic differences between verbs like "hit," "touch," etc. and those like "break," and Wells, 1974, p. 251, for a discussion of difficulties involved in classifying children's sentences with "touch," "hit," etc.). "Watch," "listen," and "look at" form a subclass distinct from the other verbs because they all involve the direction of one's attention, while "draw," "make," and "build" designate actions that result in the creation of something, as opposed to actions on existing objects.

To undo all these hierarchically organized, mutually exclusive, or overlapping classes and start over again, we can classify the verbs according to whether they specify "momentary" or "continuative" actions (cf. Fillmore, 1969). For example, "carry," "walk," "run," "go," "fly," "watch," "listen," "look at," "draw," and "build" specify activities that continue over a span of time, while "put," "throw," "give," "break," "open," "cut," "hit," and "poke"

cannot continue (unless they are repeated); rather, they are rapidly completed. "Touch" can be either momentary or continuative, while "make" seems indeterminate with regard to this semantic feature.

These examples have illustrated various ways of subclassifying verbs expressing actions, but the distinction that separates "actions" from the referents of other verbs is itself one that need not necessarily figure in any particular child's rule system. For example, rather than distinguishing between "actions" and what are often referred to as "states" (e.g., "want," "need," "see," "hear"), a child might attend to semantic features that are shared by certain "action" and certain "state" verbs, thereby creating categories that cut right across the distinction. An example of such a category would be "notice," which Bloom, Lightbown, and Hood (1975b) used in classifying utterances containing the "action" verbs "look at," "watch," and "listen," and the "state" verbs "see" and "hear."

This discussion of ways in which sentences can be classified and cross-classified was based on semantic similarities and differences among verbs, but the same exercise in classification can be carried out equally easily in other semantic domains, e.g., to determine possible subcategories of "possessive" or "locative" relationships between two sentence elements. The point is that it is possible to imagine almost an infinite variety of ways in which particular children might come to regard some relationships between objects or events in their experience as similar to other relationships, and to formulate rules for sentence construction that would apply only to situations qualifying as instances of those categories.

Although the various categories mentioned above suggest a rather static classification system whereby the child neatly enters each event into one or another pigeonhole, it is of course quite possible that even a very young child, like an adult, can conceptualize the same situation in a variety of ways. A child with a variety of classificational principles at his disposal might be able to encode the relationship he perceives between object, event, or property X and object, event, or property Y on the basis of rules for word combination at more than one level of abstraction. For example, the sentence "hit ball" might reflect knowledge not only of how to express a relationship between an act of hitting and the object hit, but also of how to deal syntactically with "verbs of surface contact," of which "hit" would be a member, and, at an even more abstract level, of how to talk about actions in relation to things acted upon. Alternatively,

the child might start out forming rules for word combination at only one level of abstraction (i.e., each event would be conceptualized in only one way for purposes of sentence construction) but gradually begin to see a variety of links at different levels of abstraction among events. In this case, the child's earliest rules for combining words would be a set of discrete formulae, each one capable of encoding a particular kind of semantic content. But the rules would gradually lose their independence and begin to join up with each other in such a way that the child would end up with a flexible system of relational categories that are hierarchically organized or overlapping. This would then enable him to learn operations applying either to all of the members of a very abstract category (e.g., person and number agreement between sentence-subject and all verbs), or to only one or more subclasses within that category (e.g., *-ing* for "process" but not "state" verbs), and so on.

This rather theoretical discussion of varieties of semantic groupings was provided to illustrate the difficulty of making principled, nonarbitrary decisions about the semantic bases of children's rule systems. Let us now turn to some evidence bearing upon the problem of justifying one classification scheme over another.

Nature of Early Relational Categories: Some Empirical Evidence

Identifying the nature of the semantic categories underlying children's word combinations has been, as Brown pointed out, "an empirical question awaiting a technique of investigation" (1973, p. 146). In the most recent studies available, attention has been given to developing the needed analytical tools. A promising technique that several investigators have either suggested or actively employed is to discover natural divisions between groups of utterances by determining what kinds of utterances *emerge at about the same time* in the child's development (Brown, 1973, p. 142; Bowerman, 1973a, and b; Schlesinger, 1974; Bloom, Lightbown, and Hood, 1975b; Braine, in press; Greenfield and Smith, in press).[14] Schlesinger (1974) outlines the reasoning as follows: "If two items in a list of possible relations [relational categories, in the terminology of this chapter] begin to appear in children's speech simultaneously, and if they use the same syntactic patterns [e.g., word order] to express these, there

[14]See Brown, Cazden, and Bellugi (1969), Brown and Hanlon (1970), and Bowerman, (1975a) for comments on a methodological problem that can invalidate attempts to determine the order of emergence of various forms in child speech.

is good reason to regard them as belonging to one and the same underlying relational concept" (p. 136). Conversely, it follows that one has reason to suspect that a putative relational category has no psychological reality for the child if either a) utterances from the various subclasses of the category do not all begin to appear at the same time but instead come in sequentially, or b) utterances from the different subclasses are treated differently syntactically (e.g., display different patterns of word order) even if they come in at about the same time.

Three studies (Braine, in press; Bloom, Lightbown, and Hood, 1975b; Bowerman, this chapter) that have used simultaneous emergence (or lack of it) as a clue to children's relational categories are described below, along with relevant data from a fourth, related study by Wells (1974).

Braine's Study Braine (in press) analyzed 16 corpora of speech from 11 children learning either English, Finnish, Samoan, Hebrew, or Swedish in an effort to determine the nature and scope of the rules children use in the earliest period of word combination. Data came from published sources or his own files. The mean length of utterance (MLU) of every sample was under 1.7 morphemes, so the children were in the developmental period that Brown (1973) has termed "Stage I" (MLU between 1.0 and 2.0). Two or more sequential samples were available for only a few of the children, so for most of the children Braine had to infer the order of emergence of various construction patterns from the characteristics of a single sample rather than by documenting change from one sample to the next.

