On Formal Grammatical Categories in Early Child Language

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One of the issues most debated in the field of developmental psycholinguistics has been the status of formal grammatical categories in child language. Two kinds of questions have been asked, the first being whether children can be credited with operating with formal categories at early stages of language development (cf. Bloom, 1970; Bowerman, 1973a, 1973b; Braine, 1963, 1976; Maratsos, 1983), the second concerning the nature of the process by which children come to possess or to acquire formal categories (cf. Chomsky, 1965; Maratsos & Chalkley, 1980; McNeill, 1966; Pinker, 1982).

In the following discussion of these issues I attempt to show that much of the controversy stems from the problematic nature of the transfer of concepts from linguistics to developmental psychology and that in some sense the developmental questions are half-way to being answered if the conceptual problems embedded in them are solved.

1. THE STATUS OF FORMAL GRAMMATICAL CATEGORIES IN EARLY CHILD LANGUAGE

The first question we discuss is whether children in the early stages of language acquisition can be credited as operating with endstate formal grammatical categories. The problem is methodological as well as theoretical. There seem to exist in children's language certain regularities which warrant the writing of grammatical rules on categories of terms rather than on individual lexical items. Thus, people attempting to write descriptive grammars of child language have to decide whether to use the adult grammatical categories of noun, verb, subject, etc., as primitive components of the grammar, or whether to posit different kinds of formal categories. Just to demonstrate the range of opinions, Bloom (1970) opted for endstate categories; Bowerman (1973a) decided to admit "lexical" categories such as noun but not major (or functional) categories such as subject; while Braine (1963) opted for more primitive structural categories such as the pivot and open classes, as elements of a descriptive grammar of child language.

At first glance, it seems obvious that it is not justified to use endstate category symbols like noun and subject in descriptions of child language. The use of category symbols such as noun, etc., is motivated in grammars written on adult language, not by some isolated feature of its rule system but by the complexly interrelated nature of the grammar as a whole.[1]

The organizational phenomena pertinent to "lexical" categories is the fact that whereas the lexicon contains a very large number of items, the grammatical rule system governing combinations of morphemes consists of a few sets of intercorrelated rules, each applying to a subgroup of morphemes. The existence of one-to-many mapping of rules to morphemes makes it possible to economize on the writing of rules in a grammar. Instead of item-specific combinatorial rules, rules can specify which group of morphemes they are written on, and it is possible to specify for each morpheme which group of rules applies to it. Such specification is carried out by means of (sub)category symbols such as noun or vert). Category symbols like these appear on the one hand in terminal strings of phrase-markers, so that an operation of

lexical substitution may insert actual lexical items in place of these markers, turning an abstract structure into a concrete sentence. On the other hand, these symbols appear in every entry in the mental lexicon, specifying (together with some secondary selectional markers) the kind of syntactic contexts the relevant item may be inserted into. Thus, the subcategory symbols provide a bridge between the base component of the grammar and its lexical component; it is not only possible to substitute an actual lexical item for each symbol appearing in an abstract phrase-marker, but in principle it is also possible to substitute for each subcategory symbol in a lexical entry the list of all phrase structure rules applying to that term.

The motivation for major category symbols such as subject (or more precisely, the noun phrase directly dominated by the sentence node in deep structure), or predicate of a sentence, is a different organizational property of the linguistic system. This is the fact that whereas there are a very large number of possible different semantic relations among lexical items comprising sentences, these are syntactically marked by a limited number of structural devices. For example, one logical-semantic argument of the verb in English sentences is mapped to a single structural role, that of the subject, and this regardless of the heterogeneity of the meaning relations the relevant arguments have with the verb in the different cases. As with "lexical" subcategory symbols, the information mapping relational meaning to structural roles is provided in the lexicon: the lexical entry for each verb specifies which argument of that verb is mapped to which structural role (Bresnan, 1978; Chomsky, 1972). As is the case with subcategory markers, it is possible in principle to substitute for each major category marker in a lexical entry the list of all phrase structure rules applying to the relevant kind of grammatical role.

Thus, category symbols, whether in phrase structure rules or in the lexicon, are logically equivalent to the rules written on them, and as such are completely system-dependent: They are shorthand descriptions of the rule system as a whole. By anyone's theory, young children's linguistic system does not possess all the features of the endstate system. In other words their language cannot be described by the same grammar as the adult system. The use of category symbols N, V, NP or VP, etc., without any qualification is equivalent to using the whole of endstate grammar to describe child language; and that is unacceptable.

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[1]The discussion of formal categories in descriptive linguistics is based on Chomsky (1965, 1975). Katz and Fodor (1963). and Katz and Postal (1964). Although other types of grammars have since been proposed, and although Chomsky's early model has been superseded (cf. 1981), most work in developmental psycholinguistics has been carried out within framework of his early phrase-structure grammar or one of its variants.

I believe that the argument in the literature around the question whether young children "have" syntactic categories such as noun or subject stems from a lack of recognition of the fact that grammatical category symbols are a kind of "package-deal." On both sides of the debate, people single out selected features of "nounhood" or "subjecthood," etc., and argue from their existence (or nonexistence) in child language to children's possessing (or not possessing) the relevant grammatical category in general. Not surprisingly, different authors seem to expect to find different sets of features of the syntactic categories in child language, while they pass over the obvious nonexistence of other features. Of special interest is the fact that some authors seem to see as basic, or minimally criterial of the possession of the categories, some of the syntactic features of these categories, while others seem to demand that their features as lexical category markers be established in the early stages of language acquisition. Thus, Maratsos (1983) argues that the *lexical* categories of noun, verb, etc., are

not established in the early stages since there is no evidence that all the relevant items in the children's vocabulary are assigned the same set of syntactic rules.

