descriptively adequate grammars are selected, if the learnability condition is met. In the next section we will consider the nature of the information available to the learner. Ultimately, this information will have to be sufficiently rich that descriptively adequate grammars are learned. It is possible, of course, that descriptively adequate properties of natural language are learned even in the absence of information relevant to the properties. In fact, the results are particularly impressive, for both linguistic and learnability theory, when we can show that descriptively adequate properties of grammars can be learned even when the input in no obvious way contains the property.29

2.7 The Nature and Function Of Input

We have so far been taking the primary data available to a learner to be example sentences and have demonstrated that the theories of set-learnability and text-learnability are unsatisfactory. They even fail on grounds of weak learnability. More important, nothing like descriptive adequacy can be attained under these theories. We have to look for richer systems of input data, with an eye to coming closer to solving, as a start, the problem of weak learnability, and ultimately the problem of strong learnability. Although a stronger form of input may be considered for reasons of weak learnability, sometimes the stronger form of input moves us in the direction of partial success with respect to strong learnability. To the extent that the stronger form of input is also empirically justified, success with respect to descriptive adequacy of learned grammars (under this form of input) will give us greater confidence in the correctness of the assumed form of input.

2.7.1 Preanalysis

Before turning to a consideration of possible enrichments of the input system, we must note that the concept of information, data, or input has to be taken in a special sense, because, in one sense, the only information is the physical data impinging on the learner's senses. In a broader sense, any conception of information will assume that the learner imposes order on the raw information. Thus, what the theory will consider information will be this preanalyzed information.30 It may be that part of this preanalysis of information has to be itself learned. If this is the case, then we simply assume that this kind of learning takes place first and in sufficient measure that the level of learning that we investigate can take place. This assumption does not solve the problem of how (if at all) the preanalysis system is learned. Rather, this problem is ignored so that progress can be made in understanding a different level of learning. Ultimately, all such levels must be investigated if we are to have an adequate theory. Of course, this is the usual situation in science, where certain assumptions and idealizations, incompletely understood in themselves, are made so that investigation can proceed. It is impossible to proceed without such limitation on scope of inquiry, and any language learning theory will have this limitation. In fact, essentially every discussion in the literature of the information available to a child learner has operated under this kind of idealization, although the particular form of the idealization varies. Even the simple artificial examples that we have considered so far operate under this kind of idealization. We have assumed that input data consist of sentences that are strings of words. But, of course, a learner is not presented with sentences segmented into words; the learner himself has to do the segmentation based on the environmental cues and his innate and learned linguistic abilities.

To take another example, a bit ahead of what we have discussed so far, suppose that we are trying to develop a theory of the learning of syntactic transformations. Much of this book will be devoted to a detailed analysis of this problem. We will have to assume that the learner is capable of preanalyzing the information. For example, we will assume that the learner can assign the correct syntactic category to words that he hears. Of course, since the assignment of categories to particular phonetic shapes is not universal across languages, this information (given in the lexicon of a linguistic theory for a language) will have to be learned. Nothing in the theory to be presented in this book investigates how the lexicon is created (learned). We simply assume that enough of it has been developed so that the processes we postulate for learning transformations can operate.

If we didn't make a particular idealization, some other idealization would be necessary. Suppose, for example, that a theory doesn't make the assumption that part of the lexicon is already developed, but tries
to explain the learning of the lexicon. Perhaps the theory assumes that the child isolates particular phonetic shapes and attaches these (on the basis of some kind of evidence) to semantic readings and syntactic (such as category) information. This theory assumes that the learner can isolate particular phonetic shapes as words. Since words themselves are not universal (different shapes are words in different languages), the theory is being carried out under an idealization or limitation of scope. If an attempt is made to do away with this limitation, a theory will have to be created to explain how the child "learns" to create phonetic shapes from a physical signal; the theory that does it will have to make particular assumptions about physics and neurobiology. Although very powerful when it works, this reductionist approach has been successful in only a few domains of science. The major criticism of the approach is that if rigidly adhered to it doesn't allow work to proceed, work that in many cases can yield important scientific insight.

Thus when we later investigate the learning of transformations we will assume that for sentence (7), the learner (child) can at the very least assign the structural description (8).

(7) The juice spilled.

(8) det[The] _n[juice] _v[spilled].

Det, N, and V are standard symbols in generative grammar, standing for particular kinds of phrases: the is a determiner, juice is a noun, and spilled is a verb.

At the very least, then, we assume that the child who is learning transformations is presented with exemplars of grammatical sentences from his language, together with the kind of structural information presented in (8). Now this last is really not an accurate way of speaking. The child is not "presented with" the structural information. Det, N, and V are in no way given in the linguistic signal. Rather, the child creates this structural information from the knowledge that he already has. (Once again, even the separation of the phonetic stream into words is not given but created.) Since in this work we are not analyzing how this creation takes place but rather are only assuming the results of the creation, we can speak of the child as being presented with the information, without loss of theoretical power. This way of speaking simplifies the discussion and will be especially useful in simplifying formal notation as illustrated in figure 2.1. Essentially this notation replaces schema (a) by schema (b). Since the middle box in (a), creation of structural information, is not analyzed in the theory, (b) is a picture that will do as much work as (a). This simplification is especially important since there will be a number of unanalyzed aspects of the presented data in the theory. Thus we gain much in notational convenience (especially in formalisms) if we adopt the kind of simplification represented in the figure. The simplification should not be misleading if it is remembered how to construct (a) from (b).

2.7.2 Negative Information

So far we have considered that the only kind of information available to the learner consists of grammatical sentences (strings) from the language he is learning. This kind of data presentation does not directly give information to the learner about which strings are ungrammatical. If the learner hears a sentence, he can assume that it is in his language. But if he does not hear a sentence, it does not imply that the sentence is ungrammatical. Possibly he has simply not yet heard the sentence. The learner can make only inferences about strings he has not heard, and we have seen the limitations of such inferences.
It is conceivable, however, that in some form the learner is given information about which strings are ungrammatical or negative information. Examples of sentences, on the other hand, constitute positive information. Probably the existence of positive information is noncontroversial; at least we know of no challenge to its existence. But negative information is another matter. Therefore, we should consider, as an alternative to the earlier theories of strictly positive information, theories that allow both positive and negative information. (There is no need to consider theories in which the only information given is negative.)