Braine's method of analysis can be illustrated with an example from his son Jonathan's data. In Jonathan's first sample there was evidence that the child had acquired a productive way of constructing two-word sentences with *big* and *little*, using a consistent word order. Braine observed that utterances of both types might have been formed according to a single rule such as "size" + X, since they emerged at the same time, displayed the same word order, and are semantically closely related. Since other utterances with adjectives, such as *hot* + *X*, *old* + *X*, and *hurt* + *X*, emerged soon afterwards, Braine considered whether Jonathan might in fact have learned an even more abstract rule such as "property" + X which would account for all of them. However, argued Braine, there is one important bit of evidence against this hypothesis: if such a rule were present, it should govern the construction of all utterances with "property" words. But in fact there was a set of sentences with *wet* or *all wet* that

did not display the consistent word order of the other utterances with "property" words. Instead they were characterized by what Braine termed a "groping" pattern: a pattern of unstable word order which, according to Braine's analyses, is associated with rules for sentence construction that are just coming in and are not yet well established. Braine concluded, therefore, that Jonathan had not formulated a superordinate concept like "property," of which *hot, big, wet,* etc. would be only instances. Rather, he argued, rules for producing sentences with these words appear to have been independent acquisitions. At most they might involve only small semantic groupings such that, for example, one rule might have been responsible for generating all the sentences with *big* and *little* and another rule all the sentences with *more* and *other.*

After analyzing each corpus separately in the detail that the above example suggests and then comparing them, Braine concluded that "the first productive structures are formulae of limited scope for realizing specific kinds of meaning. They define how a meaning is to be expressed by specifying where in the utterances the words expressing the meaning should be placed." Although the particular categories upon which the formulae operate are semantic rather than syntactic, according to Braine, they are narrower than the broad semantic categories such as "agent" posited in case grammer (cf., Fillmore, 1968, 1971).

Braine found that "children differ considerably in the kinds of contents expressed by their productive patterns . . . Certain kinds of content seem to be popular and recur in many children. Others are less popular and appear in fewer children." Among the most common were patterns that draw attention to something (*see* + *X*, *here/there* + *X*, etc.), patterns that remark on specific properties of objects (*big/little* + *X*), patterns expressing possession, patterns that note plurality or iteration (*two* + *X*, *and* + *X*), patterns concerned with recurrence or alternate exemplars of a type (*more/other* + *X*), and patterns involving location (*X* + (preposition) *here/there*, *X* + *Y* ("X is in, on, has moved to Y")). Braine explicitly specified that he found no evidence for "narrow-scope patterns confined to particular actions" as far as the relationship between action and actor is concerned. In fact, a broad *actor-action* pattern was productive for many of the children. However Braine's data did *not* reveal an analogous broad pattern governing the construction of a range of verb-object sentences. Verb-object strings were relatively infrequent (an important difference between the children investigated here and Bloom's (1970)

subjects). Many of those that did occur were quite variable with respect to word order; others reflected positional patterns involving either specific verbs (e.g., *see* + *X*, *want* + *X*) or small sets of verbs expressing a narrow range of semantic content such as "actions to do with oral consumption" (*eat/bite/drink* + *Y*), or "actions to do with movements of vehicles" (*drives/pulls/tows* + *X*).

Braine observed that despite the overall popularity of certain patterns, the children differed considerably in the *order* in which they acquired them. There was, in fact, so much variation in this respect that the productive patterns found in the corpora of two children early in the two-word stage did not overlap at all. Although Braine did not speculate on the determinants of such differences, it is tempting to hypothesize that variability in "cognitive style" may play a role, just as it appears to in determining the early words that children "select" to learn. This possibility was raised in 1964 by Miller and Ervin, who stated that "there are some suggestions in our data that linguistic patterns correlate with some nonlinguistic behavior" (p. 30). They observed that one subject who had productive patterns involving the words *off* and *on* "was a busy little girl who was always taking things off and putting them back on." A second subject, in contrast, always sat down to be entertained by the investigator, who brought a bag of toys, and her favorite construction patterns were *that* + *X* and *this* + *X*, used in identifying or labeling objects. However, despite these early intriguing suggestions on cognitive correlates of children's preferences in sentence-construction, little, if any, further work has been done on the subject.

In comparing his current proposal to his earlier (1963) work, Braine notes that it "echoes two important aspects" of his original hypothesis that children's early sentences reflect knowledge of how to position particular words in utterances: "the notions that limited formulae (rather than broad grammatical generalizations) are learned one after another during the early development, and that the formulae are positional" (i.e., make use of consistent word order). However, Braine argues that the current hypothesis amends some deficiencies of the earlier one. For example, it does not require that the positional formulae operate *only* upon specific words: categories like *actor*, *possessor*, or *location* can also be used. In addition, the present proposal deals explicitly with semantic relationships whereas the earlier one ignored meaning entirely.

Bloom, Lightbown, and Hood's Study; Wells' Study A recent study by Bloom and her colleagues (1975b) presents an interesting

contrast to Braine's monograph. In a general way it addresses some of the same questions as his but the methods are different and certain of the findings are discrepant.

Bloom et al. examined the development over time of four children to discover, among other things, the order in which the children acquired the ability to combine words to express various kinds of relational meanings. They first inspected developmental changes in the children's data in a rough way and then set up a taxonomy of "semantic-syntactic" categories that appeared to encompass the vast majority of all the children's utterances and to reveal developmental trends. Following this, Bloom et al. attempted to determined the order in which the children demonstrated productive knowledge of how to construct utterances in the various categories by setting up a criterion for productivity based on frequency of production.[15]

The primary categories used in the study were seven categories of verb relations. Bloom et al. classified the children's utterances into one or another of these, regardless of whether an actual verb appeared in them, "according to whether or not relevant movement accompanied the utterance (action vs. state events), and whether or not place was relevant to either action or state (locative vs. nonlocative events)" (p. 10).

Utterances assigned to the *action* category included 1) those referring to "action that affected an object with movement by an agent" (e.g., "my open that," "Gia ride bike," "Gia bike," "I made," etc.) (p. 10) and 2) those referring to "movements by actors (persons or objects) in events where no object other than the actor was affected" (e.g., "Kathryn jumps," "tape go round") (p. 11). Utterances assigned to the *locative action* category included 1) those entailing at least two of the four components of an *agent-action-affected object or person-place or goal of motion* pattern (e.g., "put in box," "tape on there," "you put ə finger"), and 2) those in which the agent and affected person or object were identical (e.g., "Mommy stand up ə chair," "I get down") (p. 11). *Locative state* utterances "referred to relationship between a person or object and its location" (p. 11), where there was no movement in the time surrounding the child's utterance (e.g., "light hall", "I sitting"). *Notice* utterances

[15]Methodological difficulties with the study that render some of the findings equivocal are discussed in Bowerman (1975a). Bloom *et al.* (1975a) present further analyses to support the proposed developmental sequence in a reply. The interested reader is advised to examine the matter closely.

included those with verbs of attention such as "see," "hear," "watch," and "look at" (p. 12). *State* utterances referred either to 1) internal states with "want," "need," "like," "sick," etc., or 2) temporary ownership ("have") (p. 12). Two other verb categories involved *intention* and *causality*, with matrix verbs like "want to," "have to," and "make" (p. 12).

In addition to these verb categories, Bloom et al. set up categories involving *possession* ("reference to objects that were within the domains of particular persons by virtue of habitual use or association" (p. 10)), *existence* ("pointing out or naming an object" (p. 13)), *negation* ("nonexistence, disappearance, or rejection of objects or events" (p. 13)), *recurrence* ("reference to 'more' or another instance of an object or event" (p. 13)), *attribution* ("counting, specifying, or otherwise qualifying objects" (p. 13)), *Wh-questions*, *datives* ("specifying the recipient of an action that also involved an affected object" (p. 13)), *instruments* ("specifying the inanimate object that was used in an action to affect another object" (p. 13)), and *place* ("specify[ing] where an action event occurred, for example, 'baby swim bath' " (p. 13)).

