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Children's Interpretations
of
Sentences Containing Reciprocals. *

Edward H. Matthei

Introduction

It seems that every discussion of constraints on linguistic theory either begins or ends with some reference to 'the child' and the 'learnability' of certain kinds of grammars. This should not be surprising because at least part of the motivation for wanting to constrain linguistic theory comes from a desire to discover something about the biological endowment that makes language acquisition possible for human beings. It is Chomsky's view, put forward in almost every work of his since his Aspects of the Theory of Syntax (Chomsky, 1965), that constraints on the rules of grammar are part of 'universal grammar' which, in turn, must be realized in some way as a part of the language acquisition device. Constraints on linguistic theory restrict the class of possible grammars for human languages. Their role in the language acquisition process, then, is to reduce the number of possible grammars that children have to consider when they set out to learn a language, thus making an otherwise difficult -- or impossible -- task a manageable one.

The experiment I will describe in this paper is part of an enterprise I have undertaken in order to see if and how constraints like those proposed by Chomsky (1973, 1975, 1976, 1977) may operate as children attempt to learn a language. Going a little bit beyond the scope of this paper, the question I wish to consider is, 'How does a child learn a language?' What kinds of 'assumptions' about language do children bring with them when they start making guesses about the way the languages they are learning work? Is there some set of principles which seem to guide children's guessing about languages and grammars?

This paper will proceed in the following manner: To begin, I will consider some of the specific constraints proposed by Chomsky, and I will illustrate how they operate in sentences containing reciprocal pronouns. From there I will move on to discuss an experiment involving children's interpretations of two-clause sentences containing reciprocal pronouns. After discussing the results of the experiment, I will touch on some of the basic reasons for why it is necessary to put constraints on the theory of grammar. A discussion of the general problem of language learning and of some of the results from the formal study of language learning will serve as the basis for this section. Finally, I will consider the implications of the results of the experiment in light of the preceding discussion of the problems of language learnability.

Chomsky's Recent Proposals

The person who has learned a language has constructed a system of rules and principles (a grammar, in other words) that determines the sound-meaning correspondences in the domain of that language. The grammar constructed by a linguist is a theory about what this system is like. The general theory of grammar, i.e. 'linguistic theory' or 'universal grammar', is a system of principles that specifies what counts as a grammar (conditions on form) and how grammatical rules work to generate structural descriptions of sentences (conditions on function). Conditions on the form of grammars will include specifications of the possible form of base structures, transformational

rules, phonological rules, etc. Conditions on function will include constraints on the operation of these rules such as the principle of the cycle, the A-over-A Condition (Chomsky, 1965; Bresnan, 1976), or the Coordinate Structure Constraint (Ross, 1967). The major problem in grammatical theory is to restrict the class of grammars that are available in principle to the learner. The clear intent behind this is to make some progress toward formulating a solution to the problem of how people are able to acquire a language. The construction of a theory of grammar can be viewed in part as an attempt to specify the properties of grammars that hold by necessity rather than as the accidental results of experience. As Chomsky is quick to point out, this 'necessity' is intended to mean biological rather than logical necessity. We can look upon attempts to formulate some sort of restrictive theory of universal grammar as attempts to discover something about the biological endowment that makes language learning possible for human beings.

With this in mind, Chomsky has set out in recent years to formulate a very restrictive theory of grammar. He starts with the basic notion that a grammar is a mechanism which determines sound-meaning relations. He then assumes that this mechanism is a set of rules that associate (syntactic) transformational derivations with representations of sound and meaning. In his recent work, Chomsky has said very little about the system for representing sounds, assuming the basic framework of The Sound Pattern of English (Chomsky and Halle, 1968) with some modifications. ¹

Chomsky has been more concerned as of late with the relation between a syntactic representation and some sort of semantic representation. In his model, a grammar contains a set of rules that associates syntactic derivations with representations in a system which he calls 'Logical Form' (henceforth referred to here as 'LF'). A representation in LF is supposed to incorporate the features of syntactic structure that enter directly into semantic interpretation (such as scope relationships) and are strictly determined by the properties of sentence-grammar (as opposed to those features that are determined by the rules governing the structure of discourses). He further assumes that there is another system of rules that takes representations in LF, along with the products of 'other cognitive faculties', and associates them with some kind of 'semantic' representation. These 'semantic' representations may involve such things as beliefs, expectations, etc., as well as properties of LF determined by grammatical rules; and these representations will contain all of the information needed for running inferences, determining the felicity or truth of utterances, etc. Thus, the relation between sound and meaning in Chomsky's model can be illustrated by a diagram like the one in Figure 1, below.