One way to model a situation in which both positive and negative information are available to the learner is by assuming that at each time \( t \), the learner is told whether a particular string is in the language. Gold (1967) studied various forms of this scheme, which he called "informant" presentation. Note that if a learner is told that a string is in the language this essentially constitutes an example of a sentence. (That is, the learner can take as an example a string that receives the answer "yes.") It is obvious immediately that informant presentation is at least as powerful as text presentation. Gold showed that in most cases informant presentation is in fact stronger than text presentation. In particular, the classes of context-free and context-sensitive grammars are learnable by informant presentation, whereas we have seen that these classes are not learnable by text-presentation. Thus negative information is powerful. If we can assume the existence of negative information, we should have much help in the problem of learnability.

It is therefore necessary to ask whether negative information is in fact available to a language learner. It is clear that parents do not simply present labled nonsentences to children in a systematic manner; no parents (or other speakers) say "Here is a sentence, and it is ungrammatical, and here is another one, and this one is ungrammatical, and here is a third, which is grammatical." Even as a first step in looking for the existence of negative information we have to turn to the concept of correction, the concept that when the child produces an ungrammatical sentence, he is somehow informed that the sentence is ungrammatical. The child will have to have some abilities of preanalysis in which some kind of event is translated into the information that the sentence he has spoken is ungrammatical. If some event can result in the learner’s deciding that a sentence is ungrammatical, we can call this negative information. Of course, this interpretation is consistent with the general need for preanalysis.

The question therefore becomes: Is the child corrected when he produces an ungrammatical utterance? In the opinion of those who have studied corpuses of children’s speech, there seems to be very little of this kind of feedback. For anecdotal evidence, see Braine 1971, 159–161, but at least one study approaches the question directly. Brown and Hanlon (1970) analyzed a corpus of mother-child interactions and measured the proportion of nonapproval responses of the mother to "primitive" (ungrammatical) and to well-formed expressions of the child, and found no significant difference between the two proportions; mothers did not differentially disapprove grammatical and ungrammatical sentences. Brown and Hanlon also considered the possibility that a more subtle process of correction was going on than approval or disapproval, namely, that the child was understood more readily when he uttered a grammatical sentence than when he uttered a primitive sentence. In other words, the learner would have to translate noncomprehension by the listener into an assumption that his sentence was ungrammatical. To examine this question Brown and Hanlon measured the proportion of times that mothers produced comprehending responses to grammatical and primitive sentences and again found no significant differences. Mothers seemed to understand ungrammatical sentences about as well as grammatical ones. The investigators pointed out that, in fact, what parents correct are semantic mistakes, not syntactic ones.

This evidence is only partial, of course. For example, it might be that mothers try especially hard to understand children’s utterances, whereas other adults or children differentially understand grammatical and ungrammatical utterances. There is much room for empirical research on these questions, but Slobin (1972) claims that in the many societies the Berkeley group has studied there is no evidence that children are corrected for ungrammatical utterances. At the moment, it seems that our theories of language acquisition should not assume that any nonsentences, labeled as such, are presented to the child.
2.7.3 Special Arrangement of Examples

It is sometimes suggested that the argument that special restrictions on grammar have to be assumed for the purposes of learnability is misguided, because the argument ignores the possibility of what has been called by Levelt “intelligent text presentation.” Presumably the claim is that, somehow or other, presenting sentences in some special way will provide information that will help learnability. A frequent suggestion is that presenting simple examples of language to children will aid them in learning language, thus making less necessary a component of innate linguistic structure. A version of this idea is presented by Brown (1977, 20), who writes, “But it has turned out that parental speech is well formed and finely tuned to the child’s psycholinguistic capacity. The corollary would seem to be that there is less need for an elaborate innate component than there at first seemed to be.”

Two questions are relevant to such claims. The first is theoretical: Why should we expect particular kinds of orders of presentation to help with the problem of language acquisition? What properties of input can help, and in what ways? In particular, is it possible that certain properties of input will allow us to do away with the necessity for hypothesizing special, innate structural abilities? The second question is empirical: What are the properties of input to the child? Do these have the characteristics claimed for them by those who assert that properties of intelligent text presentation are central to language acquisition? Interestingly, the answers to both questions, so far as we can tell at present, argue against the central importance of “intelligent text presentation.” First, there is no theoretical justification for the claim that simplified input aids language learning. Second, the best empirical evidence is that input to children in general does not have the special characteristics anyway.

Turning to the first question, unfortunately we rarely see an explanation of why simplicity or fine-tuning should be useful to a child learning language. The idea simply exists—unexplained (or unproved). If we do see some kind of justification for simplicity of input in language learning, it will not be of such a nature that a less elaborate innate component will be called for. We must distinguish between at least two major possible functions of simple and fine-tuned speech to children, with respect to language acquisition. On the one hand, simplified speech might be necessary because of a general limitation in children’s cognitive capacities (like inability to deal with a long sentence because of memory limitations) or because special kinds of speech might attract a child’s attention. This kind of explanation is sometimes given, and seems plausible. But this function of simplified speech to children will not decrease to any large extent the need for an innate structural component, because that need is demonstrable on the basis of a grammar’s not being inferable from data even when we assume an ideal learner, one with no problems of memory, attention, time. A second possible use of simplified speech with respect to language acquisition would be to help somehow with the logical problem of creating a grammar based on the primary data, again given no limitations of attention, and so on. Such arguments are rarely given, but it is this kind of argument that would be necessary to diminish the force of the argument for innate linguistic structure.

Levelt (1975b) attempts to provide one argument; he criticizes the lack of attention in LAD theories to the possibility of “intelligent text presentation” (p. 15). Hornung is quoted by Levelt:

Does language acquisition by children suggest means for improving our grammatical inference procedures? We believe that it does, and we conjecture that an important distinction between the child’s experience and that we have assumed for our procedures is this: The child is not initially presented the full adult language he is ultimately expected to learn. Rather, he is confronted with a very limited subset, both in syntax and vocabulary, which is gradually expanded as his competence grows . . . We should not expect our inference procedures to perform well when confronted directly with complex languages. (Hornung 1969, 15–16)

Levelt adds that “it is suggested [by Hornung] that the procedure should first be exposed to small sublanguages, which are later combined and expanded,” and continues:

These perceptive remarks have not been followed up in computer science . . . The result is that at present no formal models of the LAD
variety are available to psycholinguists for the analysis of their new empirical findings on adults' speech to children. It should, however, be obvious that from the purely syntactic point of view the urge for strongly nativist assumptions has been diminished by these findings. (Levelt 1975b, 16)

But limiting the input in the way suggested by Horning will not help us to solve the language learning problem. Simply, less information is being given to the learner than before. In reference to figure 1.1 (section 1.2.2) input is being restricted. Thus more formal constraints than before will be needed. Limiting input will make a stronger nativist case, rather than a weaker one. Levelt does not indicate how this limitation on input will help to solve the language learning problem. He is careful to point out that no results exist in this direction.

