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Three Processes in the Child's Acquisition of Syntax*

Some time in the second six months of life most children say a first intelligible word. A few months later most children are saying many words and some children go about the house all day long naming things (*table, doggie, ball,* etc.) and actions (*play, see, drop,* etc.) and an occasional quality (*blue, broke, bad,* etc.). At about eighteen months children are likely to begin constructing two-word utterances; such a one, for instance, as *Push car.*

A construction such as *Push car* is not just two single-word utterances spoken in a certain order. As single word utterances (they are sometimes called holophrases) both *push* and *car* would have primary stresses and terminal intonation contours. When they are two words programmed as a single utterance the primary stress would fall on *car* and so would the highest level of pitch. *Push* would be subordinated to *car* by a lesser stress and a lower pitch; the unity of the whole would appear in the absence of a terminal contour between words and the presence of such a contour at the end of the full sequence.

By the age of thirty-six months some children are so advanced in the construction process as to produce all of the major varieties of English simple sentences up to a length of ten or eleven words. For several years we have been studying the development of English syntax, of the sentence-constructing process, in children between eighteen and thirty-six months of age. Most recently we have made a longitudinal study of a boy and girl whom we shall call Adam and Eve. We began work with Adam and Eve in October of 1962 when Adam was twenty-seven months old and Eve eighteen months old. The two children were selected from some thirty whom we considered. They were se-

* This investigation was supported in whole by Public Health Service Research Grant MH7088 from the National Institute of Mental Health.

lected primarily because their speech was exceptionally intelligible and because they talked a lot. We wanted to make it as easy as possible to transcribe accurately large quantities of child speech. Adam and Eve are the children of highly-educated parents, the fathers were graduate students at Harvard and the mothers are both college graduates. Both Adam and Eve were single children when we began the study. These facts must be remembered in generalizing the outcomes of the research.

While Adam is nine months older than Eve, his speech was only a little more advanced in October of 1962. The best single index of the level of speech development is the average length of utterance and in October, 1962, Adam's average was 1.84 morphemes and Eve's was 1.40 morphemes. The two children stayed fairly close together in the year that followed; in the records for the thirty-eighth week Adam's average was 3.55 and Eve's, 3.27. The processes we shall describe appeared in both children.

Every second week we visited each child for at least two hours and made a tape recording of everything said by the child as well as of everything said to the child. The mother was always present and most of the speech to the child is hers. Both mother and child became very accustomed to our presence and learned to continue their usual routine with us as the observers.

One of us always made a written transcription, on the scene, of the speech of mother and child with notes about important actions and objects of attention. From this transcription and the tape a final transcription was made and these transcriptions constitute the primary data of the study. For many purposes we require a "distributional analysis" of the speech of the child. To this end the child's utterances in a given transcription were cross classified and relisted under such headings as: "*A* + noun"; "Noun + verb"; "Verbs in the past"; "Utterances containing the pronoun *it*," etc. The categorized utterances expose the syntactic regularities of the child's speech.

Each week we met as a research seminar, with students of the psychology of language,[1] to discuss the state of the construction process in one of the two children as of that date. In these discussions small experiments were often suggested, experiments that had to be done within a few days if they were to be informative. At one time, for instance, we were uncertain whether Adam understood the semantic difference between putting a noun in subject position and putting it in object position. Consequently one of us paid an extra visit to Adam equipped with some toys. "Adam," we said, "show us the duck pushing the boat." And, when he had done so: "Now show us the boat pushing the duck."

[1] We are grateful for intellectual stimulation and lighthearted companionship to Dr. Jean Berko Gleason, Mr. Samuel Anderson, Mr. Colin Fraser, Dr. David McNeill, and Dr. Daniel Slobin.

Another week we noticed that Adam would sometimes pluralize nouns when they should have been pluralized and sometimes would not. We wondered if he could make grammatical judgments about the plural, if he could distinguish a correct form from an incorrect form. "Adam," we asked, "which is right, 'two shoes' or 'two shoe'?" His answer on that occasion, produced with explosive enthusiasm, was "Pop goes the weasel!" The two-year-old child does not make a perfectly docile experimental subject.

The dialogue between mother and child does not read like a transcribed dialogue between two adults. Table 1 offers a sample section from an early transcribed record. It has some interesting properties. The conversation is, in the first place, very much in the here and now. From the child there is no speech of the sort that Bloomfield called "displaced," speech about other times and other places. Adam's utterances in the early months were largely a coding of contemporaneous events and impulses. The mother's speech differs from the speech that adults use to one another in many ways. Her sentences are short and simple; for the most part they are the kinds of sentences that Adam will produce a year later.