Similarly, Bowerman (1973b) points out that most early subjects are agents of actions, i.e., sentence subjects are not mapped to a variety of semantic relations as they are in the adult system. On the other hand. Brown (1973) uses structural arguments to demonstrate that the "verb phrase" constituent is established quite early: He points out that the privileges of occurrence of V+N combinations are similar to those of V alone, while Bowerman (e.g., 1973a) uses some different syntactic arguments to demonstrate that such a conclusion is unwarranted, e.g., that "children do not initially use phrases like 'do (so),' which make reference to a preceding VP" (p. 179). Bowerman, in general, offers a variety of arguments as to the nonvalidity of descriptions of early child language in terms of subject VP constituent structure. Interestingly, some of the latter are rejected by Bloom (1978) on the grounds that since it is illogical anyway to demand a perfect match between the features of a syntactic construct such as "subject" in child language and the endstate system, it is not necessary that a child's "subject" have precisely those features that Bowerman deems decisive.

In fact, the question whether young children operate with endstate grammatical categories is ill-defined. The system-dependent nature of these constructs does not allow a meaningful distinction between essential and inessential features, and it is logically impossible to point to a minimal set of features that has to be attained for a speaker to be credited with category knowledge. And finally, until children have mastered the whole of grammar, it will always be possible to find some feature or other of such category knowledge that children do not yet possess. In summary, it is only competent speakers of a language whose language can legitimately be described by the linguistic apparatus developed to this purpose.

2. CAN CHILDREN BE CREDITED WITH KNOWLEDGE OF ABSTRACT GRAMMATICAL CATEGORIES? A REDEFINITION OF THE QUESTION AND SOME ANSWERS.

In section 1 we have concluded that it is not justified to use endstate category symbols like noun or subject in descriptions of child language, since the use of these symbols is motivated in grammars written on adult language by the complexly interrelated nature of the whole grammatical system. As long as child language does not follow the same rules, it cannot be said to possess the same organizational features as the adult language. It is possible that some kind of formal categories can be imputed to early language, but their character depends on the characteristics of the early rule system. It is more than expected that the early formal categories will be different in nature from the endstate categories, given the vast differences in the two rule systems.

However, we can still ask what sort of knowledge of the *endstate* formal categories do young children possess. As such categories are system-dependent entities, the right question about formal category knowledge is not whether at some point in development children have or have not formed such categories. As long as their rule system is different from that of adults, they cannot be said to have the same formal categories in any case. Rather, the question should be what kind of knowledge children have that can be considered a *subset* of adults' knowledge of formal categories. Here we need a definition of what to consider knowledge of formal categories. Because we cannot assume that young children's linguistic system is as well integrated as that of adults, we should make it possible to find evidence of fragmentary knowledge by treating the two aspects of category knowledge separately. On the one hand, category knowledge should be exhibited in the form of differential combinatorial privileges of different kinds of terms in children's lexicon; on the other hand, it should be evident by the range of applicability of different combinatorial rules in their repertoire, to the relevant items in their lexicon. That is, given that children use their words in combination, the

question is whether they follow the same combinatorial rules as would govern the combination of the same items in endstate language. And, given that children apply some combinatorial rule to at least one item in their lexicon, the question is whether they apply the same rule to other items of the same subcategory in their lexicon.

Regarding differential combinatorial privileges, it is obvious that the implications of form class membership, even if some knowledge of this sort can be shown to be possessed by children, are severely restricted in the early stages of speech. Early language is notoriously lacking in structure: There is no morphology, and very little syntax. Keeping this basic fact in mind, it is still an important finding that children from the very first word combinations very rarely make form category errors. Thus, Brown (1973), summarizing the evidence on English-speaking children's early combinations from his own and from Bloom (1970), Leopold (1939-1949) and Schlesinger's (1971) data, concluded that such errors are very infrequent. Maratsos (1983), in a later review, reached a similar conclusion. Bowerman (1973a) found that most words in Finnish-speaking children's vocabularies that she classified to word classes according to adult syntactic privileges of occurrence, were classified similarly in adult Finnish. Category errors are also extremely rare in Hebrew (Berman, this volume; Levy, this volume). It seems that to the extent that children use some term in word combinations, they mostly do so in conformity with the combinatorial restrictions applying to such terms in the endstate grammar. Thus, syntactic markers like noun and verb seem to be justified in grammars of early child language, in the minimal sense that different kinds of terms fit into different, and mostly appropriate, syntactic environments.