Brown's claim is that special properties of fine tuning do away with the necessity of innate structural principles. In his Introduction to Snow and Ferguson 1977 he asks: What does Baby Talk (BT) accomplish?

A number of authors in this volume have driven home the principal point. The by-now overwhelming evidence of BT . . . refutes overwhelmingly the rather off-hand assertions of Chomsky and his followers that the preschool child could not learn language from the complex but syntactically degenerate sample his parents provide without the aid of an elaborate innate component. But it has turned out that parental speech is well formed and finely tuned to the child's psycholinguistic capacity. The corollary would seem to be that there is less need for an elaborate innate component than there at first seemed to be. (Brown 1977, 20)

The usual logical gap exists in this quotation. In what way does the "evidence of BT" refute "overwhelmingly" the claim that an "elaborate innate component" is needed? The evidence under review (Snow and Ferguson 1977) does not show that parental speech is uniformly well formed, nor that the speech is "finely tuned to the child's psycholinguistic capacity." (We will shortly turn to these matters.) But even more important than Brown's incorrect summary of the results in the papers he is reviewing is the logical gap. On what grounds can one say that an innate component is not needed if speech to children is well formed and is "finely tuned to the child's psycholinguistic capacity"? On none at all, except assertion.

In another passage Brown seems to deny what we have just quoted him as saying. He writes:

The discovery that speech to very young children is not a complex degenerate sample, but a sample fine-tuned to the child's psycholinguistic capacity, is certainly an advance over past views in the sense that it is true as they were not, but whether it is an advance in the sense of making the total acquisition problem simpler is not clear. Look at it this way. The older view posed the problem as: AS→CS (adult speech to child speech); the new view poses it as: AS→BT→CS (adult speech to baby talk to child speech). It may be easier to develop a theory deriving CS from BT than deriving it from AS, but notice that the new view includes a new problem: AS→BT. (p. 22)

Once again, Brown does not show how it is "easier to develop a theory deriving CS from BT." As we have argued, if it were true that BT is simpler in the sense, say, of containing fewer structures than adult speech, there might be less information in BT on which a learner could construct his grammar. At any rate, Brown gives no argument (an argument would depend, of course, on a theory of language learning). But in this passage Brown does see a further problem with the theory that no innate components are needed for language acquisition—how is BT derived from adult speech? No theory exists of how an adult knows how to train a child in language acquisition, which is what the notions of Brown (and others) demand. Can such a theory be created sufficient to do the job without the assumption of a strong innate component for the adult? Brown does not entertain this question in any form in which an answer might be realizable.

We do not mean to claim that sequential characteristics of the input can play no role in learning. We are claiming that such aspects of the input cannot play such a major role that there is no need for special linguistic constraints. It is possible, in a formal sense, to code aspects of the grammar to be selected into the input sequence. Consider the unlearnable class of grammars \( \mathcal{H} \) from section 2.2. Suppose we adopted a special convention regarding input order of sentences in the theory of text-learnability: Sentences have to be spoken in order of
increasing length (shortest first), and, in the case of a finite language, when the longest sentence is reached, the process starts all over again, from the shortest sentence. Thus the input order for language \( L(H_0) = a, aa, aaa, \ldots \). The input order for language \( L(H_1) = a, aa, aaa, \ldots, a^4, a, aa, \ldots, a^4, a \ldots \). There is now a strategy that will learn \( \mathcal{K} \): Guess \( H_0 \) until the first sentence (a) is repeated; then, if the sentence preceding \( a \) is \( a^4 \), guess \( H_1 \). This strategy will select the correct grammar in every case, for these input sequences.

It is highly unlikely that much information about linguistic structure is coded into the input sequence in natural language in the same way as in this artificial example, though it is conceivable that there is some useful sequential coding.\(^4\) First, notice that to put much learning weight on this kind of scheme would mean that both the adult and child would need to know a special coding of grammars into input. There is no evidence for the existence of such knowledge (compared with, say, the linguistic evidence of adults’ knowledge of structure). Thus assuming such a special coding does not allow us to do away with the need to assume innateness; rather it replaces an explicitly defined scheme of innate universals for which evidence exists by a completely undefined scheme for which no evidence exists. Second, despite the great utility of actually using certain sentences at certain times (in certain situations), according to the sequential coding hypothesis adults must present special training sequences, which may not be related to the contingencies of use. Besides there being no evidence for such a training sequence (of course, we are not sure what to look for, since the codings are not defined), it is quite implausible that such training sequences will override the necessities of language use.\(^4\) Third, though different children have different linguistic environments, they learn essentially the same grammar. Fourth, putting the learning burden on a coding into sequence does not help, so far as we can see, with strong learnability, with the necessity of the child’s learning descriptively adequate grammars (cf. section 2.6).

Turning to the second (empirical) question, some knowledge does exist concerning the nature of speech to children, and there is evidence that this speech (called baby talk or BT) does have special characteristics. These special characteristics do not, in general, code the grammar being learned in any way that can be seen to help in the problem of learnability. In fact, a real question exists as to whether BT is crucial in language acquisition.

In considering empirical studies concerning BT and its usefulness in language acquisition, it is important to distinguish between those studies that simply assert that BT plays a major role in acquisition and those studies in which the nature and role of BT is actually investigated. Levelt writes:

From these studies it appears that adults in addressing children use short, simple sentences with little embedding and inflection (Sachs et al., Snow) . . . Sentence boundaries are well marked in speech to young children (Broen). More generally, intonation is high and ‘exaggerated,’ clearly marking for the child what he should attend to. Overheard speech is therefore not to be considered as important input. (Labov 1970) moreover showed that such adult-to-adult speech is not as ungrammatical as had been generally supposed.) The syntactic complexity of adult’s speech grows with the child’s syntactic competence. More specifically, it seems that new semantic features are introduced by the child, to which the adult reacts with the more advanced syntactic construction by which they can be expressed (Van der Geest et al.). (1975b, 15)

Levelt then adds:

From the point of view of the syntactic structure of the child’s ‘observation space,’ all this amounts to what I called earlier ‘intelligent text presentation’: the child is presented with grammatical strings from a miniature language, which is systematically expanded as the child’s competence grows.

These conclusions do not follow from the actual results presented in the relevant papers. There really is no evidence that presentation from a “miniature language” takes place, or that such presentation has any role in language acquisition. Compare the quotations from Levelt with the following, from students of BT.

Ferguson, one of the early students of BT in the modern linguistic literature writes, “Given the wide variation in the details of the structure and use of BT from one community to another and from one family
to another, it seems highly unlikely that it is a crucial element in the acquisition process.\textsuperscript{44} (1977, 233).