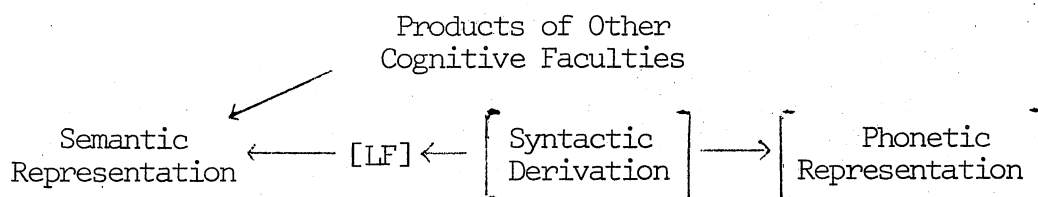


Figure 1.

The grammar relates sounds to meanings through the medium of syntactic derivations.

This way of looking at things embodies a certain version of the 'thesis of the autonomy of syntax' (See Chomsky, 1973). Chomsky assumes that the rules of sentence-grammar can be parcelled out into two categories. The first category (the category of rules making up what Chomsky (1974) has called 'formal grammar') determines representations on all levels of linguistic description except at the levels of LF and beyond. The second category of rules associates these representations with representations in LF. The whole network of assumptions and hypotheses has been called by Chomsky the 'extended standard theory.'

Within this 'extended standard theory', we can restrict the class of grammars by placing constraints in a number of different places. We can impose conditions on the base rules, thus restricting the variety of possible base structures that can enter into a derivation. We can limit the expressive power of transformational rules so that the things which transformations can do will be limited. Or we can place restrictions on the so-called 'interpretive rules' which associate representations in LF with syntactic derivations. In addition to these kinds of restrictions, we can add conditions on rule application which may not directly limit the variety of admissible grammars but which may contribute indirectly to this end by enabling us to reduce the expressive power of certain kinds of rules. Our discussion from this point on will center on restrictions on the expressive power of transformational and interpretive rules which Chomsky has proposed as well as the conditions on the application of rules which become necessary within the restricted theory of transformations proposed by Chomsky in his recent works.

Chomsky has proposed that the expressive power of transformations be severely restricted to the point where the two rules in (1) make up the only transformations in the 'core' of grammar. ²

- 1) a. Move NP
- b. Move Wh

There are many problems that arise with such radical restrictions on the expressive powers of transformations. It should be immediately obvious that a grammar that is limited to such rules as those in (1) will overgenerate tremendously. The intricate constraints on what can move and where it can go that we have become accustomed to seeing in the formulations of specific rules cannot be built into such rules. Therefore, Chomsky has pursued two specific approaches to eliminating this problem of over-generation: first, he has tried to impose general conditions on the application of rules, and, second, he has tried to impose conditions on the outputs of rules (surface structure filters). The second kind of restriction has, in general, been related to the rules of semantic interpretation (cf. Jackendoff, 1972); but recently Chomsky and Lasnik (1977) have proposed a number of syntactic surface structure filters which make reference to specific properties of the complementizer system. We will be concerned with conditions of the first type and, more specifically, with conditions that apply both to transformational rules and to interpretive rules.

Chomsky's Conditions on Rules

Chomsky has suggested that we can eliminate many of the problems of

over-generation by introducing to the grammar a few general conditions on the functioning of rules. We will discuss two of them here along with their interaction with the rule of Reciprocal Interpretation. The two conditions are stated together in (2).