According to Bloom et al.'s findings, the productive ability to make sentences in the various categories emerged in the following sequence: constructions expressing the existence, nonexistence, and recurrence of objects preceded those involving verb relations. Within verb relations, *action events* (actions and locative actions) preceded *state events* (locative states, notice, and states). For two of the children actions preceded locative actions, while for the other two both emerged at the same time. Constructions involving possession and attribution emerged in variable order, while those involving instruments, datives, Wh-questions, place of action, intention, and causality were late developments for all of the children.

Bloom et al.'s emphasis on the consistency of order of development in their subjects is in striking contrast to Braine's conclusion that children differ greatly in the order in which they learn to produce utterances of different patterns. Some of the discrepancies may be due to methodological differences. Bloom et al.'s relational categories were much broader than Braine's, which could have contributed to differences in the findings in at least three ways. First, many of Bloom et al.'s categories, being relatively broad, were potentially capable of encompassing a number of different formulae which the children they studied might have learned in variable order as independent acquisitions. For example, at a given time a child might

be able to freely produce one variety of "locative state" utterances (e.g., "I sitting") but not the other (e.g., "light hall"). Second, many of Bloom et al.'s categories encompassed utterances with a variety of specific relationships holding between their constituents. For example, "I made" (agent-action) and "open drawer" (action-affected object) were both classified as *action* events. Braine, in contrast, distinguished carefully between such utterances and found that the productive ability to make constructions of one type (e.g., agent-action) was not necessarily accompanied by the ability to make constructions of another type (e.g., action-affected object). Third, Bloom et al. did not require that all utterances involving the same relationship between their constituents (e.g., all agent-action strings) exhibit the same word order in order to be classified into the same category, while identity of word order patterns was critical to Braine's analyses.

These differences in methods of analysis can account for some of the discrepancies between Braine's and Bloom et al.'s findings. Children can differ sharply from each other at the level at which Braine was looking, yet these differences can still be consistent with the more abstract regularities in order of emergence found by Bloom et al. Not all the differences can be resolved by reference to disparate methodologies, however; certain discrepancies remain. For example, Bloom et al. found that constructions expressing *locative actions* (X goes to Z, X moves Y to Z) consistently preceded those expressing *locative states* (X is located at Y), and they discuss possible cognitive factors that could account for this. Yet Braine discovered no such consistency. Some of the children in his study developed productive formulae for expressing locative actions before locative states, but others (for example, Braine's son Jonathan) began to produce utterances of both kinds at the same time. A second discrepancy between the findings of the two studies is that while Bloom et al. concluded that *state* events involving verbs like "want," "sick," "have," and "see" became productive only after action events, Braine's study included samples from several children who demonstrated a very early productive ability with constructions involving one or another "state" word, such as *want* + *X*, *have-it* + *X*, or *see* +*X*.[16,17]

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[16]Edwards (1974, pp. 429–431) has argued that a close examination of the contexts in which children initially use what look like "state" or "experience" verbs reveals that these verbs are in fact really linked with *actions*, such that "see" is equivalent to "look at," "want" is a request for something to be given, etc. His discussion highlights the fact that identifying the relational semantic categories a child uses requires a

Findings reported in a recent study by Wells (1974) are related in a rather complex way to those of Braine (in press) and Bloom et al. (1975b). Like Bloom et al., Wells set up a semantically based taxonomic system, classified the utterances of his subjects (a total of 8 children) into one or another category according to inferences about the child's intentions that were based on the linguistic and nonlinguistic contexts in which the utterances were produced, and tried to determine the order in which utterances of various semantic types emerged. Wells' categories were similar to those of Bloom et al. in that they were indifferent to word order and did not distinguish between, e.g., agent-action and action-object strings of a given semantic type. However, Wells' categories distinguished much more finely than Bloom et al.'s among a variety of semantic notions, such that some utterances grouped together in the Bloom et al. study would have been placed in separate categories by Wells.

Wells' findings on order of acquisition are similar to those of Bloom et al. in a global sort of way. For example, both studies report that children learn how to talk about actions and locations before they begin to produce sentences with "experiential" verbs referring to feelings and perceptions. Like Bloom et al. and unlike Braine, Wells also found that *changes* of location are consistently talked about before locative states. All three studies agree that sentences involving function words like "this," "that," and "more" are among the earliest to be produced. Like Braine, Wells also found sentences such as *want* + *X* and *see* + *X* emerging early, which supports Wells' argument that these should not be classified (as in Bloom et al.'s study) with other later-appearing "states."

Despite these areas of agreement, Wells' findings differ from those of Bloom et al. in a number of details, due largely to the fact that certain utterances which would have been classed together in Bloom et al.'s study were distinguished by Wells and found to emerge at different times. For example, Wells reports that constructions specifying "functions of people" (e.g., sentences with "eat," "play," "kiss," and "sing") came in relatively late, along with states, while those involving "changes of physical attributive states" (e.g., sentences with "open," "close," "break," and "cut") were

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detailed knowledge of how the child construes the meanings of the words in his sentences (cf. Bowerman, 1974a, p. 203, for more on this theme).

[17]See Bowerman (in press b) for further discussion of differences between the approaches of Braine and Bloom.

much earlier. Utterances of both these kinds were classified as *action* events by Bloom et al., and the action category became productive in their data well before the state category. Such discrepancies make it clear that the use of different classificational systems affects the apparent order in which the ability to produce utterances of various kinds emerges.

It is not clear whether the findings reported by Bloom et al. and by Wells can be directly applied to questions about the nature of the relational categories children use in their earliest rules for word combination. Wells makes no claims that his taxonomic system employs categories that were functional in his subjects' internalized grammars. Bloom et al.'s position on this matter is somewhat ambiguous, however. Early in the study they argue that their categories were not a "superimposed *a priori* system of analysis", but rather were "presumably derived from an individual child's own rule system and were, therefore, functional for the child" (p. 9). (The meaning of "functional" in this context is not explained). The impression that they are dealing with categories assumed to have psychological reality for the child is strengthened by their observation that utterances involving verbs belonging to particular semantic categories, such as those expressing movements of one's body ("go," "sit," "stand up," etc.), were regular and distinguishable from utterances with other kinds of verbs relations (p. 3). Later in the monograph, however, Bloom et al. caution that "the taxonomy of linguistic structures that has been presented here is a linguistic description of speech data that can represent the child's knowledge and changes in the child's knowledge only in a very gross way. There is no way of knowing, at the present time, the form in which such knowledge about linguistic structure is represented in the child's mental grammar" (p. 33). Further research will clearly be required before we can be certain whether semantic concepts like Bloom et al.'s *locative action* or Wells' *change of physical attributive state* play any role in children's rule systems, or whether instead they simply provide a convenient vocabulary for describing changes over time in the subject matter of children's conversations.