Snow (1977) reviews much of the literature on mothers' speech to children. She writes:

Many of the characteristics of mothers' speech have been seen as ways of making grammatical structure transparent, and others have been seen as attention-getters and probes as to the effectiveness of the communication. But experiments in which language acquisition is the dependent variable and quality of input the independent variable have unfortunately been rare, and those few that have been performed have not all led to the conclusion that the input greatly affects language acquisition.\textsuperscript{46} (p. 38)

Slobin, while arguing that the characterization of the primary linguistic data available to a child as "meager and degenerate" is a "bit too severe," states the problem in reasonable terms: \textsuperscript{47}

The preliminary findings presented below suggest that the primary linguistic data represent a subcode which may be tuned to the language processing strategies of LAD or LAS. It should be noted at the outset that this suggestion in no way solves the problem of language acquisition posed by Chomsky, but at least it begins to clarify some of the parameters which must govern the work of LAD and LAS. (1975b, 284)

We earlier indicated that not only has Brown not given any idea how the properties of BT allow language acquisition to proceed without the assumption of a structural innate component, but even his description of parental speech as "finely tuned to the child's psycholinguistic capacity" is in doubt. The literature on such questions is difficult to review. And not only because of its size. A general problem is that the drawing of conclusions from data is often done in an unsound manner. Often the proper statistical procedures are not used. Even more important, a proper grasp does not exist of the relation between particular empirical results and particular theoretical statements. In general there are three kinds of possible empirical results that scholars claim demonstrate the crucial role of BT in language acquisition, doing away with the need for special structural principles.

1. Speech to children is simple, compared with speech to adults.

2. Speech to children becomes more complex as a child's (psycho)linguistic abilities increase (in a causal sense).

3. The more that a mother uses the special (simple) properties of BT, the more will her child develop language.

We will consider the evidence for all three of these propositions. Unequivocal answers are hard to obtain since notions such as "simple" can be defined in many ways. Nevertheless, consideration of the empirical literature leads to the conclusion that, as far as we can tell today, if definitions are made in the sense most relevant to the issues at hand, all three propositions are false.

Fortunately, a study by Newport, Gleitman, and Gleitman (1977)—henceforth NGG—is considerably more sound than most of the literature, on both counts mentioned: appropriate statistical techniques and appropriate theoretical conclusions from empirical data. In addition, in contrast to much of the literature the study approaches the problem in an open manner, asking: What can be learned empirically about the nature of BT and its role in language acquisition?\textsuperscript{48}

A major question that must be asked is how Motherese (special talk of mothers to children) influences language learning. This relates to proposition 3 about BT. As NGG point out:

Notice that the finding that Motherese exists cannot by itself show that it influences language growth, or even that this special style is necessary to acquisition—despite frequent interpretations to this effect that have appeared in the literature. After all, Motherese is as likely an effect on the mother by the child as an effect on the child by the mother. (p. 112)

NGG attempted to study the question by interviewing children twice, with six months between the two interviews. Suppose that the extent to which mothers use certain features of Motherese is correlated with the language growth of the child. As NGG point out, this correlation is not sufficient to support the interpretation that Motherese is responsible for language growth. To take one example from NGG, suppose language growth is more rapid when a child is least sophisticated linguistically. Suppose also that Motherese is used more when the child is least sophisticated linguistically. There is no reason to suppose that
Motherese causes the child to learn faster. NGG perform a partial correlational analysis, measuring correlations between the use of features of Motherese and language growth when other factors are held constant. Such techniques are standard in the analysis of multivariate problems in psychology but have not been characteristic of language acquisition studies.

We cannot discuss NGG’s conclusions in any detail. In summary, [They] show that certain highly limited aspects of the mother’s speech do have an effect on correspondingly limited aspects of the child’s learning. Many other identifiable special properties of Motherese have no discernible effect on the child’s language growth. The maternal environment seems to exert its influence on the child only with respect to language-specific structures (surface morphology and syntactic elements that vary over the languages of the world), and even then only through the filter of the child’s selective attention to portions of the speech stream. (p. 131)

An instance of the effect of mother speech is the finding that the growth in mean number of elements in the child’s verbal auxiliary yields a large partial correlation with the mother’s tendency to ask yes-no questions and to expand the child’s utterances. The growth rate for noun inflections also correlates with aspects of Motherese. “In contrast, the measures of child language growth that we take to be indices of universal aspects of language structure and content are, so far as we can see in this limited study, insensitive to individual differences in maternal speech styles” (p. 133). For example, “The child’s growth in the use of complex sentences . . . is unaffected by the aspects of Motherese examined here . . . These phenomena of language use seem to be dependent on cognitive and linguistic maturity. While they are functions of the child’s age, they are not related to specifiable features of the maternal environment” (p. 133).

NGG argue from their data that “the child is biased to listen selectively to utterance-initial items and to items presented in referentially obvious situations: the child acts as a filter through which the linguistic environment exerts its influence.” (p. 137). We will return in the next section to NGG’s second hypothesis. The first hypothesis (that the child listens especially to utterance-initial items) is used to explain why the growth in the number of elements in the auxiliary correlates with the number of yes-no questions that a mother asks (questions of the form “Did NP . . .?”, “Have NP . . .?,” “Can NP . . .?”). These questions start with an auxiliary. If children listen to beginnings of utterances, the more such questions are used, the more input child will have concerning auxiliaries.

Such results, if they can be substantiated by further research, are no way inconsistent with the hypothesis of innate structure (as NGG realize). There is no reason to expect that the child’s language learning structures (including linguistic and attentional mechanisms) will be such that parameters like time to learn will be completely unaffected by the characteristics of input. But note that making available to the child learner more instances of auxiliaries (in positions to which he is paying attention) does not inform the learner how to create a grammar that will cover such instances. His grammar formation process may have more chances to work, and thus speed up somewhat. But the structure is still not given in the input to the learner. Yet all learners wind up with the same structure. To make clear our position again, we do not mean to say that special characteristics of mother’s speech have no effect on any aspect of the growth of language in the child. In fact, such a result would surprise us. We simply are saying that what is known about language in no way can eliminate the need for an innate structural component in language learning. Nor can the constructs of BT be responsible for the child’s development of language. In our view the evidence points to the conclusion that the child is primarily responsible for language acquisition, not his mother or other adults or children in the environment.