2) In a structure of the form

... X ... [_X... Y ...]_X ... X ...

no rule can involve X and Y where:

- i. * is a tensed-S (The Tensed-S Condition)
- ii. or * contains a subject distinct from Y and not controlled by X (The Specified-Subject Condition).

Now consider the sentences in (3).

- 3) a. The men like each other.
- b. *The men want John to like each other.
- c. *The candidates expected that each other would win.

Sentences like these have suggested to some, e.g., Postal (1974), that there is some sort of 'clause-mate' constraint on the rule which interprets each other, making it necessary for the referent of each other to be contained in the same clause as the each other appears. Let us assume, following Chomsky (1974, 1977), that there is a rule called 'Reciprocal Interpretation' which assigns an appropriate interpretation to sentences containing the sequence NP ... each other.^{3,4} This rule will say nothing about clause-mate restrictions, it will simply say something like 'interpret NP ... each other in such-and-such a manner.' This rule can apply in sentence (3a), but it cannot apply in (3b) because the connection between the NP, the men, and each other will be blocked by the intervening specified-subject, John. Similarly, the rule is also blocked in (3c), this time because the dependent clause, that each other would win, is a tensed-S, hence, the Reciprocal rule cannot relate the candidates and each other. The interpretive rule acts as a 'filter' in these cases, since uninterpretable strings will be marked ungrammatical and thrown out.

Possible Implications for Language Acquisition

The status of these conditions is not clear. What their role in the theory of grammar is -- if they have any role at all -- is an empirical matter. Nor is it clear what role in the language learning process Chomsky sees these conditions playing. But, for the sake of argument, we shall take a strong and, perhaps, too simplistic view of the operation of these constraints in the language learning process.

Let us, then, assume that every child comes into the world with constraints like those in (2), p. , wired right in as standard equipment, so to speak. Whether these constraints are represented directly or indirectly as restrictions on the child's guessing procedure is not important; it is sufficient for the argument here that they exist in some form in the learner. I have done an experiment on children's interpretations of sentences containing reciprocals. Before going on to discuss the design and the results of the experiment, though, I would like to consider a number of general hypotheses

about the outcome of the experiment if we take a strong interpretation of the role of Chomsky's constraints in language learning.

The experiment is an attempt to find out how children interpret reciprocals in two-clause sentences like (4), below.

- 4) The demonstrators said that the National Guardsmen were hitting each other.

Notice that the only grammatical interpretation of this sentence involves the National Guardsmen hitting the National Guardsmen and not the demonstrators. Both the Specified-Subject Condition and the Tensed-S Condition will block the application of the Reciprocal rule to the sequence The demonstrators ... each other. What should we expect to see if we look at children's interpretations of sentences like these? There are a number of hypotheses and families of hypotheses that we might consider.

Hypothesis 1: It is possible that children will start out interpreting sentences like (4) in exactly the same way as adults. That is, once they discover the Reciprocal rule, the first hypothesis they will make is that it is a 'clause-bounded' rule because of the constraints that they innately possess.

Hypothesis 2: Children may misinterpret sentences like (4) because they have not yet figured out how to apply the constraints. Specifically, children may have to figure out what the domain of application for the constraints is. We might, then, expect them to make mistakes until they have determined such things as where clauses begin and end in complex sentences. This suggests a couple of subhypotheses:

Hypothesis 2A: The presence of a complement marker, e.g. that or to, may help children to apply constraints correctly since such markers 'signal' the beginning of a new clause.

Hypothesis 2B: Perhaps clauses containing tense markers, i.e. tensed-S's, will be easier to recognize as new clauses because they are more like simple one-clause sentences; hence, we may find children applying the constraints correctly in these cases sooner than in cases where the reciprocal is in a non-finite clause of some sort.

Hypothesis 3: Children may have to learn that the Reciprocal rule is subject to the constraints. They may treat each other just as they would any other pronoun. Ordinarily, anaphoric reference is not subject to the constraints, because much of the determination of the referents for pronouns is subject to discourse conditions. In other words, children's first guesses about the Reciprocal rule will be that it is not subject to the constraints.⁵

The Experiment

Design: The experiment was specifically designed to test Hypothesis 2, above. Note that Hypotheses 2A and 2B both predict that we will find a difference in children's interpretations of reciprocals that depends on the type of complement that contains the each other. Four types of sentences, each of which contained a different kind of verb complement, were used in the study; examples of each sentence type are given in (5), below.