Perhaps because they are short, the sentences of the mother are perfectly grammatical. The sentences adults use to one another, perhaps because they are longer and more complex, are very often not grammatical, not well formed. Here for instance is a rather representative example produced at a conference

TABLE 1

A Section from Adam's First Record

Adam	Mother
See truck, Mommy.	
See truck.	
	Did you see the truck?
No I see truck.	
	No, you didn't see it?
	There goes one.
There go one.	
	Yes, there goes one.
See a truck.	
See truck, Mommy.	
See truck.	
Truck.	
Put truck, Mommy.	
	Put the truck where?
Put truck window.	
	I think that one's too large to go in the window.

of psychologists and linguists: "As far as I know, no one yet has done the in a way obvious now and interesting problem of doing a in a sense a structural frequency study of the alternative syntactical in a given language, say, like English, the alternative possible structures, and how what their hierarchical probability of occurrence structure is."[2] It seems unlikely that a child could learn the patterns of English syntax from such speech. His introduction to English ordinarily comes in the form of a simplified, repetitive, and idealized dialect. It may be that such an introduction is necessary for the acquisition of syntax to be possible but we do not know that.

In the course of the brief interchange of Table 1 Adam imitates his mother in saying: "There go one" immediately after she says "There goes one." The imitation is not perfect; Adam omits the inflection on the verb. His imitation is a reduction in that it omits something from the original. This kind of imitation with reduction is extremely common in the records of Adam and Eve and it is the first process we shall discuss.

Imitation and Reduction

Table 2 presents some model sentences spoken by the mothers and the imitations produced by Adam and Eve. These were selected from hundreds in the records in order to illustrate some general propositions. The first thing to notice is that the imitations preserve the word order of the model sentences. To be sure, words in the model are often missing from the imitation but the words preserved are in the order of the original. This is a fact that is so familiar and somehow reasonable that we did not at once recognize it as an em-

TABLE 2

Some Imitations Produced by Adam and Eve

Model Utterance	Child's Imitation
Tank car	*Tank car*
Wait a minute	*Wait a minute*
Daddy's brief case	*Daddy brief case*
Fraser will be unhappy	*Fraser unhappy*
He's going out	*He go out*
That's an old time train	*Old time train*
It's not the same dog as Pepper	*Dog Pepper*
No, you can't write on Mr. Cromer's shoe	*Write Cromer shoe*

[2] H. Maclay and C. E. Osgood, "Hesitation phenomena in spontaneous English speech," *Word*, XV (1959), 19-44.

pirical outcome rather than as a natural necessity. But of course it is not a necessity, the outcome could have been otherwise. For example, words could have been said back in the reverse of their original order, the most recent first. The preservation of order suggests that the model sentence is processed by the child as a total construction rather than as a list of words.

In English the order of words in a sentence is an important grammatical signal. Order is used to distinguish among subject, direct object, and indirect object and it is one of the marks of imperative and interrogative constructions. The fact that the child's first sentences preserve the word order of their models partially accounts for the ability of an adult to "understand" these sentences and so to feel that he is in communication with the child. It is conceivable that the child "intends" the meanings coded by his word orders and that, when he preserves the order of an adult sentence, he does so because he wants to say what the order says. It is also possible that he preserves word order just because his brain works that way and that he has no comprehension of the semantic contrasts involved. In some languages word order is not an important grammatical signal. In Latin, for instance, "Agricola amat puellam" has the same meaning as "Puellam amat agricola" and subject-object relations are signalled by case endings. We would be interested to know whether children who are exposed to languages that do not utilize word order as a major syntactic signal, preserve order as reliably as do children exposed to English.

The second thing to notice in Table 2 is the fact that when the models increase in length there is not a corresponding increase in the imitation. The imitations stay in the range of two to four morphemes which was the range characteristic of the children at this time. The children were operating under some constraint of length or span. This is not a limitation of vocabulary; the children knew hundreds of words. Neither is it a constraint of immediate memory. We infer this from the fact that the average length of utterances produced spontaneously, where immediate memory is not involved, is about the same as the average length of utterances produced as immediate imitations. The constraint is a limitation on the length of utterance the children are able to program or plan.[3] This kind of narrow span limitation in children is characteristic of most or all of their intellectual operations. The limitation grows less restrictive with age as a consequence, probably, of both neurological growth and of practice, but of course it is never lifted altogether.