Another characteristic of BT that many authors have seen as important for language acquisition is its simplicity (proposition 1). But the data of NGG show that there is no reason to consider BT simple, in any syntactic sense. Of course BT is short, but shortness is not to be confused with simplicity. The notion of “simple” is often used in the literature without being well defined. NGG try various definitions proceeding from the notion of language lessons. For example, presenting subject-verb-object declarative sentences to the listener sounds simple compared with presenting other kinds of sentences. But the data show that Motherese is less simple in this way than adult speech. The
is, children hear a smaller proportion of subject-verb-object sentences. Again compared with adult speech, a higher percentage of the utterances in Motherese involve optional movement or deletion transformations. And "there is a wider range of sentence types and more inconsistency to children than [when mothers talk] to the experimenter" (NGG, 122). In one sense, however, speech to children is simpler than speech to adults: "The sentences to children are shorter because they go on one proposition at a time. Embeddings and conjunctions are rare in the Motherese corpora." Newport, Gleitman, and Gleitman summarize, "Overall then, 'syntactic simplicity' is a pretty messy way to characterize Motherese" (p. 122).

About the role of syntactic simplicity in language acquisition, NGG conclude on the basis of their data:

We can hardly agree with such writers as Levelt (1975) who asserts that Motherese has been shown to present the child with a syntactically limited subset of sentences in the language; and that 'from the purely syntactic view the urge for strongly nativist assumptions has been diminished by these findings'. On the contrary, nativist assumptions are left intact by a close look at Motherese—they neither gain nor lose plausibility. The point is that demonstrating that speech to children is different from other speech does not show that it is better for the language learner. Most investigators have jumped from the finding of a difference, here replicated, to the conclusion that Motherese is somehow simple for inducing the grammar. But the finding that Motherese has properties of its own does not show that these give acquisition support. Notice, at any rate, that the view of Motherese as a syntactically simple corpus merely transfers a very strong claim about the child (that, owing to restrictive and rich hypotheses, he can deduce the grammar from haphazard primary data) to a very strong claim about his mother (that she has some effective notion of what constitutes syntactic simplicity so that in principle she can choose utterances on this basis). (p. 123)

Brown's claim that parental speech is "fine-tuned to the child's psycholinguistic capacity" is challenged by the lack of evidence in the literature for this proposition (see note 50) and, more directly, by the data of NGG. They find that maternal speech does not "grow syntactically more complex in a fine-tuned correspondence with the child's growing linguistic sophistication"; the proportion of simple declaratives increases with MLU (mean length of utterance) of the children, and the sentence range narrows. They add, "Our findings suggest . . . that many features of the mother's speech change in accordance with the child's age, not his competence with constructional features of the language" (p. 145). Thus proposition 2 seems to be false.

We have presented a good deal of evidence against the assumption that, in any way that has been explicated so far, BT is crucial for syntax acquisition. But BT does have special properties. In dealing with biological phenomena it is always reasonable to ask about their function. What is the function of BT? NGG present arguments and evidence, which we will not summarize, that the function of BT is communication with a young child. In their words, "Along with some other investigators (see Shatz & Gelman, this volume), we believe this language style arises primarily in response to the pressures of communicating with a cognitively and linguistically naive child in the here-and-now, not from the exigencies of the language classroom" (p. 124).

Another aspect of Brown's argument about the lack of a need for an "elaborate innate component" is the claim that parental speech is "well formed." This is generally, though not universally, true. NGG found that only one utterance out of 1,500 spoken to children was a "disfluent." Four percent of the utterances were unintelligible. Cross (1977) found in mothers' speech that 3.3 percent of the utterances were "disfluent," 2 percent were unintelligible, and 9.8 percent were run-on sentences. This is hardly a picture of uniformly well-formed utterances. It is true that adult-to-adult speech has been found to be somewhat less grammatical. Nevertheless, even a small percentage of ungrammatical sentences could conceivably cause trouble for a language learner uninformed as to the nature of language (see note 47).

In summary, evidence from studies of children's speech does not challenge the need for special structural principles to be invoked in the explanation of language acquisition, especially syntax acquisition. As for semantic acquisition, we know too little about how to describe the ultimate abilities to make firm conclusions about what is needed for their learning. The situation with respect to pragmatic and cognitive considerations is even less clear (see note 46). As we have said before,
we do not claim that conditions of input have nothing to do with language acquisition, only that such conditions cannot play a role in the acquisition of language so central that special structural principles are not needed. In our view, the only way to discover the exact role that such input conditions play is to create a theory of language learning that can account for the fact that language is learned, and to incorporate in this theory empirically acceptable assumptions about the role of input. Short of such a theory, precise arguments simply cannot be made about how particular environmental conditions function in language acquisition.

2.7.4 Structural Information as Input
In section 2.7 we have been left with the problem of trying to modify learnability theory's conception of the input to the learner in order to help solve the problems of weak and strong learnability. We have seen, however, that many proposals along these lines cannot be right. Apparently, almost no negative information about syntax is presented to the child. In general the input to the child is not syntactically simple, and even if it were, we have argued that this might cause the learnability problem to be more rather than less difficult. Especially from the standpoint of learning syntax, the input to the child cannot be looked on as a series of graded lessons (fine-tuning). 53

In this section we will suggest an enrichment of the input that does help in the problem of language acquisition. One property seems to emerge from a number of studies. There are devices in a child's environment which help to ensure that in a good number of cases the child has a reasonable chance to interpret an utterance correctly even if he is not able to understand the entire syntactic structure of the utterance. Of course, no external force can directly feed a correct interpretation into the child. The interpretation has to be accomplished by the child, based on his abilities and the environmental situation. But it might be possible that in a number of cases the child has an understanding of the situation which matches the correct interpretation of the utterance, even if he doesn't understand (or only partially understands) the syntactic structure of the sentence.

We do not intend anything like the suggestion that syntax is unnecessary because people can understand from situations. It is obvious that adults understand the structure of sentences, so they can correctly interpret utterances even when the referents are distant in time and space and there is nothing in the nonlinguistic environment to hint at the interpretation to be given to the utterance. It is the learning of this ability that has to be explained. We are merely suggesting that there are cases when the child will receive external information that helps in the interpretation of the utterance (which happens with adults also). It is conceivable that the kind of information thus available is useful as data to the child in language acquisition.