- 5) a. that complements:
'The horse said that the cows jumped over each other.'

- b. 'deleted'-that complements:
'The pigs said the chickens pecked each other.'
- c. infinitival complements:
'The cows want the lambs to kiss each other.'
- d. gerundive complements:
'The pigs noticed the boys patting each other.'

This allows us to test to see if there is any difference in the interpretations children give to sentences which contain finite-clause complements, (5a) and (5b), and non-finite complements, (5c) and (5d), or to those which contain complement markers, (5a) and (5c), and those which do not, (5b) and (5d).

While doing a pilot study, I noticed that the children appeared to find simple sentences like those in (6) easier to understand when the subject was a conjoined NP, as in (6b), than when it was simply a plural NP, as in (6a).

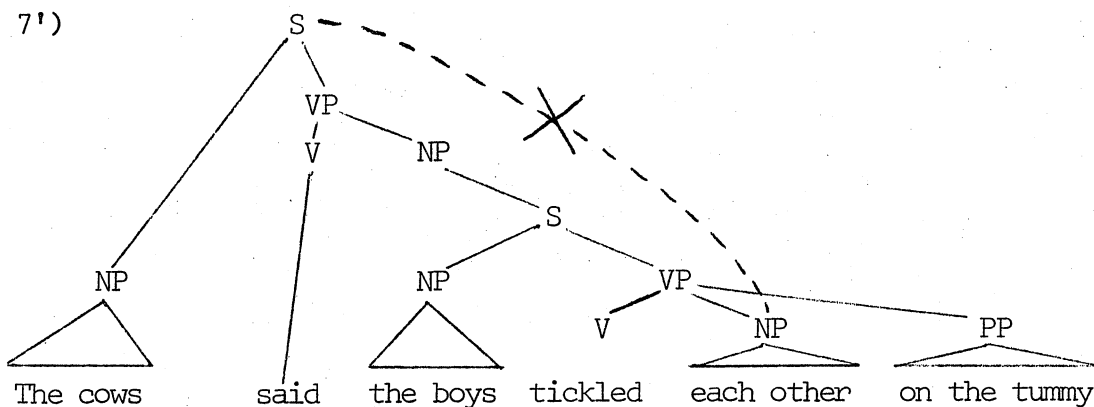
- 6) a. The cows were kicking each other.
- b. The pig and the lamb were kissing each other.

I decided to include a test of this intuition in the experiment. If children somehow find it easier to understand reciprocals when there are clearly two distinct individuals involved, then, perhaps, this might influence any tendency they might have to violate the 'clause-mate' constraints on Reciprocal Interpretation. Therefore, I varied the subject NP's in both the matrix sentences and the complements so that some were simply plural NP's while others were conjoined NP's.

It was suggested to me in discussions with my colleagues that the children might somehow be attaching each other to the highest S-node in a sentence if it turned out that they took the subject of the matrix sentence as the referent for the reciprocal. In order to test this hypothesis, I attached a prepositional phrase to the end of some sentences which could only be related to the verb in the complement, as in (7).

- 7) The cows said that the boys tickled each other on the tummy.

This would effectively block attachment of each other to the highest S-node, since the branch of the tree attaching the PP to the VP of the complement would 'cut off' attachment of each other to the matrix-S node.



(See Solan and Roeper, this volume, for a discussion of how this 'highest-S attachment' phenomenon can be seen in the child's emerging grammar.)

Because the principle hypothesis being tested involved possible differences attributable to differences in sentence type, the experiment had to be designed to avoid the 'language-as-fixed-effect fallacy' (Clark, 1972). Verbs in both the matrix-S and the complement were inserted randomly into sentence frames so that each child received a different set of sentences. This allows us to collapse any variance that might be due to the choice of a particular verb or verbs with the inter-subject variance.