As to the range of application of grammatical rules, it can be safely generalized that children do not apply every combinatorial rule to every term in their vocabulary to which such a rule could apply. The evidence is extensively re viewed in Maratsos (1983). Among the examples he mentions are the following. Bowerman's Eve (1976, p. 157) started to produce combinations of want + (object wanted] when other verbs in her vocabulary still appeared only as single word utterances. Braine's subject David (1976) also had want + [object] combinations when other verbs such as hold or roll appeared only with "it" as object. Braine's Jonathan produced subject-verb combinations with sleep, sit, walk or work, but not with verbs like eat, drink, bite or drink, for which, however, he produced verb-object combinations. Expressions such as *don't* and *can't*, as well as inflections such as *-ed* and *-ing* are used with largely non-overlapping sets of terms around Stage II (Bellugi, 1967; Bloom, Lightbown, & Hood, 1975; Bloom, Miller. & Hood, 1975; Bloom, Lifter, & Hafitz, 1980). Hebrew-speaking children first use verb + infinitive combinations exclusively with 'want', as in 'want to-go'. and only quite later with other matrix verbs. They first produce sentence complements to only one of a whole range of perception, cognitive, and speech verbs, namely to 'say', as in 'he said that the baby is asleep.' Moreover, they first produce embedded (indirect) questions only with 'see' and look', as in 'see what happened' (R. Berman, personal communication).

These examples certainly show that children do not apply a given combinatorial rule to all the terms which could take such a rule according to adult usage. Although such production data does not prove conclusively that it is not within children's competence to produce the missing combinations, and although some of the examples are well explained on pragmatic rather than syntactic considerations (cf. Ninio & Snow, this volume), it seems quite well established that, in the early stages of language acquisition, syntactic subcategory symbols such as verb or noun in children's rule system do not seem to have the adult range of applicability to concrete terms.

The situation seems to be similar on both counts with regard to major (or relational) syntactic categories such as subject or VP. On the one hand, to the extent that children express the relation between some predicate and its arguments, the word order between the relevant constituents in most cases mirrors adult usage (Bloom et al., 1975a; Bowerman,

1973a; Braine, 1976; Brown, 1973; Brown & Fraser, 1963). It is evident that the mapping of predicate argument relations into surface structure represents the internalization of a segment of the adult system. Thus, within the restrictions of children's undeveloped grammar, the use of major category markers is notationally justified for the relevant lexical entries. On the other hand, early syntactic constructions apparently involving major constituents do not have the same range of semantic mapping as in adult language. For instance, most early subjects are agents of actions (Bowerman, 1975; Pinker, 1982).

These two facts about the early status of grammatical categories have important implications for a decision about the terms in which a grammar of child language is to be written. On the one hand, the notational system should make prominent, rather than obscure, the basic continuity that exists between child language and the endstate system. In other words, it should explicitly make note of all structural knowledge that children seem to have accumulated about the differential combinatorial properties of different kind of terms and about the differential applicability of combinatorial rules, which is the true early form of endstate syntactic category knowledge. At the same time, the notational solution adopted should not mislead into implying that children's language has a higher degree of abstractness or generality than it actually possesses.

If the only objective of writing a grammar were the description of a child's current language, the terms in which a well-motivated grammar would be written would be derived from the child's own system. As is shown later, there are good reasons to believe that the best-motivated grammar of early child language would consist of specific combinatorial rules defined for individual "predicate" words and their arguments. Such a grammar would be neither syntactic, nor semantic, but lexical.

On the other hand, there *are* many considerations which would make it desirable to use endstate category symbols in a description of child language. It is a legitimate research strategy to plot the course of development in terms of its departure from its endstate. Such a move would make it easy to trace continuities between children's rule systems and endstate grammar as well as spot departures from it.

However, in section I we reached the conclusion that since category symbols are system-dependent entities, and since children cannot be credited with the same rule system as adults, it is unjustified to use the endstate category symbols in a description of child grammar. Let us now re-think this conclusion.

The reason we should not use endstate category symbols is because their use would misleadingly imply that children's language has the same organizational features as does adult language. Now, we have seen that although children's early grammar is different from adults', it is in fact similar to it in that whatever formal rules children possess, these are, with a few exceptions, correct segments of the endstate grammar. This was long ago pointed out by Brown (1973). Thus, the mistake in using endstate category symbols for the description of children's grammar would consist of imputing to children knowledge of a larger segment of adult grammar than they in fact possess but not in the very imputation of such knowledge. In particular, the mistake would be of attributing a wider range of applicability to any combinatorial rules in the system than these actually have, and the grammar would predict combinations which the children are actually unable to produce. This, however, is a mistake which can be averted. If endstate syntactic category symbols are used in grammars of child language, pains can be taken that their categories' restricted range is represented in the grammar as well. Such an effect could be achieved relatively simply and in accordance with the form of standard descriptive grammars if for each appearance of such symbols, a set of explicit mapping rules specified either the range of terms which can be substituted for the symbol, or the rules in which a given term may play the role of, e.g., the verb. Similarly, a set of explicit projection rules would take care of the fact that major category symbols such as subject or VP do not take all the argument relations which are admissible under adult

grammar.

Thus, if a rule in a child's grammars's base component is

$$VP \rightarrow V + NP$$

and at a certain time the only verb which follows this rule is "want," this should be noted by a lexical insertion rule *attached to* the relevant phrase structure rule:

$$VP \rightarrow V + NP \quad V \leftarrow want$$

The same information would also be as represented in the lexicon, where the lexical entry of "want" would include the potential syntactic environment of the VP whereas the entries of other verbs in the child's vocabulary would not.