Before proposing a method of incorporating this kind of information into our theory of the input, we can consider what kind of evidence actually exists that such information is available. First, one can look at utterances to children as they occur. Slobin writes:

Most studies of child language comprehension put the child into a situation where there are no contextual cues to the meanings of utterances, but in real life, there is little reason for a preschool child to rely heavily on syntactic factors to determine the basic propositional and referential meaning of sentences which he hears. Judith Johnston and I have gone through transcripts of adult speech to children between the ages of two and five, in Turkish and English, looking for sentences which could be open to misinterpretation if the child lacked basic syntactic knowledge, such as the roles of word order and inflections. We found almost no instances of an adult utterance which could possibly be misinterpreted. That is, the overwhelming majority of utterances were clearly interpretable in context, requiring only knowledge of word meanings and the normal relations between actors, actions, and objects in the world. (1975b, 30)

We must be careful not to overinterpret such a result. For example, "knowledge of word meanings" is not necessarily a well-understood concept and might even include some knowledge that is normally called syntactic. Nor are we sure exactly what Slobin means by "interpretation." For example, in English, without the knowledge of inflections one cannot know whether past or present tense is indicated. Is determining tense part of "interpretation"? Perhaps Slobin means that, if knowledge of the situational context is added, the utterance becomes interpretable. At any rate, even if the claim is not accepted at
its fullest strength, there seems to be reason to believe that in many instances a child could interpret an utterance correctly without knowledge of its entire syntactic structure.

Newport, Gleitman, and Gleitman (1977) provide some suggestive evidence that the extent to which mothers match their utterances to concepts that are at the same time in the child's consciousness correlates with linguistic development. One of a number of examples involves affirmative imperatives:

Affirmative imperatives are poor constructions from which to learn the language from the point of view of reference-making. They rarely map clearly onto the non-linguistic context: one says 'Throw me the ball' just when it is not being thrown and often when it isn't even in hand. Appropriately, then, the more frequently the mother produces imperatives, the more slowly the child grows not only in auxiliary structure but also in noun-phrase inflection. (pp. 140-141)

Other interpretations of these data are possible, but NGG argue why their interpretation is best. Note also that although NGG find evidence that producing "a construction when the child's attention is fixed on the notion that construction refers to in the language" increases language growth somewhat, still these results do not show that such techniques are necessary for language acquisition to proceed.

This view (NGG's) is consistent with Brown's conclusion that "what I think adults are chiefly trying to do, when they use BT with children, is to communicate, to understand and to be understood, to keep two minds focused on the same topic" (1977, 12). Brown further offers evidence (p. 19) for his conclusion:

How should they do so if not by talking about things the child is prepared to understand? If you do not speak to a very young child about what he knows and what interests him, he will, as Gleason points out, tune you out. The lead, it now appears, is not in the parents' hands as far as early content is concerned. It appears to lie in an interaction between the nature of young children and the nature of the physical world. Only now, perhaps, can we properly understand the amazing uniformities in what is named and what kinds of relations are talked about in Stage I speech. These uniformities, which are universal as far as they have been tested, appear to arise not from the predilections of parents, but from the nature of human children and the world they live in.54

A tendency to talk to children about things they understand does not necessarily imply that children can interpret the utterance without understanding the syntax of the utterance. But it does make this possibility more plausible. For example, much of the evidence on which Brown bases his conclusions about the motivation for BT is that of Cross (1977).

Some of Cross's measures relate to "referential characteristics," which involve "utterances that referred to the immediate context (i.e., to the child's or the mother's activities or to persons and objects in the recording situation), as well as those that referred to non-immediate events (i.e., events, people or objects that were removed from the child's perceptions)" (p. 159). In Cross's data, 73 percent of mothers' utterances made "immediate reference." (Cross's subjects were especially selected as those who "showed signs of rapid language acquisition." ) The greater the child's linguistic understanding the more the mother refers to nonimmediate events (correlation = +0.72).55 Certainly referring to an immediate event makes it more possible to interpret an utterance from the situational context than if reference is to a nonimmediate event.

Once again, we are not arguing for the necessary existence of certain training procedures. Rather, we are suggesting that the child has a certain ability, the ability in some instances to extract interpretations from situations (often the situations will be supplemented by some linguistic knowledge, such as meanings of words, or partial syntactic knowledge). Some evidence suggests that mothers, desiring to communicate with the child, tend to produce utterances in situations where this possibility exists.

How can we use this ability of the child in our conception of the input to the language learner, as we attempt to move in the direction of weak and strong learnability? We imagine that the child is presented not only with sentences (strings of words) but also with the interpretations of the sentences. That is, we conceive of one datum for the language learner as a pair consisting of a sentence together with its interpretation.
We have shown that the class of transformational grammars on a universal base is not even weakly learnable (section 2.2). Is it possible for input that contains interpretations to help in the solution of that problem (and the problem of strong learnability also)? How we formulate the problem depends on our theory of interpretation, in particular on which syntactic level the theory relates to interpretation. We have adopted a theory (based on Chomsky 1965 and Katz and Postal 1964) that semantic interpretation is defined on the syntactic deep structure of a sentence. Syntactic transformations apply to the deep structure without changing the meaning of the sentence, yielding a surface structure. (These assumptions constitute a form of what is often called the Katz-Postal hypothesis.) There is good reason in linguistic theory to assume that at least some of the interpretation of a sentence is to be carried out on the surface structure. One proposal that has received some attention is that the basic grammatical relations are defined in the deep structure but notions such as “focus” and “scope of quantification” are defined on the surface structure (see, for example, Jackendoff 1972). If grammatical relations are defined on deep structure, much information about interpretation that children have will be relevant to deep structure. As a start on the problem we will assume, for purposes of current theory, that the semantic interpretation is defined on deep structure. It would be important to question this assumption in future work. This is especially true to the extent that semantic information not defined on deep structure is crucial to the learning of grammar.

Transformations are mappings from phrase-markers into phrase-markers. The kind of information that might help a learner of transformations would be information about the phrase-markers that the transformations map from and to. Although children hear surface sentences (strings of words), there is not much reason to believe that they are presented with information about what the surface phrase-marker is. The deep structure is the level of structure of a sentence before transformations apply. If much semantic interpretation is related to the deep structure of a sentence, and if a child sometimes has available the semantic interpretation of a sentence even when he doesn’t understand its syntax, perhaps it is plausible that in some cases the child might be able to compute what the deep structure of a sentence is even when he doesn’t understand the syntax of a surface sentence.

We are proposing that the possibilities of semantic interpretation might sometimes allow the learner to reconstruct the deep structure of a sentence. Exactly how he does this we cannot explicate here. We assume that the child has cognitive abilities that allow him to do it. A more adequate theory would explicate these abilities. In part some of the abilities must be learned, because we know, for example, that there is no universal base grammar: different languages have different base grammars. However, it is conceivable (and there have been proposals to this effect) that the possibilities for base grammars are very limited. Therefore, it may be that the central rules of base grammars are learned easily and early. At the point when transformations are being learned, the syntactic rules of the base grammar may be available to the child. Suppose that the rules of translating between the base grammar and semantic interpretation are available to the child (as they will be if they are innate or if they are learned first). Then if the child has semantic interpretation of some sentences available, he will be able to reconstruct the base phrase-marker. In contrast to fine tuning, the property of input that we are suggesting here does give the language learner more information.