A constraint on length compels the imitating child to omit some words or morphemes from the mother's longer sentences. Which forms are retained and which omitted? The selection is not random but highly systematic. Forms

[3] Additional evidence of the constraint on sentence length may be found in R. Brown and C. Fraser. "The acquisition of syntax," C. N. Cofer and Barbara Musgrave, eds., *Verbal Behavior and Learning* (New York: McGraw Hill, 1963).

retained in the examples of Table 2 include: *Daddy, Fraser, Pepper,* and *Cromer; tank car, minute, briefcase, train, dog,* and *shoe; wait, go,* and *write; unhappy* and *old time.* For the most part they are nouns, verbs, and adjectives, though there are exceptions, as witness the initial pronoun *He* and the preposition *out* and the indefinite article *a.* Forms omitted in the samples of Table 2 include: the possessive inflection *–s,* the modal auxiliary *will,* the contraction of the auxiliary verb *is,* the progressive inflection *–ing,* the preposition *on,* the articles *the* and *an,* and the modal auxiliary *can.* It is possible to make a general characterization of the forms likely to be retained that distinguishes them as a total class from the forms likely to be omitted.

Forms likely to be retained are nouns and verbs and, less often, adjectives, and these are the three large and "open" parts-of-speech in English. The number of forms in any one of these parts-of-speech is extremely large and always growing. Words belonging to these classes are sometimes called "contentives" because they have semantic content. Forms likely to be omitted are inflections, auxiliary verbs, articles, prepositions, and conjunctions. These forms belong to syntactic classes that are small and closed. Any one class has few members and new members are not readily added. The omitted forms are the ones that linguists sometimes call "functors," their grammatical *functions* being more obvious than their semantic content.

Why should young children omit functors and retain contentives? There is more than one plausible answer. Nouns, verbs, and adjectives are words that make reference. One can conceive of teaching the meanings of these words by speaking them, one at a time, and pointing at things or actions or qualities. And of course parents do exactly that. These are the kinds of words that children have been encouraged to practice speaking one at a time. The child arrives at the age of sentence construction with a stock of well-practiced nouns, verbs, and adjectives. Is it not likely then that this prior practice causes him to retain the contentives from model sentences too long to be reproduced in full, that the child imitates those forms in the speech he hears which are already well developed in him as individual habits? There is probably some truth in this explanation but it is not the only determinant since children will often select for retention contentives that are relatively unfamiliar to them.

We adults sometimes operate under a constraint on length and the curious fact is that the English we produce in these circumstances bears a formal resemblance to the English produced by two-year-old children. When words cost money there is a premium on brevity or to put it otherwise, a constraint on length. The result is "telegraphic" English and telegraphic English is an English of nouns, verbs, and adjectives. One does not send a cable reading: "My car has broken down and I have lost my wallet; send money to me at the

American Express in Paris" but rather "Car broken down; wallet lost; send money American Express Paris." The telegram omits: *my, has, and, I, have, my, to, me, at, the, in.* All of these are functors. We make the same kind of telegraphic reduction when time or fatigue constrain us to be brief, as witness any set of notes taken at a fast-moving lecture.

A telegraphic transformation of English generally communicates very well. It does so because it retains the high-information words and drops the low-information words. We are here using "information" in the sense of the mathematical theory of communication. The information carried by a word is inversely related to the chances of guessing it from context. From a given string of content words, missing functors can often be guessed but the message "my has and I have my to me at the in" will not serve to get money to Paris. Perhaps children are able to make a communication analysis of adult speech and so adapt in an optimal way to their limitation of span. There is, however, another way in which the adaptive outcome might be achieved.

If you say aloud the model sentences of Table 2 you will find that you place the heavier stresses, the primary and secondary stresses in the sentences, on contentives rather than on functors. In fact the heavier stresses fall, for the most part, on the words the child retains. We first realized that this was the case when we found that in transcribing tapes, the words of the mother that we could hear most clearly were usually the words that the child reproduced. We had trouble hearing the weakly stressed functors and, of course, the child usually failed to reproduce them. Differential stress may then be the cause of the child's differential retention. The outcome is a maximally informative reduction but the cause of this outcome need not be the making of an information analysis. The outcome may be an incidental consequence of the fact that English is a well-designed language that places its heavier stresses where they are needed, on contentives that cannot easily be guessed from context.

We are fairly sure that differential stress is one of the determinants of the child's telegraphic productions. For one thing, stress will also account for the way in which children reproduce polysyllabic words when the total is too much for them. Adam, for instance, gave us *'pression* for *expression* and Eve gave us *'raff* for *giraffe*; the more heavily-stressed syllables were the ones retained. In addition we have tried the effect of placing heavy stresses on functors which do not ordinarily receive such stresses. To Adam we said: "You say what I say" and then, speaking in a normal way at first: "The doggie will bite." Adam gave back: "Doggie bite." Then we stressed the auxiliary: "The doggie *will* bite" and, after a few trials, Adam made attempts at reproducing that auxiliary. A science fiction experiment comes to mind. If there were parents who stressed functors rather than contentives would they have children whose speech was a kind of "reciprocal telegraphic" made up of articles,

prepositions, conjunctions, auxiliaries, and the like? Such children would be out of touch with the community as real children are not.