There is no question in such a grammar whether the symbols VP or V are justified on any other grounds but the ones explicitly written into the grammar. The minimal and atheoretical claim is only that the syntactic category of VP has evolved in this child's language *to the extent* that he or she has mastered the formal devices of expressing the "direct object" relation with respect to the one term "want" or with respect to the semantic relation of wanting-to-the-object wanted. There is no ground on which such a description could be disputed as soon as it is realized that in this child's grammar it is useless to look for any other feature of the construct "VP," but that at the same time the child's knowledge of sentence-construction does definitely include the lawful combination of a verb with its argument class expressed as a direct object. This feature of explicitness of the proposed grammar could deal with most of the objections raised against the use of syntactic category symbols as overrepresenting structural knowledge, e.g., with Braine's (1976) argument that the introduction of the rule *S —> NP + VP* to describe actor-action combinations would predict that the ordering of the constituents in a new combination such as expressing the relation of entity to location would already be known, and thus the combination would not have to undergo a phase of "groping" for order.

Another advantage of such a notational system would be that it could incorporate descriptions of any semantic categories the children might be operating with, in a manner concordant with the spirit of conventional descriptive grammars. The way to introduce such "semantic" rules might be to write categorical "projection rules." For example, if a child is thought to operate with the generalization that agents of action are mapped to the preverbal (i.e., pre-action-word) position in sentences, the corresponding base and projection rules would be

$$S \rightarrow NP + VP \quad\quad NP \leftarrow \text{agents of action}$$
$$VP \leftarrow \text{actions.}$$

This proposal is identical to Schlesinger's (1971), although neutral with respect to the claim that in child language, semantic categories fulfill the role of syntactic ones (cf. Schlesinger, 1971, 1974, 1977, 1981, 1982, this volume, and Bowerman, 1973a, 1973b).

Obviously, the restrictive annotations to phrase structure rules would be altered as children widen the scope of their rules. The problematic feature of this proposal is that it is extremely difficult to decide purely on distributional evidence when it is justified to stop enumerating the list of discrete terms or specific relations which make up a given category and assume that the adult range of organization has been achieved. I believe that this decision has to wait until children are mature enough to make grammaticity judgements.

Now, even if the proposed grammar would not be misleading, the very use of syntactic category symbols would violate a principle which is usually evoked against their use in child

language. The principle is that even if it is possible to describe some linguistic phenomenon in endstate syntactic terms, such a usage is gratuitous as long as the same phenomenon can be described in other terms which are presumably closer to children's reality, for instance in terms of semantic categories (Bowerman, 1973a; Braine, 1976; Maratsos, 1982). For example, Maratsos (1982) says:

> Let us put the question this way: What can we mean by asking if categories such as noun or verb should be used to describe children's early constructions? I think what we would mean is something like this: Do any of their grammatical rules make reference to groups of terms that *cannot be united by semantic denotations* such as "object word" or "action word" or "word denoting a possessor," that is, to groups of terms that are semantically heterogeneous yet seem to approximate, somehow, the boundaries of the adult categories, with a somewhat similar organizational basis? . . . . . If we look at the available evidence for positive indications of adult form-class organizations, we see that not very much is presently known. What would constitute such evidence? Essentially, the child would have to show that he could predict new grammatical functions of a term on the basis of knowledge of some of its other functions, when this prediction *could not be made on the basis of the semantic nature of the term itself.* For example, children's making verb-operation overregularizations such as *breaked* and *runned* is not necessarily strong evidence: Because *break* and *run* are also actional terms, they might be employing the *-ed* past overregularization to apply to actional terms. (pp.248-251, italics mine)

Maratsos (1982), who uses this kind of argumentation throughout, nevertheless warns that "the conscientious use of skeptical arguments . . . could prevent the analysis of the beginnings of such grammatical unification in subsets of the system, or even prevent analysis of the completed system" (p.39). I want to add that the principle of deeming as gratuitous descriptions in terms of syntactic category symbols as long as they are not necessary or as long as other descriptions are equally valid is basically counterproductive as far as studying the course of grammatical development is concerned. The empirical findings reviewed above imply that the early development of category markers in the lexicon and category symbols in the syntactic rule system is best characterized as the gradual accumulation of *correct* information about, respectively, the syntactic environments in which a given term might appear, and the list of terms which might appear in a given environment.[2]

The fact that children seem to acquire formal rules in a piecemeal fashion for the expression of individual predicate-argument relations and at best generalize these formal rules to other semantically very similar predicate-argument relations (Bowerman, 1976; Brown, 1973; Braine, 1976; Francis, 1969; Macnamara, 1972; Maratsos, 1983; Roberts, 1983; Schlesinger, 1974), should not in fact be taken as evidence for their grammatical system being organized in ways alien to the organization of the endstate system. Indeed, children's combinatorial rules are expected to be tied to particular predicate terms and their argument relations, and they are expected to be individually learned. The reason is that their rules deal exclusively with the formal expression of predicate/argument relations between *words* rather than between *phrases,* and such rules are tied to particular predicate terms in endstate grammars as well. Both Chomsky's (1965) original transformational grammar and newer grammars like Bresnan's (1982) lexical functional grammar acknowledge the particular rather than general nature of projection and other mapping rules and register the relevant information about them in an individual fashion in the lexical entry of each word. In fact, in Bresnan's (1978) grammar some combinatorial rules are directly inserted in the lexicon: For example, for each verb the lexicon registers the immediate syntactic environments into which that verb might be inserted. As far as the immediate syntactic contexts of predicate words are concerned, endstate syntactic rules can be with justification described as concrete rather than

abstract, as individually defined rather than applying to classes of words. As long as children's grammar is concerned exclusively with giving formal expression to predicate-argument relations among words, their syntactic categories are no less *unified than* those of adults. A similar point is made by Maratsos (1979) when he says:

> [L]earning individual or small groups of lexical distributional-meaning configurations, which can seem like a difficult way into adult structure, nevertheless comprises in many ways a natural one. For as already summarized, the distributional regularities and transfers of privileges that characterize the grammatical productivity of adult language must begin with the storage of individual lexical information and arise from abstraction of common distributional-meaning privileges in numbers of items, (pp.306-307)

I want to go further than Maratsos and say that individual learning of predicate-argument configurations is not only a natural but a logically necessary way of learning the relevant facts of language. As far as this level of grammar is concerned (i.e., the level of roles for the formal expression of predicate-argument relations of individual predicate terms), the use of category symbols is no more than a notational convenience in adult grammar as well as in child language. It is only when specific predicate-argument relations are nested in higher-order constructions as phrases that their abstractness as constructional units is required in grammar or for that matter can be thought of as developmentally possible. These ideas are elaborated in the rest of this paper.

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[2]Although there are some interesting departures from adult rules, these can be given an adequate description in a completely explicit framework such as the one proposed here. For instance, a finding such as that Braine's (1976) Andrew produced "more fish," "more read," as well as "more hot," could be represented, for example, by the unusual semantic and syntactic features of the lexical entry of "more" for that child. Obviously, the final decision which lexical entry is divergent from the adult one should be made on the basis of the consideration of the child's total usage.
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3. THE DEVELOPMENT OF ABSTRACT GRAMMATICAL CATEGORIES: A PROPOSAL

It is often assumed that the productivity of adult language as well as child language is a phenomenon of the lawful *generalization* of grammatical privileges. For example, Maratsos (1979) writes:

> [L]inguistic productivity can largely be formulated as a process of transfer of combinatorial privileges within classes of lexical items. (p.286)

Although this conception is quite widespread in developmental psycholinguistics, it is actually very different from the explanation of productivity derived from linguistic descriptions. Although it is true that the *manifestation of* productivity is the construction of new combinations on the basis of others which the speaker did hear uttered, in a linguistic framework the phenomenon underlying productivity is not generalization, but rather the *abstractness* of grammatical rules. The difference between the two is a matter of storage of rules. In talking of transfer or generalization, the assumption is made that combinatorial rules are in fact concrete, i.e., defined on specific concrete terms, and that they are transferred to other concrete terms according to some criterion of commonality, whether based on semantic

similarity or on shared syntactic form-class membership. In any case, the rules are stored in terms of, and in contiguity with, some concrete lexical items. The notion of abstractness, on the other hand, implies that rules are written on abstract symbols or variable names, that they are stored independently of any concrete term, and that access to the right set of combinatorial rules is assured by a conceptually separate set of access rules, for example, by those that interpret subcategory symbols in the lexicon.

I propose that the linguistic notion of abstractness be taken seriously as the explanatory framework for the productivity of actual speakers. In particular, I suggest that all grammatical rules are indeed inherently abstract, that their abstractness stems from different principles at different levels of the rule system, and that there is a complicated interplay of abstract and concrete components at every level of the system.

Syntactic rules dealing with the lawful combination of two different terms, whether words or phrases, are inherently abstract as far as one of the components of the combination is concerned, and inherently concrete as far as the other term is concerned. The inherent abstractness of syntactic rules is due to the fact that the semantic relations, which are expressed by syntax, involve categories of entities rather than individual entities. That this is so is not due to any learned categorization but stems from the way meanings are encoded by words in a language. Every syntactic relation involves, at its core, one term which encodes as part of its meaning some logical-semantic relation defined on a class of entities. In formal terminology, such expressions have logical arguments (Reichenbach, 1947). Syntactic rules are without exception descriptions of the structural devices by which the relation between the different "predicate" terms and their arguments is expressed. It follows that basically a syntactic rule is defined on one fixed "predicate" term and one variable name standing for one of the argument classes of that term. It is important to point out that *all* the words and other morphemes in English, except for nouns, encode a relational meaning component and take logical arguments, and even nouns may do so (as shown by constructions like "baby carriage").

Hierarchical syntactic constructs represent the successive nesting of predicate-argument configurations in higher-order units, in which the lower-order predicate-argument pairs play the role of either the predicate or the argument. A logical calculus determines what the logical status of a given combination will be as a component of a higher-order unit: For example, if the configuration is of an adjective and a noun, the noun is the "head" of the phrase and the combination will play the argument role in higher combinations. Or, if the configuration is of a verb and a noun, the resultant combination will have the status of predicate if the noun fills the "object" role in relation to the verb. One function of syntactic "rewrite rules" is to regulate the logical status of phrases with respect to further combinations and. except for the case of full sentences, this is equivalent to the preservation of the logical status of the "head" term of the combination. This implies that part of the abstractness of the highest-order syntactic relations can be traced back to the abstractness of one of their component "predicate" terms. A similar point was made by Maratsos (1979) when he observed that "constituent structure arises from, in fact summarizes, generalizations about the combinatorial properties of individual lexical items" (p.300). Thus, part of the abstractness of the major constituent relation of subject to VP of a sentence can be traced to the fact that the heads of predicate phrases are verbs which have at least one logical argument. For instance, with respect to a main VP involving the verb "sit," the sentence subject role can be thought of as abstract because it is a variable slot that can accept any expression that is the sitter argument of "sit." That "sit" takes a "sitter" argument is a fact about the semantics of this word: The word sit is meaningless unless it is understood to entail that there is someone to do the sitting, and, moreover, the word is not understood correctly if it is not understood that many different persons may do the sitting.[3]