To put the assumption in formal terms, we can assume that one input to a learner is a pair \((b,s)\), where \(b\) is a base phrase-marker and \(s\) is the surface sentence (string, not phrase-marker) that is derived from \(b\) by the operation of the set of transformations of the grammar. Of course, in no way is \(b\) actually presented to the learner—our justification for this form of input is that the learner constructs the deep structure by a form of preanalysis. The notation is simpler if we assume that the child is presented with a \((b,s)\) pair, but the actual interpretation that is to be given to this assumption can be reconstructed on analogy with figure 2.1. The formal demonstration that \((b,s)\) pairs work will be given in chapters 3 and 4.

Of course, it is more plausible that only some (not all) utterances in situations are such that the child will be able to reconstruct the deep structure. Again for formal and notational purposes, we will make an assumption that appears to be at variance with this state of affairs. We
will assume that the sequence of inputs to children is a sequence of 
(b,s) pairs. It is not necessary to justify this formal assumption by 
assuming that the child can invariably reconstruct the deep structure of 
a sentence that he hears. Brown (1977) quotes Gleason (1977) to the 
effect that children will tune out utterances that they don't understand, 
so a child may simply not pay attention to some utterances. Or, even if 
he doesn't ignore an utterance, he may not use it as part of his input for 
language learning. (That is, if the child cannot reconstruct the deep 
structure, he may simply not use the utterance to form hypotheses 
about transformations). All we really need to assume is that 
"enough" (b,s) pairs are presented to the child.

Following the suggestion and rationalizations of the last section, we 
will consider a theory of learnability in which the input consists of a 
sequence of (b,s) pairs, where b is a base phrase-marker (generated by 
the context-free base grammar) and s is the surface string (sentence) of 
the surface structure which is derived from b by the operation of the 
transformational component. This decision implies that once again we 
are considering as the class of grammars the class of transformational 
grammars on a universal base. The input is a sequence of pairs (b₁,s₁), 
(b₂,s₂), . . . generated by the adult transformational grammar A, where 
s is the terminal string of A(b). In order to achieve success, the learn-
ing mechanism must ultimately select a set of transformations that 
performs the correct mapping of base phrase-markers into surface sen-
tences.

3.1 The Class of Transformational Grammars

Formal details of the class of transformational grammars whose learn-
ing we investigate in this first (b,s) theory may be found in Hamburger 
and Wexler 1975. For reasons of space we will not repeat those de-
tails here, especially those that are standard. (We assume some general 
knowledge of transformational grammar.)

For our purposes, a transformational grammar consists of a context-
free base grammar, which generates base phrase-markers, and a set of
whereas the learnability problem starts from behavior or properties and tries to deduce the grammar. The latter problem appears to be more difficult, in general. It appears that the only way to solve it is to turn it into a variant of the former problem, with much of the structure given as starting information.

26
For example, \( \mathcal{H} \) of sec. 2.2 is still unlearnable. The proof is clear, namely, there is only one grammar for any language in the class anyway. Without working out the details, it seems that the proof of the Characterization theorem can be maintained so that it will turn out that exactly the same classes of grammars are learnable under this weakened criterion as under the criterion of set-learnability as we have given it.

27
As we stress throughout this book, and as is stressed in linguistic theory, such knowledge does not have to be conscious. It is an empirical question what constitutes knowledge of a language, and consciousness is not criterial.

28
One way of achieving strong learnability solely by restricting the class of grammars would be for the theory of grammar to be such that the allowable grammars that generate a particular language (set of strings) all be strongly equivalent. There is no reason to think that the theory of grammar in general can be constrained to this extent, although it is an empirical question. The point is very much like the question in linguistic theory of whether, in general, there will be only one allowable grammar that is compatible with the primary data. Chomsky (1965, 36–37) writes,

It is logically possible that the data might be sufficiently rich and the class of potential grammars sufficiently limited so that no more than a single permitted grammar will be compatible with the available data at the moment of successful language acquisition, in our idealized “instantaneous” model: . . . In this case, no evaluation procedure will be necessary as a part of linguistic theory—that is, as an innate property of an organism or a device capable of language acquisition. It is rather difficult to imagine how in detail this logical possibility might be realized, and all concrete attempts to formulate an empirically adequate linguistic theory certainly leave ample room for mutually inconsistent grammars, all compatible with primary data of any conceivable sort. All such theories therefore require supplementation by
Chomsky (1965, 25) leaves the question open and considers that the child might receive both positive and negative information, that is, instances of sentences (labeled as such) and nonsentences (labeled as such), the former arising naturally in the speech that the child hears and the latter coming from some kind of process of correction.

We have ignored certain technical modifications of this result, especially Gold's case of "anomalous" presentation and the role of primitive recursiveness. These considerations do not change the character of the discussion.

Note that there has been no demonstration that including negative information in the input will help with the problem of strong learnability. It is plausible, however, that negative information could help with this problem, that is, could help to ensure that descriptively adequate grammars are selected. This will be true, of course, to the extent that variations in structure will yield variations in output. In fact, many of the complexities of current work in linguistic theory involve puzzles as to why certain strings are ungrammatical, rather than why they are grammatical. That is, linguistic theory as it stands, uncomplicated by additional constraints, accepts certain strings that native speakers judge to be ungrammatical. A major puzzle is the question of, first, how to account for these ungrammaticalities descriptively (in a grammar) and, second, why the language learner chooses a grammar that rejects these sentences. If we could assume that the learner was somehow told that these particular sentences were ungrammatical, it would be clearer, at least in broad outline, why the attained grammars made the sentences ungrammatical. To the extent that we cannot assume that there is negative information (which is essentially what we will claim), then the existence of these ungrammatical sentences will have to be accounted for by other aspects of learnability theory, particularly by restrictions on the form of grammar that is possible, given primary data. Some examples appear in chap. 5. See Baker (in press) for related discussion.

This interpretation is analogous to Gold's (1967) "request informant."

Even if the child is corrected, there is no reason to believe that he takes note of the correction in a way useful for language acquisition. Consider the mother-child interaction reported by McNeill (1966, 69):

Child: Nobody don't like me.
Mother: No, say "nobody likes me."
Child: Nobody don't like me.
( . . . Eight repetitions of this dialogue . . . )
Mother: No, now listen carefully; say "nobody likes me."
Child: Oh! Nobody don't likes me.