It may be that all the factors we have mentioned play some part in determining the child's selective imitations; the reference-making function of contentives, the fact that they are practiced as single words, the fact that they cannot be guessed from context, and the heavy stresses they receive. There are also other possible factors: for example, the left-to-right, earlier-to-later position of words in a sentence, but these make too long a story to tell here.[4] Whatever the causes, the first utterances produced as imitations of adult sentences are highly systematic reductions of their models. Furthermore, the telegraphic properties of these imitations appear also in the child's spontaneously produced utterances. When his speech is not modeled on an immediately prior adult sentence, it observes the same limitation on length and the same predilection for contentives as when it is modeled on an immediately prior sentence.

Imitation with Expansion

In the course of the brief conversation set down in Table 1, Adam's mother at one point imitates Adam. The boy says: "There go one" and mother responds: "Yes, there goes one." She does not exactly reproduce the model sentence of the child but instead adds something to it or expands it. What she adds is a functor, the inflection for third-person on the verb, the very form that Adam had omitted when he imitated his mother.

One of the first things we noticed when we began to study child speech several years ago was the frequency with which adults imitated children. Indeed they seemed to imitate more often than did the children themselves. We later came to realize that adult imitations are seldom exact reproductions; they are usually expansions. The mothers of Adam and Eve responded to the speech of their children with expansions about thirty per cent of the time. We did it ourselves when we talked with the children. Indeed we found it very difficult to withhold expansions. A reduced or incomplete English sentence seems to constrain the English-speaking adult to expand it into the nearest properly formed complete sentence. Table 3 lists a few sample expansions from the hundreds in the records.

The first thing worthy of attention in the expansions of Table 3 is the fact that the words spoken by the mother preserve the order of the words in the child's sentences. To be sure, words and inflections are added but they are fitted in—before, and after and between the words the child used; they are not generally permitted to disturb the order of the child's words. It is as if

[4] Brown and Fraser, *ibid.*

TABLE 3

Expansions of Child Speech Produced by Mothers

Child	Mother
Baby highchair	*Baby is in the highchair*
Mommy eggnog	*Mommy had her eggnog*
Eve lunch	*Eve is having lunch*
Mommy sandwich	*Mommy'll have a sandwich*
Sat wall	*He sat on the wall*
Throw Daddy	*Throw it to Daddy*
Pick glove	*Pick the glove up*

these latter were taken as constants by the mother, constants to which some sentence had to be fitted. She acts as if she were assuming that the child means everything he says, all the words and also their order, but as if he might also mean more than he says. From the mother's point of view an expansion is a kind of communication check; it says in effect: "Is this what you mean?"

The second thing to notice about Table 3 is the character of the forms added to the child's utterances. They include the auxiliaries *is* and *will;* the prepositions *in, on, to,* and *up;* the verb forms *is, have, had,* and *having;* the articles *a* and *the;* the pronouns *her, he,* and *it.* For the most part, the words added are functors and functors are of course the words that the child omits in his reductions.

The interaction between mother and child is, much of the time, a cycle of reductions and expansions. There are two transformations involved. The reduction transformation has an almost completely specifiable and so mechanical character. One could program a machine to do it with the following instructions: "Retain contentives (or stressed forms) in the order given up to some limit of length." The expansion accomplished by Adam's mother when she added the third-person inflection to the verb and said "There goes one" is also a completely specifiable transformation. The instructions would read: "Retain the forms given in the order given and supply obligatory grammatical forms." To be sure this mother-machine would have to be supplied with the obligatory rules of English grammar but that could be done. However, the sentence "There goes one" is atypical in that it only adds a compulsory and redundant inflection. The expansions of Table 3 all add forms that are not grammatically compulsory or redundant and these expansions cannot be mechanically generated by grammatical rules alone.

In Table 3 the topmost four utterances produced by the child are all of the same grammatical type; all four consist of a proper noun followed by a com-

mon noun. However, the four are expanded in quite different ways. In particular the form of the verb changes: it is in the first case in the simple present tense; in the second case the simple past; in the third case the present progressive; in the last case the simple future. All of these are perfectly grammatical but they are different. The second set of child utterances is formally uniform in that each one consists of a verb followed by a noun. The expansions are again all grammatical but quite unlike, especially with regard to the preposition supplied. In general, then, there are radical changes in the mother's expansions when there are no changes in the formal character of the utterances expanded. It follows that the expansions cannot be produced simply by making grammatically compulsory additions to the child's utterances.