Two one-clause sentences which included two NP's and a reciprocal pronoun were also included; these are shown in (8).

- 8) a. The boys bumped the cows into each other.
b. The lamb and the dog pushed the horses to each other.

Both of these sentences are -- or can be construed to be -- ambiguous with respect to the referent of the reciprocal. These were included as a check to see if children had a preference for choosing the closest or the first NP as the referent for each other. In all, 34 sentences were included in the test. (See Appendix I for a complete list of the verbs used in the experiment.)

Method: The child and the experimenter sat on the floor, facing each other. A row of toy animals and people (from a Fisher-Price set of barnyard creatures) was set up between the child and the experimenter. The child usually set up the array so that each animal was within easy reach of the child. There were two of each animal, and the children usually arranged the animals in pairs.

After some preliminary discussion about the animals, the experimenter explained that he wanted to play a sort of game with the child in which he would read something to the child and then ask the child to show him 'what happened' by taking the animals mentioned in the sentence and 'making them do it.' Every effort was made to allay any fears about being evaluated that the child might have by letting her/him know, in one way or another, that as far as the experimenter was concerned there were no right or wrong answers. All of the children, in fact, appeared to be perfectly willing to treat the whole affair simply as a game.

To begin, the experimenter read a number of simple, declarative sentences like, 'The pig jumped over the lamb,' to acquaint the child with the task. Then the experimenter introduced between three and five one-clause sentences containing reciprocals (like those in (6), above). If the child appeared to understand these sentences correctly (i.e. as adults do), the experimenter moved on to the actual test. No children who failed to understand the one-clause sentences with reciprocals were included in the test sample.⁶

Test sentences were read to the child as many times as it was necessary to insure that the child remembered a sentence correctly. Most of the children spontaneously rehearsed the sentences aloud, so it was relatively easy to tell when they had remembered the sentences correctly. While rehearsing, the children gave the sentences normal intonation contours and gave no indication that they were just remembering strings of words instead of structured utterances.

Scoring was done by the experimenter who did what to whom when the child

acted out the sentences. Originally, a tape recorder was also used; but, in many cases, it turned out to be a distraction for the children and was not used in most of the sessions.

Subjects: Seventeen children ranging in age from 4;2 to 6;6 participated in the study. All of them were in pre-school or day-care programs in the Amherst-Northampton, Mass., area. They were all native speakers of English. They were tested individually in rooms away from the general noise and activity of the group. Most children were able to run through the test in a single 35-45 min. session; others were tested in two sessions of about 20-25 min. on consecutive days.

Results and Discussion: We will now consider how each of the hypotheses sketched above fare in the light of the data from the experiment. Hypothesis 1 predicted that the children would not make the mistake of choosing the subject of the matrix clause as the referent for each other. The results of the experiment clearly show that the children did make this mistake; 64.4% of the total number of responses were ones in which the children chose the matrix clause subject as the referent for each other.⁷ That is, they would interpret a sentence like (9) as meaning that the pigs tickled the chickens, and vice versa.

- 9) The chickens said that the pigs tickled each other.

Indeed, some of the children in the sample consistently chose the matrix clause subject over the subject of the complement as the referent for the reciprocal pronoun. Hypothesis 1, therefore, appears to be wrong.

Hypothesis 2 predicted that we would find some differences in the children's responses that depended on the type of complement that the each other was embedded in. A one-way analysis of variance was carried out to see if there was any significant effect of complement type on the children's responses. The result of this analysis showed no significant effect, $F(3, 48) < 1$. The general hypothesis -- including the two subhypotheses 2A and 2B -- appears to be incorrect. Phinney (1977) has also found that complement type does not appear to affect children's misinterpretations of the scope of negation in two-clause sentences. To be more explicit, she found that children interpreted sentences like those in (10) as if they contained negatives in both clauses.

- 10) a. Gertrude sees that Martin is not eating.
b. Gertrude does not see that Martin is eating.