Evidence from Christy and Eva An analysis I have performed on data collected from my children during the early stages of word combination is similar in spirit to the study by Braine discussed above and supplements his findings in certain ways. Like Braine, I was interested in exploring the nature and scope of children's early rules for sentence construction. The data I used, which were collected for

the purpose of eventually performing such an analysis, consisted of weekly tapes and extensive daily notes on utterances and the contexts in which they occurred. My plan of data collection had been to get a detailed enough record that the history of every word each child used could be traced from the single-word stage on up through the early period of word combination. The wealth of data that was ultimately available allowed a very fine-grained analysis. Only certain aspects of the study are reported on here.[18]

The information of interest included what word combinations began to occur at about the same time, whether these could conceivably be related to each other as reflections of the same relational category on grounds of either semantic or syntactic similarity, and, if so, whether they employed the same word order. In addition, information on *single-word utterances*—a type of data not available to Braine in his study—was used to determine whether there were verbs, adjectives, and the like in the child's vocabulary that potentially could have been used in constructing sentences of a given semantic or syntactic type but that did not begin to enter into combination at the same time as semantically similar words.

Christy and Eva were obliging subjects in that they opted for strikingly different approaches to the business of word combination and so provide an interesting glimpse into the range of individual differences possible among children who receive a rather similar environmental and linguistic input. The differences between them are consonant with two strategies for acquiring grammar that Bloom (1970, pp. 222–227) has outlined, as will be discussed following a presentation of the children's data.

Let us consider Eva first. Eva's initial approach to word combination was clearly based on learning how to express the specific semantic relationships encoded by function or operator-like words which exerted a constant semantic effect on the words with which they were juxtaposed. That is, her early rules for combining words did not operate on *categories* of words, such as "action" or "modifier," that could include more than one exemplar. Rather, each word was treated as a semantic isolate, in the sense that the ability to combine it with other words was not accompanied by a parallel ability to make two-word utterances with semantically related words.

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[18]A fuller report on the study was given in "Relationship of Early Cognitive Development to a Child's Early Rules for Word Combination and Semantic Knowledge," a miniseminar presented at The American Speech and Hearing Association Annual Meeting, Las Vegas, November, 1974, but a discussion of the material appears here in print for the first time.

For example, the first week of word combination at about 17½ months was characterized by the sudden production of a large number of constructions involving the word "want," in sentences like "want bottle," "want juice," "want see," and "want change." At the time that Eva began to combine "want" with other words she was using approximately 25 other verbs of adult English as single-word utterances. These included both names for actions, such as "wipe," "push," "pull," "open," "close," "bite," and "throw," and names for states such as "see" and "got" (in the sense of "have"). However, none of these verbs began to enter into combination for another month. Eva's ability to combine "want" with another word thus did not reflect a growing awareness of how to combine verbs with direct objects but rather was based simply on her knowledge of how to combine words to express a request for an object or an activity. This initial rule for word combining was thus very narrow, and did not permit generalization in sentence construction beyond the meaning of "want" itself, either to other states like "see" or "got," or, more generally, to verbs that take direct objects.

A second example of Eva's approach involves her treatment of noun modifiers. At 18 months, 1 week Eva began to combine "more" with other words. At this time she was using about seven adjectives as single-word utterances ("hot," "wet," etc.) as well as several other words with close semantic ties to "more," such as "again," "no more," and "allgone." Yet none of these began to enter into construction with other words for at least a month after combinations with "more" started, and when they did start to combine, they did so sequentially over a long period of time rather than all at once.

This type of lexically based rule learning prevailed for about 2½ months. During this period new function words like "no," "yukky," and "here" (while handing over an object) began to enter into combination, but each word was initially treated as semantically unique. Thus, Eva did not at first take advantage of the potential economy she could have introduced into her rule system by formulating rules on a more abstract level, such as "word for an action precedes word for an object acted upon," "quantifier precedes word for object quantified," or "modifier precedes word for object modified."

Nor was there evidence for the operation at a later time of rules at an intermediate semantic level, which would indicate that after a period of experience with the syntax of particular words Eva had reorganized her information about them according to simpler superordinate semantic categories like "agent" or "action" (cf. Schlesinger, 1971a, pp. 79–80, for mention of this kind of reorganiza-

tion as a theoretical possibility). For example, she did not suddenly begin to produce great numbers of combinations involving all the words she knew of a particular semantic type (e.g., actions, quantifiers) after an initial period of learning to combine certain of these one by one. She went instead rather swiftly from an approach based on learning sequentially how to make constructions with particular lexical items to a much more mature system in which words of virtually all semantic subtypes were dealt with fluently. I do not know how she accomplished this transition, but there is no evidence that she achieved it with the aid of relational concepts at a level of abstraction intermediate between the semantics of particular words and syntactic notions that are independent of any particular semantic content, such as "subject" and "direct object."

Eva's lexically based approach to word combination was accompanied by a tendency to work a new construction pattern heavily (e.g., *more* + *X*) and then to virtually drop it in favor of one or more new patterns. Braine (in press) remarks on a similar behavior in his son Jonathan, who, like Eva, appeared to favor lexically based rules for word combination. This behavior contrasts strikingly with Christy's. Christy, as we shall see shortly, did not employ the lexically based method, and her syntactic progress was relatively smooth, with no abrupt shifts or discontinuities.

One possible explanation for the discontinuous behavior that tentatively seems to be correlated with the lexically based approach to word combination is that this approach is too restricting. There is little power in a syntactic system predicated on how to combine words that encode particular conceptual notions like "desire" or "moreness" with words representing the objects or events that are desired or of which there is "more." Each rule is so limited in the kinds of sentences it can generate that the child achieves relatively low returns for all his efforts. Eva seemed to be trying valiantly to crack into the syntactic system of English, taking one route after another, but she was not able to progress very far as long as she stuck to the method of learning how to combine individual words with other words to express restricted relational meanings. She did not begin to go quickly forward, losing her "try it, then drop it" behavior, until she apparently began to realize, at about 20 months, that word combination can be based on deeper abstractions than those manifested in the semantics of particular words.

The data from Christy illustrate quite a different approach. Christy did not rely heavily on the strategy of learning how to com-

bine particular words with other words to express fixed semantic relationships (there were a few such patterns initially, however). Instead, she seemed to take a more abstract view of the problem of sentence construction, searching for patterns of some generality that could govern word combinations with many different lexical items.[19]

Christy's treatment of noun modifiers provides a good illustration of this. Recall that Eva began to use different modifiers in combination with other words at different times, apparently learning a position for a new modifier every couple of weeks while semantically similar words continued to occur only as single-word utterances. In contrast, Christy produced almost no modifier-modified constructions until about 2 months after word combination had started, despite the fact that she used many adjectives as single-word utterances and knew names for many of the objects in connection with which they were said. Then within a period of a few days she suddenly began to combine "hot," "wet," "allgone," and "alldone" with "that" or a word for an object, consistently placing the modifier in second position: e.g., "that wet," "Daddy hot," "bottle allgone."