How does a mother decide on the correct expansion of one of her child's utterances? Consider the utterance "Eve lunch." So far as grammar is concerned this utterance could be appropriately expanded in any of a number of ways: "Eve is having lunch"; "Eve had lunch"; "Eve will have lunch"; Eve's lunch," etc. On the occasion when Eve produced the utterance, however, one expansion seemed more appropriate than any other. It was then the noon hour, Eve was sitting at the table with a plate of food before her, and her spoon and fingers were busy. In these circumstances "Eve lunch" had to mean "Eve is having lunch." A little later when the plate had been stacked in the sink and Eve was getting down from her chair the utterance "Eve lunch" would have suggested the expansion "Eve has had her lunch." Most expansions are not only responsive to the child's words but also to the circumstances attending their utterance.

What kind of instructions will generate the mother's expansions? The following are approximately correct: "Retain the words given in the order given and add those functors that will result in a well-formed simple sentence that is appropriate to the circumstances." These are not instructions that any machine could follow. A machine could act on the instructions only if it were provided with detailed specifications for judging appropriateness and no such specifications can, at present, be written. They exist, however, in implicit form in the brains of mothers and in the brains of all English-speaking adults and so judgments of appropriateness can be made by such adults.

The expansion encodes aspects of reality that are not coded by the child's telegraphic utterance. Functors have meaning but it is meaning that accrues to them in context rather than in isolation. The meanings that are added by functors seem to be nothing less than the basic terms in which we construe reality: the time of an action, whether it is ongoing or completed, whether it is presently relevant or not; the concept of possession and such relational concepts as are coded by *in, on, up, down,* and the like; the difference between

a particular instance of a class ("Has anybody seen *the* paper?") and any instance of a class ("Has anybody seen *a* paper?"); the difference between extended substances given shape and size by an "accidental" container (*sand, water, syrup,* etc.) and countable "things" having a characteristic fixed shape and size (*a cup, a man, a tree,* etc.). It seems to us that a mother in expanding speech may be teaching more than grammar; she may be teaching something like a world-view.

As yet it has not been demonstrated that expansions are *necessary* for learning either grammar or a construction of reality. It has not even been demonstrated that expansions contribute to such learning. All we know is that some parents do expand and their children do learn. It is perfectly possible, however, that children can and do learn simply from hearing their parents or others make well-formed sentences in connection with various nonverbal circumstances. It may not be necessary or even helpful for these sentences to be expansions of utterances of the child. Only experiments contrasting expansion training with simple exposure to English will settle the matter. We hope to do such experiments.

There are, of course, reasons for expecting the expansion transformation to be an effective tutorial technique. By adding something to the words the child has just produced one confirms his response insofar as it is appropriate. In addition one takes him somewhat beyond that response but not greatly beyond it. One encodes additional meanings at a moment when he is most likely to be attending to the cues that can teach that meaning.

Induction of the Latent Structure

Adam, in the course of the conversation with his mother set down in Table 1, produced one utterance for which no adult is likely ever to have provided an exact model: "No I see truck." His mother elects to expand it as "No, you didn't see it" and this expansion suggests that the child might have created the utterance by reducing an adult model containing the form *didn't.* However, the mother's expansion in this case does some violence to Adam's original version. He did not say *no* as his mother said it, with primary stress and final contour; Adam's *no* had secondary stress and no final contour. It is not easy to imagine an adult model for this utterance. It seems more likely that the utterance was created by Adam as part of a continuing effort to discover the general rules for constructing English negatives.

In Table 4 we have listed some utterances produced by Adam or Eve for which it is difficult to imagine any adult model. It is unlikely that any adult said any of these to Adam or Eve since they are very simple utterances and yet definitely ungrammatical. In addition it is difficult, by adding functors

TABLE 4

Utterances Not Likely to be Imitations

My Cromer suitcase	*You naughty are*
Two foot	*Why it can't turn off?*
A bags	*Put on it*
A scissor	*Cowboy did fighting me*
A this truck	*Put a gas in*

alone, to build any of them up to simple grammatical sentences. Consequently it does not seem likely that these utterances are reductions of adult originals. It is more likely that they are mistakes which externalize the child's search for the regularities of English syntax.

We have long realized that the occurrence of certain kinds of errors on the level of morphology (or word construction) reveals the child's effort to induce regularities from speech. So long as a child speaks correctly, or at any rate so long as he speaks as correctly as the adults he hears, there is no way to tell whether he is simply repeating what he has heard or whether he is actually constructing. However, when he says something like "I digged a hole" we can often be sure that he is constructing. We can be sure because it is unlikely that he would have heard *digged* from anyone and because we can see how, in processing words he has heard, he might have come by *digged.* It looks like an overgeneralization of the regular past inflection. The inductive operations of the child's mind are externalized in such a creation. Overgeneralizations on the level of syntax (or sentence construction) are more difficult to identify because there are so many ways of adding functors so as to build up conceivable models. But this is difficult to do for the examples of Table 4 and for several hundred other utterances in our records.