That is, the interpretations which the children gave to both of these sentences involved Gertrude not seeing that Martin was not eating. Phinney found that complement type had no effect on the children's tendency to assign such interpretations to sentences like these. This lack of an effect of complement type, therefore, appears to be quite general.

A look at the data also shows that the children did not all of a sudden start obeying one or both of the constraints, either. That is, there is no sharp cut-off at which the children start to interpret the sentences as adults do. This suggests that there are no sudden discoveries of the domain of application for the constraints. Read and Hare (1977) have found a similar

gradual development toward adult grammar in children's interpretations of reflexive pronouns in English, where the rule which interprets reflexives is also subject to 'clause-mate' constraints like the reciprocal rule.

This apparently gradual development of the 'clause-mate' restriction also seems to provide evidence against Hypothesis 3. If children have to learn that the rule of Reciprocal Interpretation is subject to the constraints, we might expect them to suddenly start interpreting the two-clause sentences correctly. However, I admit that this argument is rather weak and that the best way to see if children do actually gradually develop toward the adult interpretation of these sentences is through a longitudinal rather than a cross-sectional study.

In the section on the design of the experiment, I mentioned two other hypotheses that this experiment was specifically designed to test: the possible difference between conjoined and plural NP's as preferred referents for each other and the possibility of 'highest-S attachment' of each other. These hypotheses were tested by performing a two-way analysis of variance with repeated measures on the four-cell matrix in Table 1.

	c-pl	pl-c	Marginal Mean.
No PP	<u>that</u> complement 'deleted' <u>that</u> complement 18	infinitival complement gerundive complement 14	16
PP	infinitival complement gerundive complement 19	<u>that</u> complement 'deleted' <u>that</u> complement 12	15.5
Marginal Mean	18.5	13	

Table 1

Summary of data used in two-way analysis of variance to test effect of conjoined vs. plural NP and sentence-final prepositional phrase. 'c' stands for conjoined NP, 'pl' for plural NP; 'c-pl' indicates matrix subject NP was a conjoined NP, complement subject was simply a plural NP. Numerical values indicate total number of matrix sentence subjects chosen as referent for each other.

Because no effect of complement type was found, the combining of the data from two sentence types in Table 1 can be justified. The results of the analysis show no effect on the choice of the matrix clause subject as the

referent for each other due to a sentence final PP, $F(1, 12) = 1$. This indicates that the children were treating each other strictly as an anaphoric element. The fact that they also interpreted the grammatical role of the reciprocal in the complement correctly (i.e. as the object of the complement verb) also is an argument against 'highest-S attachment' for each other. This finding should not be considered as providing evidence against the 'highest-S attachment hypothesis' in general however. What it indicates is that the errors the children made were not errors that can be explained by saying that the children were simply attaching the each other to the wrong place in the tree. The problem is strictly one of knowing where one can look for a referent for the reciprocal pronoun.

However, the results show a strong tendency for the children to choose a conjoined NP as the referent for each other, $F(1, 12) = 11.524$, $p = .005$. Perhaps this is due to some sort of saliency effect. The presence of two distinct referents in one NP position in a sentence may bias the children towards choosing conjoined NP's as referents for reciprocals no matter where they occur in the sentence.

Results from the single clause sentences containing two possible referents for each other show a tendency for the children to choose the nearest NP as the referent for each other when the referent for each other is ambiguous. 85.3% of the responses were ones in which the children picked the second NP in the sentence as the referent for the reciprocal, the NP closest to the reciprocal. Even the children who consistently chose the matrix clause for the referent for each other appear to follow this same strategy. Therefore, the predominance of matrix clause referents for each other in the two clause sentences does not seem to be the result of a preference to take the first NP in a sentence as the referent for each other.