This implies that syntactic rules are, to some extent, abstract and productive from the very

beginning of combinatorial speech: Their productive abstractness consists of the possibility of predicate words to combining with all terms in children's vocabularies that are arguments of the relevant prepositional function (Bloom, 1970; Braine, 1976; Brown, 1973). The earliest combinations seem to consist of such formulae with one fixed element and one variable, such as this+(object noticed], when each element is soon accorded a fixed position in the string. I stress the point that not only the fixed element (i.e., "this") is mapped to a position in the sentence but the variable element (i.e., "(object noticed]") as well. Among "predicate" words observed in early speech are forms such as "no," "another," "up," "here"; determinatives such as "this"; adjectives; and verbs. In such combinations the semantic relation between the two items is an inherent component of the meaning of the fixed element. Once a certain relational term is chosen to express whatever semantic relation the child has in mind, it restricts the choice of the other terms in the combination to such items that are legitimate arguments of the predicate. Thus, there is good reason to believe that there is an intimate connection between the emergence of syntax and the acquisition of semantically complex vocabulary items.[4]

In producing their earliest word combinations, children demonstrate that they grasp the logical structure of words which encode inherent semantic relations and which therefore take logical-semantic arguments. Thus, the very ability of children to impose formal structure on their utterances follows from their ability to learn the meaning of lexical items that have a variable semantic component. Moreover, since the word-order between the "predicate" word and its arguments) in most cases mirrors adult usage (Braine, 1976; Brown, 1973; Bowerman, 1973a; Brown & Fraser, 1963; Bloom et al, 1975a), it is evident that the mapping of each predicate-argument relation into surface structure represent the internalization of a segment of the adult rule system. Thus, children break into their language's syntax precisely because they are able to work with structural rules defined on variable names.[5]

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[3]The preceding analysis can easily be extended to morphology. Grammatical morphemes are relational terms that take argument classes (Reichenbach, 1947). Their functional characteristics and manner of combination with other morphemes are to be individually learned, and for many grammatical morphemes this is fully equivalent to the formation of a lexical entry.

[4]See also Keenan's (1979) analysis of the semantics of function or predicate terms.

[5]Another kind of combinations in early language are noun-noun combinations expressing semantic relations such as between possessor and possessed, actor and object of action, or an object and its location. Bloom (1970) termed such combinations "categorical" since she saw in them evidence of categorization by the child. Although (he relationship expressed by noun-noun combinations is independent of the lexical meaning of either term in the combination, it is easy to see that fundamentally these combinations are very similar to the "pivotal" combinations discussed above. In all cases of noun-noun combinations, the two expressions are in an indirect logical relationship, namely, they represent two different arguments of an (unexpressed) "predicate." It is possible that the missing "predicate" word is actually known to the child and has been omitted due to some mistaken notion of ellipsis (as Brown, 1973, and Bowerman, 1973a suggest), or else it might not be known to the child as a lexical item but exist merely as a mediating concept linking the two arguments (as follows from Braine, 1974, 1976; see also Ervin-Tripp, 1970 on nominal answers to what-do questions). If we supply the missing "predicate." the terms participating in noun-noun combinations are shown to be restricted by their being legitimate arguments of a particular logical relationship the child had in mind, exactly as the argument terms are restricted by the "predicate" word in "pivotal" combinations. Thus, the combinatorial rules involving noun-noun combinations represent the mapping of particular argument-argument relations into surface structure, usually in accordance with adult word-order: just as the rules for "pivotal" combinations represented the realization of particular predicate-argument relations. In neither case is there

any inherent categorization involved: just as we don't have to say that the word "another" is combined with a category consisting of its arguments, we don't have to say (as Bloom, 1970, and Schlesinger, 1971, say) that in the case of noun-noun combinations a semantic category of e.g., possessors is combined with a semantic category of possession.
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4.   THE EARLY ANTECEDENTS OF FORMAL CATEGORIES

The preceding analysis leads to the conclusion that the true antecedents of end state formal categories in early child language are to be found in those grammatical entities which have reached the status of abstractness within the child's own system, namely in the argument classes of "predicate" expressions.

   The earliest of these, appearing before the first two-word combinations, seem to be the reply-slots to certain well-comprehended questions such as "What is that?" or "Where is [entity]?" In the earliest word-combinations children pro duce, the relevant abstract entities are the argument classes of specific predicate words such as "this," "another," "no," "want," "eat," or "up," or of specific functional relations such as possession. At a slightly later stage, these are certain variable slots in simple sentence-frames, such as "This my+[entity]."