The fact that Christy began to use several different modifiers in identically ordered sentences at about the same time indicates that she had learned something more abstract than the position of individual words. This supposition is supported by the fact that she first began to produce predicate nominative constructions like "that airplane" during the same week. Predicate adjective constructions like "swing wet" and "that hot" and predicate nominative constructions like "that airplane" can perhaps be considered semantically related in that both *attribute* something to an object: a property in one case and a name in the other. Syntactically they are clearly related in that in adult English they both are expressed by a copular sentence pattern. Whatever the nature of the similarity in Christy's mind, it seems clear that her production of these utterances was delayed until she had organized the structural information governing them at a fairly abstract level.

Christy's utterances with verbs, like those with modifiers, support the hypothesis that she was organizing structural information according to patterns based on abstractions subsuming more than one

[19]Christy did not begin to combine words quite as early as Eva. This provides some supporting evidence for Haselkorn's (1973) proposal that it may take longer for a child to develop abstract *categories* of relational notions such as agent-action and possessor-possessed than to discover the distributional properties of function or operator-like words such as "more."

lexical item. For example, the locative particles "up," "down," "on," "off," and "back" all began to combine at about the same time with a word for the person or object undergoing the indicated directional motion. Similarly, a wide spectrum of words naming actions of various sorts began to appear with agentive subjects at close to the same time, while verbs that do not take agents, like "fit" and "got," continued to occur only in isolation.

To summarize, the early utterances of Eva on the one hand and Christy on the other reflect different approaches to word combination. These approaches are consistent with two strategies for learning to combine words that Bloom (1970) has outlined. The distinction between the two strategies (which are not mutually exclusive) is based on the nature of the rules for word combination that the child appears to be formulating. Formulating one kind of rule, which Bloom termed "pivotal" (from Braine's (1963) notion of "pivot" words for which a position is learned), involves searching for constancies in the expression of relationships involving the semantic notions encoded by *particular words* such as "more," "no," "yukky," etc. Eva's earliest rules were virtually all of this nature; Bloom's subject Eric initially followed this strategy too.

The other strategy Bloom outlined involves formulating rules that specify how to position words performing relational functions like "possessor," "subject" or "agent," and "direct object" or "object affected." Bloom called this kind of rule "categorical." Christy's approach to word combination was certainly more "categorical" than it was "pivotal," and so in this respect she was more like Bloom's subjects Gia and Kathryn than like Eric. However, the characteristics of Christy's early utterances, together with those of some of Braine's (in press, discussed above) subjects, indicate that two kinds of categorical rules should be distinguished. The variety with which Bloom (1970) was concerned are quite abstract, being essentially independent of the lexical meanings of the words used to fulfill the relational categories. For example, the relationship between possessor and possessed, between subject and object, and between object located and location is not inherent in any way in the meanings of the particular words that can function in these roles. But some of Christy's rules for word combination appeared to operate upon relational categories that were *not* independent of lexical meaning in this way. For example, there was evidence for a rule having to do with directional motion, as expressed by a small set of locative particles ("up," "down," etc.). Similarly, Braine (in press) found evidence, as

noted earlier, for rules involving the placement of words referring to size, to oral consumption, or to the movements of vehicles. Rules specifying how to deal with *groups* of words, all of which share a semantic feature, must be considered "categorical," like those involving notions such as "possessor" or "agent," because they make reference to *categories* of words rather than to single words. However, they are rather similar to "pivotal" rules in that they are not independent of lexical meaning and may involve as few as *two* words with a shared semantic feature (e.g., "big" and "little"). Formulating rules of this intermediate type requires a somewhat different kind of induction about linguistic structure than is needed either for rules based on the semantics of particular lexical items or for those involving categories like "possessor" or "object located" that do not necessitate recognition of similarities in word meaning. Some children may arrive at such rules easily, while other children may never use them. Further study of the process is clearly needed to determine how the language development of children who formulate these rules may differ from that of children who do not.

Origins of Children's Relational Concepts

How the child arrives at the relational concepts with which he constructs his first word combinations is perhaps even more mysterious than how he formulates the categories underlying his use of words. How much is contributed to the process by the child's nonlinguistic cognitive development, and how much by his analysis of sentence structure in the language to which he is exposed?

Prior Knowledge One possibility, of course, is that the child's two-word utterances reflect relational concepts that are formulated independently of linguistic input.[20] Schlesinger (1971b) initially argued for this view, although his position has since altered somewhat as will be discussed shortly. According to Schlesinger's original proposal, the relational categories underlying sentence construction are concepts like "agent," "action," "object," and "location." These are innate in the sense that they are "part and parcel of our way of viewing the world" (1971b, p. 98); that is, they are determined by the basic cognitive capacity of the child. Acquiring grammar, according

[20]McNeill's (1966, 1970, 1971) hypothesis that knowledge of the basic grammatical relations is innate and guides children's language development even prior to word combination fits in here. In this chapter, however, we will be looking only at semantically based proposals of this nature.

to this view, simply involves learning the appropriate syntactic devices for expressing these concepts.

A related approach is taken by Nelson, who proposes that "the earliest sentences (as opposed to learned phrases) express the child's own conjunction of concepts" (1973b, p. 117). (This view is, of course, consistent with her position on the concepts underlying early word meanings that was outlined on p. 130). Nelson's stance on the initial relational concepts differs from Schlesinger's in one important respect, however. Unlike Schlesinger, Nelson does not consider the categories to be innate or predetermined to take certain forms. On the contrary, she argues that they are acquired on the basis of experience and may vary considerably from child to child.

The view that the categories children initially use in constructing sentences are formed independently of linguistic input receives some support from child language data. As Brown (1973) points out, "the productive acquisition of a syntactic construction seldom at first entails using it over the full semantic range to which it applies" (p. 196). For example, in the early period of word combining children's genitive constructions ("(the) *X*('s) *Y*") express only the semantic notions of "prior rights of access" ("Daddy chair") and part-whole relationships ("doggie tail," "Mommy nose"). The genitive in adult speech is not limited in this way, cf. "the ship's captain," "Germany's capital" (Brown, 1973, p. 196). Similarly, according to Horgan's (n.d.) analyses, children initially use the full passive construction in accordance with semantic constraints that are not found in the adult syntax of passivization. A plausible explanation of a child's usage of *any* form (whether it be a pattern for sentence construction, an inflection, a word, etc.) over a *semantically restricted* range is that the child has identified the form with a concept of his own devising. This concept thus serves as the child's hypothesis about the semantic range across which the linguistic form is applicable. An alternative explanation of the phenomenon, of course, is that adults may *model* forms primarily or exclusively in connection with a limited range of semantic content; little is yet known about this, however (but cf. Bowerman, 1973a, pp. 191–192, for one bit of evidence along these lines).