Conclusion

So, what have we learned from this experiment? Well, we have seen that children will violate both the Specified-Subject Condition and the Tensed-S Condition. We have also seen that there seem to be no signals that the children pick up on in different kinds of complements that help them to apply the constraints earlier in some complements than in others or to apply one constraint correctly earlier than the other. Children apparently start out with the hypothesis that each other behaves just like any other anaphoric element in English. Tavakolian (1977) has found that children will search outside of a sentence to find a referent for ordinary pronouns like he, she and it in cases of 'backwards pronominalization', i.e. when a pronoun precedes its referent. This gives us a way to test to see if children really do treat reciprocals just like ordinary pronouns. I think that it is important to see if children's interpretations of reciprocals really do parallel those that they give to ordinary pronouns. Therefore, I am now putting together an experiment that will look at some other aspects of children's interpretations of reciprocals. Specifically, I want to find out what happens when the reciprocal pronoun is in a dependent clause that precedes the matrix sentence; and I want to see if children will go outside the bounds of a sentence to find a referent for each other in other cases -- will they, for example, choose the subject of a preceding sentence as the referent for the reciprocal? Maybe children's versions of Reciprocal Interpretation are related to some general strategies that children use in interpreting discourse.

But what about the broader implications of the results of this experiment? We appear to have evidence that the constraints we set out to test for are learned; so it appears that we must look for some other limits on the Language Acquisition Device.

Gold (1965, 1967) has developed a framework for the formal study of language learning. His work is important because it provides us with a basic vocabulary of concepts and results that we can use to evaluate attempts to formulate theories of language learning. Gold has shown that certain approaches to solving the problem of how a child learns a language simply cannot work and that other approaches to the problem can work only if certain critical assumptions are made about the learner and about the kind of data available to the learner.

In Gold's framework, the problem for the learner is defined as that of selecting a given language from a class of languages. The problem facing the child is to select from the class of all possible human languages the particular language (s)he is exposed to. It makes no sense to ask whether a particular language is learnable, then; what we want to know is whether the class of languages to which that language belongs is learnable. A child can learn any human language. Therefore, our theory of the child as a language-learner must be general enough to account for this ability.

In these last few pages I will touch on some of the reasons for why we must continue to search for some kind of constraints on universal grammar. The discussion which follows is based, for the most part, on work in the formal study of language learning. The results that I refer to here represent, in my opinion, some of the most compelling reasons for why we must assume that the child comes into the world armed with some set of 'assumptions' about what it is that (s)he must set out to learn.

The proofs which Gold (1967) presents show that differences in the kinds of information given to a language learner can have profound effects on the learnability of different classes of languages. For example, he has shown that certain classes of languages that have been proposed at one time or another as models for human languages, namely, the context-sensitive languages, the context-free languages, and even the finite-state languages, are not learnable if the data received by the learner consists only of correct sentences in the language to be learned. However, with the 'informant' scheme of data presentation in which the learner gets examples of the possible instances of non-sentences, labelled as such, as well as instances of correct sentences, Gold has shown that all of the above-mentioned languages as well as of the set of primitively-recursive languages are learnable. The class of languages computable by a Turing machine, though, is not learnable even with this very rich form of data.

This last result of Gold's has a special significance for us because Peters and Ritchie (1973a) have shown that a transformational grammar which consists of a simple set of finite-state base rules coupled with a certain set of transformational rules is equivalent in computational power to a Turing machine. This means that there is no set of computable sentences that such grammars could not be used to represent. And this result, together with Gold's, makes it necessary for us to restrict the power of transformational rules, to hypothesize a greater richness in the information source, or to do both. If we don't do something, we may find ourselves with theories of language learning that predict that children cannot learn language.

Other problems arise when we consider that our theory must predict that the learner will learn a language within a psychologically plausible amount of time. It can be shown (viz. Anderson, 1976, pp. 500-501) that any learning procedure that contains no assumptions about what it is to be learned and in what way it should go about trying to learn it will be hopelessly slow.