The processes of imitation and expansion are not sufficient to account for the degree of linguistic competence that children regularly acquire. These processes alone cannot teach more than the sum total of sentences that speakers of English have either modeled for a child to imitate or built up from a child's reductions. However, a child's linguistic competence extends far beyond this sum total of sentences. All children are able to understand and construct sentences they have never heard but which are nevertheless well-formed, well-formed in terms of general rules that are implicit in the sentences the child has heard. Somehow, then, every child processes the speech to which he is exposed so as to induce from it a latent structure. This latent rule structure is so general that a child can spin out its implications all his life long. It is both semantic and syntactic. The discovery of latent structure is the greatest of the processes involved in language acquisition and the most

difficult to understand. We will provide an example of how the analysis can proceed by discussing the evolution in child speech of noun phrases.

A noun phrase in adult English includes a noun but also more than a noun. One variety consists of a noun with assorted modifiers: *The girl*; *The pretty girl*; *That pretty girl*; *My girl*, etc. All of these are constructions which have the same syntactic privileges as do nouns alone. One can use a noun phrase in isolation to name or request something; one can use it in sentences, in subject position or in object position or in predicate nominative position. All of these are slots that nouns alone can also fill. A larger construction having the same syntactic privileges as its "head" word is called in linguistics an "endocentric" construction and noun phrases are endocentric constructions.

For both Adam and Eve, in the early records, noun phrases usually occur as total independent utterances rather than as components of sentences. Table 5 presents an assortment of such utterances at Time 1. They consist in each case of some sort of modifier, just one, preceding a noun. The modifiers, or as they are sometimes called the "pivot" words, are a much smaller class than the noun class. Three students of child speech have independently discovered that this kind of construction is extremely common when children first begin to combine words. [5, 6, 7]

TABLE 5

Noun Phrases in Isolation and Rule for Generating Noun Phrases at Time 1

A coat	*More coffee*
*A celery**	*More nut**
*A Becky**	*Two sock**
*A hands**	*Two shoes*
The top	*two tinker-toy**
My Mommy	*Big boot*
That Adam	*Poor man*
My stool	*Little top*
That knee	*Dirty knee*

$NP \rightarrow M + N$

$M \rightarrow$ *a, big, dirty, little, more, my, poor, that, the, two.*
$N \rightarrow$ *Adam, Becky, boot, coat, coffee, knee, man, Mommy, nut, sock, stool, tinker-toy, top,* and very many others.

* Ungrammatical for an adult.

[5] M. D. S. Braine, "The ontogeny of English phrase structure: the first phrase," *Language*, XXXIX (1963), 1-13.

[6] W. Miller and Susan Ervin, "The development of grammar in child language," Ursula Bellugi and R. Brown, eds., *The Acquisition of Language, Child Developm. Monogr.* (1964).

[7] Brown and Fraser, *op. cit.*

It is possible to generalize the cases of Table 5 into a simple implicit rule. The rule symbolized in Table 5 reads: "In order to form a noun phrase of this type, select first one word from the small class of modifiers and select, second, one word from the large class of nouns." This is a "generative" rule by which we mean it is a program that would actually serve to build constructions of the type in question. It is offered as a model of the mental mechanism by which Adam and Eve generated such utterances. Furthermore, judging from our work with other children and from the reports of Braine and of Miller and Ervin, the model describes a mechanism present in many children when their average utterance is approximately two morphemes long.

We have found that even in our earliest records the M + N construction is sometimes used as a component of larger constructions. For instance, Eve said: "Fix a Lassie" and "Turn the page" and "A horsie stuck" and Adam even said: "Adam wear a shirt." There are, at first, only a handful of these larger constructions but there are very many constructions in which single nouns occur in subject or in object position.

Let us look again at the utterances of Table 5 and the rule generalizing them. The class M does not correspond with any syntactic class of adult English. In the class M are articles, a possessive pronoun, a cardinal number, a demonstrative adjective or pronoun, a quantifier, and some descriptive adjectives—a mixed bag indeed. For adult English these words cannot belong to the same syntactic class because they have very different privileges of occurrence in sentences. For the children the words do seem to function as one class having the common privilege of occurrence before nouns.

If the initial words of the utterances in Table 5 are treated as one class M then many utterances are generated which an adult speaker would judge to be ungrammatical. Consider the indefinite article *a*. Adults use it only to modify common count nouns in the singular such as *coat, dog, cup,* etc. We would not say *a celery,* or *a cereal,* or *a dirt; celery, cereal,* and *dirt* are mass nouns. We would not say *a Becky* or *a Jimmy; Becky* and *Jimmy* are proper nouns. We would not say *a hands* or *a shoes; hands* and *shoes* are plural nouns. Adam and Eve, at first, did form ungrammatical combinations such as these.