   In order to account for this level of abstractness in the system, it is unnecessary to assume that any kind of categorization of lexical items occurs. Since words are inserted into the variable slots according to their meaning, i.e., according to whether they fulfill the argument role specified by the relevant predicate, the scope and membership of an argument class is determined solely by the child's perception of the meaning of the "predicate" term and by the availability of appropriate argument terms in his or her vocabulary.

   To a large extent, these argument classes are homogenous as to word class membership. Some terms, for example "this" or "give-me," have an argument class that consists of nouns, while others, e.g., "I-can't" or "don't," have argument classes consisting of verbs. This is explained on the convergence, on the level of individual predicate-argument relations, of semantic and syntactic selection restrictions on possible word-combinations. The only terms that fulfill the semantic-logical argument role in relation to a given predicate word are, in endstate grammar, of an identical form-class membership. To the extent that children have the right semantics, they will produce the right grammar as well. Thus, children do not say "my hot" or "get do" (Brown, 1973, p. 126) as Braine's original pivot grammar would predict that they do, not because they observe formal restrictions on possible combinations but because they know that "my," for example, only takes entities as its argument and "hot" is not one. Some argument classes, e.g., those of "want," "more" or "no," are heterogenous as to word class membership. To some extent, this can attributed to the incorrect or fuzzy semantics, in young children, of the "predicate" words, or to insufficiencies of children's lexicon (see Ervin-Tripp, 1970). Another possibility is that because of the pragmatic centrality of "want," "more," and "no," children tend to use them when they are only approximately appropriate, in the lack of better alternatives at their command.

   The argument classes of such discourse-slots, "predicate" terms and sentence-frames could be regarded as the forerunners of the adult formal grammatical categories. It is obvious that their scope is very narrow in comparison to the adult categories; but then the nature of formal categories changes in the course of development according to the nature of the rule system itself. When and to the extent that the rule system is discontinuous and fragmented, so are formal categories.

   It could also be said that the argument classes we have been describing are the forerunners of adult "word classes". In effect, endstate argument classes are limited subsets of word classes. Shared membership of various items in many different argument classes-is the phenomenon motivating the linguist's employment of the word class concept in the first place.

However, the argument classes we have been describing are best seen as the immature antecedents of such syntactic relational categories as subject or object and not of lexical categories such as noun or verb; early argument classes as well as endstate syntactic relational categories consist of terms that form a set only by virtue of standing in a common relationship with predicate terms.

At this level of grammar, the developmental process leading to closer approximation to the endstate category system is mainly the evolution of the semantics of different terms to the level where it will determine their participation in various predicate-argument combinations in accordance with endstate privileges and restrictions. Thus, it is expected that the argument classes of various predicate terms will undergo constant modification as the result of increased semantic learning and the expansion of the child's lexicon. Some evidence for such processes is provided by Ervin-Tripp's (1970) description of the gradual evolving of category-correct answers to product-questions. There is no need to describe these modifications as changes in the organization of the linguistic system, however. An argument class "existing" at a certain level of development does not have to be unlearned with further development as it only "existed" in the first place as a derivation of the semantics of the predicate and argument terms.

5. FURTHER DEVELOPMENT OF ABSTRACT CATEGORIES

Although the level of abstractness achieved by children goes a long way toward explaining the productivity of grammar, it is important to stress that the rules we have been discussing are predicate-specific, namely, abstract only with respect to the argument variables but concrete and tied to specific terms with respect to the predicate. I claim that this is as far as the inherent abstractness of low-level syntactic rules goes: There is no way to avoid the formulation of predicate- argument realization rules except in terms of each individual predicate term, and there is no way to avoid the storing of this information individually for each predicate term. In a real sense, the linguistic system is not generative on the level of individual predicates, and, regarding predicates, linguistic rules are concrete and item-bound rather than truly abstract.

However, the level of abstractness attributable to variable argument slots is insufficient by itself to account for the complete abstractness of the adult linguistic system. In the endstate system many different kind of abstract categories exist, and in particular, not only the argument slots of combinatorial rules are abstract symbols but the predicate slots are, too. The development of the full blown abstract category system is however not an independent phenomenon but rather the byproduct of the development of the rule system itself. (See also, Schlesinger. 1982, pp.225-228 on this point.) Consequently, the nature of children's categories continuously and dynamically changes as their combinatorial rules change.

I argue that the evolution of abstract predicate categories, e.g., of adjectives or of verbs, is a phenomenon occurring later than two-term combinatorial speech, and that this development is intimately tied to children's gradually evolving ability to combine in a sentence the immediate syntactic environments of two different predicate-argument relations, i.e., to the learning of rules for construct ing hierarchical structures.

At the onset of combinatorial speech children typically have some two-word combinations like

X + want	open + X
X + hit	want + X
X + give	hit+ X
X + see	more + X
	no + X

big + X
this + X,

when X stands for any word that is an argument of the relevant predicate word according to the child's current system. At some later point children realize that there are formal means of expressing more than one predicate-argument relation in the same string. In some cases children will express two different arguments of the same predicate, e.g., subjects and objects of verbs. In one sense, such constructions represent the knowledge that more than one of the arguments of a single multi-argument term can be realized at once, according to the relational placement rules learned previously for each argument separately. However, these constructions can also be seen as hierarchical ones, in which a [predicate + argument] combination is embedded in the predicate slot of a higher-level [argument] + [predicate] construct (Brown, 1973; Schlesinger, 1982), as in

X + [hit + Y]
X + [want + Y]
X + [give + Y].