The Interactionist Position Schlesinger (1974) has recently reappraised the role of linguistic input in the development of children's early relational categories. As noted above, he proposed earlier that relational categories reflect the child's innately determined way of viewing the world; they would develop in the same way whether the

child acquired language or not. Schlesinger now suggests instead that the child "probably comes into a world which is a booming and buzzing confusion, rather than into one which is neatly parceled into agents, actions, and so on" (1974, p. 145). Relational concepts gradually develop *both* through nonlinguistic experience and through observations of the way in which various events are encoded linguistically. For example, "by hearing sentences in which all agents are treated the same way, [the child] acquires the agent concept with rules for realizing it in speech" (1974, p. 145). In sum, Schlesinger rejects "cognitive determinism," which "postulates a one-way influence from cognitive to linguistic development." He argues instead for an interactionist approach whereby the learning of sentence structure can contribute to the way in which the child "slices up" his experiences (1974, p. 145). Schlesinger's proposal that cognitive development is determined by many factors, linguistic input among them, is very similar to the position taken by Wells (1974, 1975), which was discussed above on pp. 132–133.

Bloom's (1973) views on the origin of the relational categories underlying early sentences appear to have some similarities to those of both Nelson (1973b) on the cognition-first side and Schlesinger (1974) on the interactionist side. The way Bloom differs from both of these investigators highlights some of the complexities involved in evaluating the opposing positions.

Unlike Schlesinger and like Nelson, Bloom tends to reject the possible influence of language on children's cognitive organization of their experiences: "The evidence presented thus far appears to indicate that the child's conceptual representation of events does not depend on or derive from a linguistic basis" (1973, p. 64). However, unlike Nelson, Bloom does not feel that the independently achieved understanding of the relationships among objects and events can themselves directly constitute the relational categories upon which rules for word combination can operate: "Cognitive categories do not develop in a one-to-one correspondence with eventual linguistic categories; that is, the cognitive categories that are formed in the last half of the second year are not directly mapped onto corresponding linguistic categories" (Bloom, 1973, p. 121). Rather, Bloom argues, the cognitive schemata by which children mentally represent the relationships among objects and events are global in that they do not distinguish specifically between the participants in the relations. That is, for example, "cognitive categories represent the *entire* relationship among, for example, agent, action, and object, or possessor and

possessed" (Bloom, Lightbown, and Hood, 1975b, p. 30; emphasis added). What the child must do before he can start to combine words to express such relationships, according to Bloom, is to induce, from his experiences with language, information about the kinds of relationships that can hold between words. Bloom (1973) outlines this process as follows: "... the child hears words in combination that refer to the categories of events that he has come to represent conceptually. The child comes to discover the semantic relations that can exist between words by hearing such words in relation to each other, in relation to the events in which they occur, and using such words successively in the same kinds of situations" (p. 120). In short, "such differentiated semantic categories as agent, place, affected object, etc., are linguistic inductions that the child has made on the basis of his linguistic experience relative to existing relations in cognitive schemata" (Bloom et al., 1975b, p. 30).

While Bloom and Schlesinger (1974b) seem to agree that concepts like agent, action, etc., are formed by experience with sentence structure rather than developing autonomously, they differ sharply in their interpretation of the subsequent cognitive status of such categories. Whereas Schlesinger feels that the child's conceptualization of events is influenced by his awareness of how they are treated syntactically, Bloom emphatically denies that semantic categories also become cognitive categories: "The child does not have a cognitive notion AGENT or PERSON-AFFECTED; rather, his cognitive categories are mental representations of the entire relation in experience between agent-action-object or person affected-affecting state, etc." (1973, p. 121).

To summarize, Bloom apparently regards semantic categories like agent, etc., as exclusively linguistic inductions that neither directly reflect the child's presyntactic cognitive organization nor act back upon that organization to influence its subsequent development. Linguistic categories and cognitive categories thus lead independent lives: how the child represents events to himself is quite separate from the information he uses to express these events in sentences. This is a theoretical possibility, but it requires substantiation. While I fully agree with Bloom that conceptual and semantic categories must be distinguished (cf. Bowerman, 1974b, pp. 156–159) and that semantic categories may in principle be learned through language rather than necessarily reflecting prior cognitive distinctions, I hesitate to conclude either that cognitive categories can never be used as the basis for semantic categories or that semantic categories arrived at by the

processing of linguistic data can have no influence on the child's conceptual structuring of experience. The matter is enormously complex, however, and only recently are some of the relevant theoretical distinctions and alternative possible views becoming differentiated. We can expect to see much future debate on these issues.

IMPLICATIONS FOR LANGUAGE TRAINING

The foregoing discussions of word meaning and sentence construction have emphasized that being able to use language in novel ways requires the speaker to recognize implicitly the *categorical* nature of language—that words and syntactic devices are linked not to unique experiences but to *classes* of events. The child learning language must operate with this basic assumption in order to work out even preliminary correspondences between his nonlinguistic experiences and linguistic forms and devices.

How can programs designed to help language-deficient children benefit from recent advances in our understanding of how normal children go about constructing the categories that enable them to use words in new situations and to create novel sentences? Some possibilities are considered below. The first subsection suggests some possible ways in which the language materials that are presented to the child can be tailored so as to take advantage of, rather than clash with, his natural classificational tendencies. This should facilitate ease and speed of learning. The final subsection of this chapter outlines a way in which the use of negative feedback to the child about his performance may have undesirable effects on his ability to formulate and test hypotheses about linguistic categories.

Choosing and Sequencing Language Training Materials

In order to link a word or a pattern of word combination with a category of objects, events, properties, or relationships, a child must be able to see similarities among the various situations in which the word or sentence pattern is modeled. If the child is presented with several exemplars for the object "dog" or the action "open" which do not seem at all alike to him, regardless of how similar they may seem to adults, he can do no more than memorize independent associations between word and exemplars. Similarly, if the clinician gives the child a number of sentences such as "the boy runs," "the baby eats," and "the doggie barks" in the hopes that the child will be able to abstract out a rule governing the production of other agent-

action strings, but the child can see no similarity linking boys running with babies eating and doggies barking, the induction cannot be made.

Ideally, all of the exemplars with which a word or a pattern for combining words are taught would be ones that the child can perceive as similar in some way. The elimination of input that is nonsense from the child's point of view, in that it does not contribute to his grasp of a governing concept, would lead to greater speed and efficiency in the child's formulation of rules for word use and sentence construction. To the extent that this ideal can be approximated, moreover, the child is spared the frustration of having to respond in a trial-and-error fashion because he cannot "solve the puzzle"—cannot find ways to organize and make sense of the mass of individual words or sentences with which he is presented.