The numeral *two* we use only with count nouns in the plural. We would not say *two sock* since *sock* is singular, nor *two water* since *water* is a mass noun. The word *more* we use before count nouns in the plural (*more nuts*) or mass nouns in the singular (*more coffee*). Adam and Eve made a number of combinations involving *two* or *more* that we would not make.

Given the initial very undiscriminating use of words in the class M it follows that one dimension of development must be a progressive differentiation of privileges, which means the division of M into smaller classes. There must also be subdivision of the noun class (N) for the reason that the privileges

of occurrence of various kinds of modifiers must be described in terms of such sub-varieties of N as the common noun and proper noun, the count noun and mass noun. There must eventually emerge a distinction between nouns singular and nouns plural since this distinction figures in the privileges of occurrence of the several sorts of modifiers.

Sixteen weeks after our first records from Adam and Eve (Time 2), the differentiation process had begun. By this time there were distributional reasons for separating out articles (*a, the*) from demonstrative pronouns (*this, that*) and both of these from the residual class of modifiers. Some of the evidence for this conclusion appears in Table 6. In general one syntactic class is distinguished from another when the members of one class have combinational privileges not enjoyed by the members of the other. Consider, for example, the reasons for distinguishing articles (Art) from modifiers in general (M). Both articles and modifiers appeared in front of nouns in two-word utterances. However, in three-word utterances that were made up from the total pool of words and that had a noun in final position, the privileges of *a* and *the* were different from the privileges of all other modifiers. The articles occurred in initial position followed by a member of class M other than an article. No other modifier occurred in this first position; notice the "Not obtained" examples of Table 6A. If the children had produced utterances like those (for example, *blue a flower, your a car*) there would have been no difference in the privileges of occurrence of articles and modifiers and therefore no reason to separate out articles.

The record of Adam is especially instructive. He created such notably un-

TABLE 6

Subdivision of the Modifier Class

A) PRIVILEGES PECULIAR TO ARTICLES

Obtained	Not Obtained
A blue flower	*Blue a flower*
A nice nap	*Nice a nap*
A your car	*Your a car*
A my pencil	*My a pencil*

B) PRIVILEGES PECULIAR TO DEMONSTRATIVE PRONOUNS

Obtained	Not Obtained
That my cup	*My that cup*
That a horse	*A that horse*
That a blue flower	*A that blue flower*
	Blue a that flower

grammatical combinations as "a your car" and "a my pencil." It is very unlikely that adults provided models for these. They argue strongly that Adam regarded all the words in the residual M class as syntactic equivalents and so generated these very odd utterances in which possessive pronouns appear where descriptive adjectives would be more acceptable.

Table 6 also presents some of the evidence for distinguishing demonstrative pronouns (Dem) from articles and modifiers. (Table 6B). The pronouns occurred first and ahead of articles in three-and-four-word utterances—a position that neither articles nor modifiers ever filled. The sentences with demonstrative pronouns are recognizable as reductions which omit the copular verb *is*. Such sentences are not noun phrases in adult English and ultimately they will not function as noun phrases in the speech of the children, but for the present they are not distinguishable distributionally from noun phrases.

TABLE 7

Rules for Generating Noun Phrases at Time 2

$NP_1 \rightarrow$ Dem + Art + M + N	NP $\rightarrow$ (Dem) + (Art) + (M) + N
$NP_2 \rightarrow$ Art + M + N	
$NP_3 \rightarrow$ Dem + M + N	
$NP_4 \rightarrow$ Art + N	( ) means class within parentheses is optional
$NP_5 \rightarrow$ M + N	
$NP_6 \rightarrow$ Dem + N	
$NP_7 \rightarrow$ Dem + Art + N	

Recall now the generative formula of Table 5 which constructs noun phrases by simply placing a modifier (M) before a noun (N). The differentiation of privileges illustrated in Table 6, and the syntactic classes this evidence motivates us to create, complicate the formula for generating noun phrases. In Table 7 we have written a single general formula for producing all noun phrases at Time 2 [NP $\rightarrow$ (Dem) + (Art) + (M) + N] and also the numerous more specific rules which are summarized by the general formula.

By the time of the thirteenth transcription, twenty-six weeks after we began our study, privileges of occurrence were much more finely differentiated and syntactic classes were consequently more numerous. From the distributional evidence we judged that Adam had made five classes of his original class M: articles, descriptive adjectives, possessive pronouns, demonstrative pronouns, and a residual class of modifiers. The generative rules of Table 7 had become inadequate; there were no longer, for instance, any combinations

like "A your car." Eve had the same set except that she used two residual classes of modifiers. In addition nouns had begun to subdivide for both children. The usage of proper nouns had become clearly distinct from the usage of count nouns. For Eve the evidence justified separating count nouns from mass nouns, but for Adam it still did not. Both children by this time were frequently pluralizing nouns but as yet their syntactic control of the singular-plural distinction was imperfect.