Perhaps there are hints in the data, and the learner expects such hints and knows how to use them. For example, the child may have access to something like Greenberg's (1963) list of language universals and could use such hints as a dominant VSO word order to predict that a language will have prepositions rather than postpositions (Greenberg's Universal #3). Or, all grammars may not be equally likely, and the learner's hypotheses may move from the most likely grammars to the least likely ones. This may amount to something like the theory proposed by Chomsky which we discussed above. Chomsky has proposed that in language acquisition the learner has a very restricted conception of what kinds of objects constitute valid grammars.⁸ He proposes, in effect, to set up an ordering scheme in which there is a set of plausible grammars, each with some non-zero probability, and a set of implausible grammars, each with zero probability. Of course, we can also imagine combinations of these two approaches in which certain hints in the data would cause the learner to narrow its hypothesis space and possibly set up a unique ordering of hypotheses as a result of a given hint. Partee (1977) has suggested that her 'Well-Formedness Constraint' may operate in this way, reducing the range of grammars compatible with a given set of data while adding no restrictions on the size of the class of possible human languages.

The important thing to see here is that we must assume that there are some strong innate assumptions about the nature of the language learning problem in the language learning procedure -- either explicitly stated in terms of some sort of innate 'knowledge' or implicitly represented in the workings of the learning mechanism. If the child were presented with a language or, perhaps, even with a learning 'situation' which did not conform to the pattern that (s)he expects, then we would expect her/him either to be incapable of learning the language or to expend an inordinately large amount of time and effort in doing so. We must develop a theory which contains a hypothesis about the assumptions about language that children bring with them to the language learning task that is 'sufficiently rich to account for the acquisition of language, yet not so rich as to be inconsistent with the known diversity of language, (Chomsky, 1965, p. 58).'

Roger Brown (1973) has suggested that we might look at every grammar or stage that a child goes through on her/his way to learning a language as an example of a possible human language. Of course, this is a perfectly obvious and trivial suggestion if we take it merely at face value -- children, presumably, are human beings; if we find them using what appears to be a language which they have 'created' for themselves, of course it must be a human language. What Brown's suggestion amounts to, in my opinion, is the claim that the language learner is tightly constrained from the beginning and that each guess that a child makes on her/his way to mastering a language can provide us with evidence for the structure of the language learning device. Baker (1977) has suggested that those engaged in constructing theories of language learning might find it worthwhile to search for constraints on the form of rules rather than constraints on the function of rules. The idea is, to simplify it somewhat, that there may be certain kinds of rules that children

would never think of hypothesizing simply because they do not have the necessary 'words' in their 'meta-linguistic vocabulary'. The conditions we set out to look for in the reciprocals experiment are conditions on the function of linguistic rules -- they are general conditions that say what linguistic rules can and cannot do. Such conditions say nothing about what rules of grammar can look like. Suppose we were to start looking for constraints on the 'notation' of the 'language' in which children formulate their hypotheses about language. Obviously, we need constraints on the base rules and on the expressive power of transformational rules. Perhaps there are some general constraints on 'notation' that can be found in the emerging grammars of children that can do much or all of the work that conditions like the Specified-Subject Condition and the Tensed-S Condition do.

Footnotes.

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1. Specifically, those modifications suggested by Bresnan (1973).
2. Chomsky has recently introduced the term 'core grammar' to refer to a theory of universal grammar with highly restricted options, limited expressive power, and few parameters which forms the basis for a kind of theory of markedness for syntax. The idea is that

Systems that fall within core grammar constitute "the unmarked case"; we may think of them as optimal in terms of the evaluation metric. An actual language is determined by fixing the parameters of core grammar and then adding rules or rule conditions... (Chomsky and Lasnik, 1977, p. 430).

3. In earlier work, Chomsky (1973) assumed an analysis which involved a rule of Each-Movement, which derived sentences like (3a) from sentences like (i)
 - i) The men each like the other(s).

4. For a more extensive treatment of the semantics of reciprocals, see Fiengo and Lasnik (1973) or Dougherty (1974). Notice that here we are concerned only with part of the reciprocal rule -- the part that has to do with determining the referent for the reciprocal pronoun. The rule also must say something about the reciprocity of the action expressed by the verb in reciprocal sentences.

5. In 'On Wh-Movement', Chomsky (1977) suggests that conditions like those in (2) above, do not impose absolute restrictions against certain kinds of rules but that they are part of a theory of 'markedness' (viz. also fn. 2). Rules which violate the constraints can be formulated, but they will be