Of course, one can never know with certainty in advance how a particular child is already classifying things or what kinds of experiences he can learn to regard as similar with a little help. Nevertheless, information about processes in normal language acquisition can suggest some categories that are typically "easy" for children and hence help the clinician to minimize some of the noise in the linguistic input.

Teaching words There is evidence, as was reported earlier, that children may differ systemantically in the kinds of similarities across situations to which they are sensitive in their attempts to link words with categories of experiences. Nelson (1973b) has been particularly interested in the ways in which the linguistic input to a child can harmonize or clash with his conceptual style. In her study of children's acquisition of their first 50 words, she found that children whose mothers use language in a way that is consonant with their cognitive style acquire vocabulary faster than those whose mothers use language in a contrasting way. In particular, "great difficulty seems to arise when the mother uses the language primarily in a R mode [for naming and describing objects and events] while the child has organized the world primarily in an active or social mode or the reverse" (1973b, p. 103).

These considerations suggest that a language-deficient child can be taught vocabulary more effectively if first words to be trained are selected on the basis of close observations of the child's way of interacting with his physical and social environment rather than taken directly from a standardized program. An additional source of information about the child's personal style of classifying experiences can be gained by analyzing the ways in which he misuses words. What

classificational principles do the errors suggest that the child is using? Perceptual similarities like shape? Functional similarities like common behaviors or actions associated with different objects? Similarities across social settings or across internal reactions or intentions as opposed to similiarities among objects or events? If the child's classificational tendencies can be determined, words whose meanings *require* the speaker to make these sorts of classifications can be selected for initial training.

Some more specific recommendations about the selection and sequencing of words to be taught are listed below.

1. There is much evidence to suggest that children are cognitively predisposed toward classifying objects on the basis of perceptual similarities, particularly shape. The selection of initial words for objects and of exemplars for these words should take advantage of this natural tendency. That is, the words used should have as possible referents objects that *look* quite similar. According to this criterion, "shoe," "ball," and "cookie" would be good candidates while "toy" and "food" would not. Within the constraint imposed by maintaining perceptual similarity, first words should be tags for objects that are salient by virtue of their ability to *act* spontaneously or to be *acted upon* by the child.
2. The selection of words for nonobject concepts (verbs, adjectives, etc.) should be guided by information about the kinds of concepts acquired early by normal children, as judged by their word use. Words to do with existence, disappearance, recurrence, falls and bumps, directional motion, manipulations of objects, bodily activities, and transitory properties like "wet" and "hot" appear to be good candidates for easy acquisition.
3. Many normal children appear to associate words for directional motion ("up", "down", etc.) and bodily activities ("night night," "sit," "walk") first with activities of their own bodies, then with the bodies of other people, then (sometimes inappropriately) with actions of or upon inanimate objects. Words like "more" and "allgone" often appear first in connection with requests for additional food and drink, only later being extended to additional or alternate exemplars of other things. Following a similar sequence in presenting illustrative *referents* for such words may help certain language-deficient children—those who have difficulty seeing abstract similarities from one situation to the next—to gradually widen initially narrow categories until the categories encompass more diverse exemplars.

This kind of schedule could be quickly abandoned for children who readily recognize rather abstract similarities among experiences.

Teaching Patterns for Sentence Construction Recent semantically oriented studies of early syntactic development have begun to influence the planning of programs to teach children how to make sentences. For example, Miller and Yoder (1974), who argue that "the content for language training for retarded children should be taken from the data available on language development in normal children" (p. 511), have concluded after review of the relevant literature that "that basis of early language development is the semantic concept. Semantic concepts or functions, then, are the basic elements to be taught in the teaching program" (p. 516). The specific concepts that their program employs in organizing and sequencing training materials are derived from studies by Bloom (1970, 1973), Brown (1973, elsewhere), and Schlesinger (1971a and b). They include such relational categories as existence, nonexistence, disappearance, recurrence, agent, action, object, possessive, locative, attributive, experiencer, state, and others.

While this general approach is well founded, it is important to recognize that the taxonomic systems by means of which normal children's "semantic intentions" have been described do not at this point provide a principled guide to the relational notions underlying their utterances, although they are useful as provisional hypotheses. As we saw earlier, it is quite uncertain whether children actually make use of concepts like "agent," "possessor," or "location" in constructing sentences. It is quite possible that the specific relational semantic categories underlying normal children's earliest patterns for word combination are somewhat idiosyncratic (Braine, in press) and that children may vary considerably in the preferred level of abstraction at which they formulate these categories (cf. the comparison of Christy and Eva in this connection, pp. 156–160 above). In summary, lack of knowledge about children's "natural" tendencies in classifying relationships among objects and events constitutes a lingering obstacle to programs like Miller and Yoder's that aim at helping the child discover links between syntactic devices like word order and underlying semantic relationships.

Despite these difficulties, our current state of knowledge could perhaps be used to improve syntax-teaching programs in at least two ways. First, the way in which modeled sentences are grouped and sequenced for presentation to the child could be refined somewhat on the basis of recent findings by Bloom, Lightbown, and Hood (1975b)

and Wells (1974) on the order in which normal children acquire the ability to produce sentences of various semantic types (see pp. 150–155 above). (What to do in areas where the two studies do not agree is a problem, of course). Second, the existing evidence (see p. 160 above) that children tend to follow one of two (or possibly more) alternate strategies in forming relational categories for sentence construction could be used to develop alternative syntax-teaching programs. These would differ somewhat with respect to the way sentences are initially grouped and sequenced for the child. For example, one would implicitly stress abstract relational categories like agent-action, modifier-modified, possessor-possessed, etc., while another would stress distributional consistencies in the expression of *particular* relational semantic notions like *more* + *X*, *see* + *X*, and so on. A child who did poorly with one program could then be switched to another that might provide a better match for his cognitive style.

Role of Negative Feedback

Any successful language training program must aim not only at encouraging children to link linguistic forms and devices with categories of experiences but also at helping them to improve on their initial guesses about these categories when they are incorrect. The techniques that can promote this improvement most effectively will probably not be found until we learn more about the little-understood process to which Clark (quoted in Bowerman, 1974a, p. 200) has called our attention: how normal children who have adopted a given hypothesis go about determining whether or not it is correct.

At this point there seems to be more to say about how normal children apparently do *not* improve their hypotheses than about how they do. This information centers on the role of *negative feedback* (by which I mean here any explicit message to the child that his linguistic performance was imperfect, e.g., "No, say it *this* way . . .," "That's not an X, it's a Y," etc. *No* feedback, i.e., ignoring the child's utterance, may also function rather like negative feedback). Because negative feedback is such a widely used clinical tool, it seems important to review briefly some evidence that at least for normal children it is not only unnecessary and ineffective but also may actually be detrimental to progress.