In summary, one major aspect of the development of general structure in child speech is a progressive differentiation in the usage of words and therefore a progressive differentiation of syntactic classes. At the same time, however, there is an integrative process at work. From the first, an occasional noun phrase occurred as a component of some larger construction. At first these noun phrases were just two words long and the range of positions in which they could occur was small. With time the noun phrases grew longer, were more frequently used, and were used in a greater range of positions. The noun phrase structure as a whole, in all the permissible combinations of modifiers and nouns, was assuming the combinational privileges enjoyed by nouns in isolation.

In Table 8 we have set down some of the sentence positions in which both nouns and noun phrases occurred in the speech of Adam and Eve. It is the close match between the positions of nouns alone and of nouns with modifiers in the speech of Adam and Eve that justifies us in calling the longer constructions noun phrases. These longer constructions are, as they should be, endocentric; the head word alone has the same syntactic privileges as the head word with its modifiers. The continuing failure to find in noun phrase positions whole constructions of the type "That a blue flower" signals the fact that these constructions are telegraphic versions of predicate nominative sentences omitting the verb form *is*. Examples of the kind of construction not obtained are: "That (that a blue flower)"; "Where (that a blue flower)?"

For adults the noun phrase is a subwhole of the sentence, what linguists call

TABLE 8

Some Privileges of the Noun Phrase

Noun Positions	Noun Phrase Positions
That (flower)	*That (a blue flower)*
Where (ball) go?	*Where (the puzzle) go?*
Adam write (penguin)	*Doggie eat (the breakfast)*
(Horsie) stop	*(A horsie) crying*
Put (hat) on	*Put (the red hat) on*

an "immediate constituent." The noun phrase has a kind of psychological unity. There are signs that the noun phrase was also an immediate constituent for Adam and Eve. Consider the sentence using the separable verb *put on*. The noun phrase in "Put the red hat on" is, as a whole, fitted in between the verb and the particle even as is the noun alone in "Put hat on." What is more, however, the location of pauses in the longer sentence, on several occasions, suggested the psychological organization: "Put . . . the red hat . . . on" rather than "Put the red . . . hat on" or "Put the . . . red hat on." In addition to this evidence the use of pronouns suggests that the noun phrase is a psychological unit.

The unity of noun phrases in adult English is evidenced, in the first place, by the syntactic equivalence between such phrases and nouns alone. It is evidenced, in the second place, by the fact that pronouns are able to substitute for total noun phrases. In our immediately preceding sentence the pronoun "It" stands for the rather involved construction from the first sentence of this paragraph: "The unity of noun phrases in adult English." The words called "pronouns" in English would more aptly be called "pro-noun-phrases" since it is the phrase rather than the noun which they usually replace. One does not replace "unity" with "it" and say "The *it* of noun phrases in adult English." In the speech of Adam and Eve, too, the pronoun came to function as a replacement for the noun phrase. Some of the clearer cases appear in Table 9.

Adam characteristically externalizes more of his learning than does Eve and his record is especially instructive in connection with the learning of pronouns. In his first eight records, the first sixteen weeks of the study, Adam quite often produced sentences containing both the pronoun and the noun

TABLE 9

Pronouns Replacing Nouns or Noun Phrases and Pronouns Produced Together with Nouns or Noun Phrases

Noun Phrases Replaced by Pronouns	Pronouns and Noun Phrases in Same Utterances
Hit ball	*Mommy get it ladder*
Get it	*Mommy get it my ladder*
Ball go?	*Saw it ball*
Go get it	*Miss it garage*
Made it	*I miss it cowboy boot*
Made a ship	*I Adam drive that*
Fix a tricycle	*I Adam drive*
Fix it	*I Adam don't*

or noun phrase that the pronoun should have replaced. One can here see the equivalence in the process of establishment. First the substitute is produced and then, as if in explication, the form or forms that will eventually be replaced by the substitute. Adam spoke out his pronoun antecedents as chronological consequents. This is additional evidence of the unity of the noun phrase since the noun phrases *my ladder* and *cowboy boot* are linked with *it* in Adam's speech in just the same way as the nouns *ladder* and *ball.*

We have described three processes involved in the child's acquisition of syntax. It is clear that the last of these, the induction of latent structure, is by far the most complex. It looks as if this last process will put a serious strain on any learning theory thus far conceived by psychology. The very intricate simultaneous differentiation and integration that constitutes the evolution of the noun phrase is more reminiscent of the biological development of an embryo than it is of the acquisition of a conditional reflex.