There are the other complex constructions that appear in early child language that clearly represent the nesting of one of the child's established functions as a component in another such function, as in

this + [big + X]
no + [more + X]
no + [big + X]
I-can't + [open + X]
want + [this + X]
want + [another + X].

There are soon even more complex embedded constructions such as

no + [more + (big + X)]
want + [another + (big + X)]
X + [want + (another + Y)]

and so forth. In my opinion, such constructions are only possible due to the child's realizing that word-combinations inherit the logical combinatorial properties of one of their terms, and with it their formal (i.e., syntactic) combinatorial privileges. Although this sounds like a very complex idea for children to grasp, that is because we lack a simple vocabulary to talk about intuitions. Children understand the logic of their combinatorial rules. That means nothing more than that they understand the meaning of two-word combinations that they themselves produce: and it is the meaning expressed by these combinations that determines their logical status. E.g., a *big bail* is still a ball; and if you can say *another ball* you can also say *another big ball.* There is of course new learning involved in the transition to three- and four-term constructions but the kind of learning required is more in the character of an insight than a gradual accumulation of new rules. The insight is the realization that the combinations are also the predicates or the arguments of the same prepositional functions as one of their components, and can therefore appear in the same kind of combinations as that component, and in the same position, too.

According to this analysis, the development of an abstract category of adjectives or of verbs is an outcome of the establishment of higher-order abstract units in three- or four-term

word-combinations. These units can be filled *by phrases* as well as by single words. E.g., the argument slot of *"want"* can be filled by the phrases *"big X." "red X."* or *"another X."* as well as by singled s. In general, the argument slot of *"want"* can be filled by *any predicate-argument construction that is an argument of ' 'want, ' '* and that means that *the phrase embedded in the ' 'want' ' construct has a variable predicate slot as well as a variable argument slot.* All terms that can logically fill this embedded predicate slot form a common predicate class, in this case that of adjectives. Thus, the abstractness of the 'Adjective' slot in an immediate syntactic construct like Adjective+Noun derives from the abstractness of the "predicate word" slot *in this specific kind of noun phrase embedded in higher-order structures.* This "embedded" predicate class is simultaneously defined by its semantic, logical and syntactic properties.

Now what is shared by the class of all adjectives, or of all verbs, etc., is precisely their logical-semantic-syntactic common behaviour in higher-order word-combinations. We might say that part of the definition of an adjective is that it is a predicate word such that when it is combined with an argument in a [predicate word] + [argument word] construction, the combination functions as an argument. Similarly, a verb might be defined partly as a predicate word such that when it is combined with an argument in a [predicate word] + [argument word] construction, the combination functions as a predicate (as "see a boat" in "I see a boat"). The full definition of adjectives or of verbs is given by the total set of the different kind of combinations they can participate in and their logical status in these combinations. As children gradually learn to build more and more complex hierarchical structures for constructing sentences, they gradually expand the abstract elements of the phrase structure and expand and refine their grammatical categories.

If this analysis is correct, it follows that it is not necessary to assume that any kind of categorizing or subsuming of different predicate terms occurs in the system; rather, the abstraction of predicate slots is a necessary outcome of the abstractness of phrases and, ultimately, of sentences. A possible prediction on this hypothesis could be that nonsyntactic grammatical combinations involving verbs and adjectives, e.g. verb morphology, would become productive only after the appearance of hierarchical syntax. This is borne out by the developmental literature: by the time morphological markers start to be produced, children's language has considerable structure (Brown, 1973).

In general, this model predicts that syntactic regularities of some kind are mastered before morphology. When, eventually, morphological markers and other closed-class items are acquired, they are probably learned as extensions and elaborations of existing sentence-frames rather than as a completely novel type of grammatical phenomenon. For instance, my corpora of Hebrew-speaking children shows that the definite article (a prefix in Hebrew) first appears *exclusively* as the extension of two or three simple sentence-frames, e.g., the extension of "Here's X."to "Here's the-X.", where X stands for a noun. Other nouns in the same corpora that appeared in utterances basically lacking structure were never marked the same way. Thus, closed-class markers are incorporated into existing word-class-dependent syntactic frames, as endstate grammar deter mines they should be, rather than learned in isolation, as Maratsos and Chalkley (1980) have proposed. This explains why adjectives do not get inflected by verb inflections such as *-ed* for past tense (Maratsos, 1983) even if they have an "actional" character: They occupy a different structural slot than verbs (see also Schlesinger, this volume, on this issue). Ultimately, the way to the formation of formal grammatical categories or form classes is syntax, rather than morphology; and their evolution involves complex processes of semantic, logical, and structural learning, rather than the registering of purely surface distributional regularities.

The intimate relation we have been proposing to exist between the development of abstract constituents and the development of the ability to combine meanings into higher-order meaningful units follows directly from Chomsky's (1965, pp. 196-197) insight that sentence

constituents are not only the units on which grammatical rules are defined, but that to be a constituent, a verbal string must be able to receive a semantic interpretation as well. Neither in linguistics nor in theories of language development can the two facets of structure be separated.

ACKNOWLEDGMENT

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