Learning theory accounts of language acquisition have generally assumed that a child's language development depends heavily upon his access to feedback, both positive and negative, about the adequacy of his utterances. In recent years, however, there have been several

studies that question whether the language-learning mechanisms of normal children depend to any large extent upon feedback about their performance. Brown and Hanlon (1970), for example, found evidence that children in the early stages of language acquisition receive very little information about the grammaticality of their sentences either in the form of direct praise and criticism or in the form of parental comprehension contingent upon syntactic well-formedness. These authors tentatively conclude that "the only force toward grammaticality operating on the child is the occasional mismatch between his theory of the structure of the language and the data he receives" (p. 50).

Braine (1971) argues even more strongly that "negative information cannot be necessary for first language acquisition," pointing to the conspicuous lack of information about what is not a sentence in the speech of even education-conscious middle-class parents, to evidence that children are quite insensitive to explicit corrections, and to the "universality with which language is acquired at a fairly rapid rate . . . despite a wide variety of cultural conditions and child-rearing practices" (pp. 159–160). Braine proposes that the child acquiring language is "capable of learning—and typically learns—from positive instances [i.e., actual models of speech] only" (p. 168).[21]

Evidence of this sort suggests that feedback about inadequate performance is neither required for language learning nor does it particularly accelerate its pace. However, the focus in these studies has primarily been on the possible effects of feedback upon learning grammar rather than upon acquiring word meanings. Cazden (1968, pp. 135–136) suggests that parents typically provide more negative feedback for their children's errors of word choice than for grammatical mistakes, and proposes that learning the meanings of

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[21]In arguing against the view that knowledge of language structure is innate, Braine (1971) contended that the lack of negative feedback to the child precludes a hypothesis-testing model of how the child acquires language. He pointed out that information about what is not a sentence is essential if a hypothesis-testing child is to avoid formulating an overinclusive grammar that would generate not only all well formed sentences but ungrammatical ones as well. However, Braine noted that the terms "hypothesis" and "hypothesis testing" have been used with meanings other than those which he was challenging (p. 154). I think that his view of a language acquisition device which proceeds by "registering and accumulating properties of verbal strings and correlations between properties of strings and other events" (p. 154) is compatible with the way in which the notion of "hypothesis testing" has been used in this chapter. Specifically, the "hypotheses" with which I have been concerned are precisely the child's provisional assumptions about the nature of the "correlations between properties of strings and other events."

words may benefit more from "active tuition" than does learning grammar. Brown (1958b), like Cazden, has emphasized the tutorial role played by the parent in the child's acquisition of vocabulary. In the operation of what Brown termed "the Original Word Game," "The tutor [parent] names things . . . The player [child] forms hypotheses about the categorical nature of the things named. He tests his hypotheses by trying to name new things correctly. The tutor . . . checks the accuracy of fit between his own categories and those of the player. He improves the fit by correction" (p. 194). Similarly, " . . . the child and his father can play [the Original Word Game] as they walk along the street, father naming, child trying, father correcting" (p. 223).

In view of these assumptions about how word meaning is acquired, some recent evidence that negative feedback on adequacy of word use may actually impede a child's progress is particularly arresting. In her study of the acquisition of vocabulary by 18 children, Nelson (1973b) found that "directive" mothers, who felt that they must " 'teach' the child the right words" (p. 103) by correcting his inaccurate efforts, had children who learned relatively slowly compared to children whose mothers accepted their utterances even when these utterances were phonologically ill-formed or semantically inappropriate. Nelson concluded that "rejection or nonacceptance inevitably slows the child's learning. Active control and premature differential reinforcement retards rather than advances progress. It is the generally accepting mother who appears to be the most facilitative; selective responding, for example, correcting early errors, is unproductive" (1973b, p. 113).

Bruner (1975), in discussing his own data on mother-child interactions, concurred with Nelson's view on the effects of negative feedback, noting that "it is often the case that mother's correction of a 'mismatch' inhibits the interchange" (p. 15). He theorized that the process of language acquisition is "made possible by the presence of an interpreting adult who operates not so much as a corrector or reinforcer but rather as a provider, an expander and idealizer of utterances while interacting with the child" (p. 17).

Why should correcting the child's errors, which in theory should give him the information he needs to adjust his hypotheses about the links between language forms and nonlinguistic events, actually work to slow his progress? Nelson (1973b) hypothesizes that a directive maternal style "impose[s] the mother's views and expectations and prevent[s] the child from effectively formulating and naming his own

concepts" (p. 94). She adds that "the process of parental education may persuade him that his own categories are not to be trusted and that he must rely upon parents . . . to define the world" (p. 118). In short, the effect of negative feedback may be to discourage the child from taking an active role in acquiring language. Rather than gently directing his efforts to arrive at an adult-like understanding of the concepts that particular linguistic forms encode, the frequent receipt of corrections may put such a damper on the child's initial efforts to communicate that he is deterred from actively looking further for connections between concepts and language forms. Instead, he learns in effect to wait passively to be instructed on the requisite concepts.

That negative feedback may have undesirable consequences has not yet been conclusively demonstrated, of course. Further investigation is needed, especially on the consequences of correcting syntactic errors as opposed to inaccurate word choices and on the possible contribution of the child's stage of development to the effects of correction.

Despite the need for caution, however, the possibility that negative feedback may carry with it unexpected and unwelcomed side effects has important implications for language intervention. For some populations of language-disturbed children, the consequences may be minimal. For example, severely retarded children may be so deficient in the ability to form and test hypotheses about the categories governing the use of words and other linguistic devices that whatever knowledge of language they are to achieve must essentially be "built in" in a completely artificial manner. Corrective feedback, both positive and negative, perhaps plays an indispensable role in this type of teaching.

For other more able children with language disturbances, however, it might be more profitable in the long run to work on encouraging initial efforts with little concern for deviations from adult norms. The ability to make guesses, however inaccurate, about connections between linguistic and nonlinguistic categories may well be one of the child's most valuable tools in the language acquisition process. To press for accuracy from the start, by insisting in effect that the child make discriminations or abstractions which he is not yet ready to make, may therefore be to risk losing one of the clinician's most important potential allies.

In conclusion, it appears likely that at least for some children the clinical use of negative feedback may be less effective as a procedure for teaching language than techniques designed to uncritically sup-

port and encourage initial stumbling efforts. To the extent that negative feedback is not used, however, other methods of helping the child gradually improve his inaccurate hypotheses will have to be instituted. It seems likely that effective new methods of implementing this goal may ultimately be derived from the findings of recent studies (e.g., Broen, 1972; Snow, 1972; Cross, 1975; Newport, Gleitman, and Gleitman, 1975) on the way that mothers of normal children, especially those of children who are linguistically advanced, structure their linguistic input to the child at successive stages of his development.

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