Even if listeners do differentially comprehend grammatical and ungrammatical utterances of the child, the child might interpret the non-comprehension in a variety of ways. For example, the child might think that various pragmatic conditions (on conversation, say) were not being met, or that the listener was disagreeing. The Brown and Hanlon study is not a study of the effect of reinforcers, but a study of whether reinforcers exist that differentially reinforce the child's grammatical and ungrammatical utterances.

There really is a paucity of studies concerning the linguistic environment of the child, especially with regard to how this environment can aid in language learning. As far as we know, the Brown and Hanlon study has not been replicated. There are very few studies concerning whether children or other adults respond less appropriately to primitive utterances than do mothers. In a recent collection of conference papers (Campbell and Smith 1978) eight papers were published in a section entitled "Mother/Other-Child Interaction and Language Development." Of these, none reported any research relevant to the question of how the environment provided information on which the learning of syntax could be (even partially) based. One article was concerned with intonational contour. The other seven articles were concerned in one way or another with pragmatic considerations, for example, conversational rules.

A yet more subtle form of negative information may be available to the child. Brown, Cazden, and Bellugi (1968) discuss the occurrence of expansions in parent-child interactions. For example (see McNeill 1970, 108), if the child says "That mommy hairband," his mother might expand the utterance by replying, "That's mommy's hairband." Note that many other sentences could have been used for the expan-
sion. Which one is used depends on the situation. The child is receiving negative information, but not of the form "That mommy hairband is not a grammatical sentence." If he were, he would have no way of knowing that a semantic correction was not a correction of the form "That utterance is not a sentence." We might look on the expansion as informing the child that the utterance he has just made is not the correct utterance given the interpretation of the situation. Rather, the expansion is the proper surface sentence. The sentence the child uttered may be a sentence of the language, but it does not have the structure indicated by the correct interpretation of the situation. Thus, negative information is presented to the child, but a particular kind of negative information. This interpretation is consistent with the theory presented in chap. 3.

41 We will discuss the well-formed nature of speech to children later.

42 LAD refers to Language Acquisition Device. LAD theories are essentially any theory (for example, that of Chomsky, 1965) in which the language learner is thought of as forming hypotheses about grammar based on a starting configuration and the input data. Levitl is essentially criticizing the conclusion that a complex starting configuration (innate component) will be necessary.

43 For example, it has been suggested that sometimes adults utter a sentence to a child together with other sentences that are transformationally related to this sentence. Such data might make it easier for the child to learn the transformation. Although such presentation may be of some help, the child has the same general interpretive problem as for correction and other "training" routines. Note that often sentences are presented together which are not transformationally related. If the child assumes that (temporal) contiguity of sentences implies that they are transformationally related, he will often draw quite incorrect conclusions. Of course, this objection is not proof that such schemes won't work, but certainly any such training theory will have to explicitly come to grips with such problems. At present none do, and it seems reasonable to be skeptical about the possibilities.

44 Although there is evidence, which we will discuss shortly, that speech to children is in general different from speech to adults (for one thing, speech to children tends to be shorter), this fact in no way implies a special sequence of utterances to a child which give him special information (coded into the sequence) that aids in language learning.

45 Ferguson adds,

If the effects of BT as a teaching device were decisive, this would certainly have been noticed long ago in many societies, and in particular by child development researchers. But in the absence of detailed experimental evidence one can still join Snow's (1972:561) observation that the speech addressed to young children 'in many ways seems quite well designed as a set of "language lessons."' (1977, 233)

The conclusion that the speech addressed to young children seems 'well designed as a set of "language lessons",' does not mean that the speech actually functions as a set of language lessons. In fact, there is evidence, which we will discuss, that this speech does not function in this particular way (aside from its exemplar role, of course). All that similarity between speech addressed to children and language lessons might mean is that our commonsense understanding of what would constitute good language lessons agrees in some details with BT. The causative relations are completely unknown. It might turn out that our commonsense understanding of "language lessons" derives from an observation of BT. Or that BT derives from a commonsense understanding of "good language lesson." There are many other possibilities.

We have no particular reason to think that our commonsense understanding of "good language lesson" is in fact correct. Being immersed in a natural language situation is better in general, even for second language learning, than training according to any of our commonsense concepts of language lessons. Nor has learning theory in psychology or education been able to precisely state, and supply compelling evidence for, any particular notion of what a good language lesson is. In our opinion, the investigation of our folk notions of "good language lesson" would make an interesting study, along with such notions as our folk perception of how the physical world operates (which, of course, are quite different from the theories that have emerged from the study of physics). This folk perception of what constitutes a good language lesson should not be confused with what actually constitutes a good language lesson (if, in fact, there is such a thing).

46 Snow's admission that there is no empirical reason to believe that
particular details of mother's speech have an effect on what is learned is particularly interesting in view of her statement that:

The first descriptions of mothers' speech to young children were undertaken in the late sixties in order to refute the prevailing view that language acquisition was largely innate and occurred almost independently of the language environment. The results of those mothers' speech studies may have contributed to the widespread abandonment of this hypothesis about language acquisition, but a general shift of emphasis from syntactic to semantic-cognitive aspects of language acquisition would probably have caused it to lose its central place as a tenet of research in any case (p. 31).

It is not clear why the results of mothers' speech studies (which Snow admits do not show a language acquisition role for mothers' speech) should contribute to the "widespread abandonment of this [innateness] hypothesis." Incidentally, so far as we can tell from the literature, the innateness hypothesis was never widely held and so could hardly have been the subject of widespread abandonment. The hypothesis, as we discuss it in this book, is still accepted by very few psychologists (it is difficult to find examples). Perhaps a few more linguists than psychologists accept the view, but it does not seem to us to have been the "prevailing view" in the sixties, nor is it now the prevailing view.

It is also not clear why Snow seems to think that a shift to semantic and cognitive aspects of language acquisition would lead to an abandonment of the innateness hypothesis. Presumably she means that these aspects of language acquisition can be shown to be more clearly related to environmental influences than can the acquisition of syntactic structure. If so, the "abandonment" of the innateness hypothesis is not due to evidence that there are no innate principles of language. Rather, the crucial problem of the acquisition of syntactic structure has simply been ignored. If a scientist chooses to ignore a problem, the principles needed to solve the problem may be "abandoned."

It is not at all clear that semantic and cognitive aspects of language acquisition can be described and explained without the use of innate structural principles any more than can the acquisition of syntax. In our opinion the situation simply is that we have a good deal less formal structural knowledge about semantics (and even less about cognition) than we have about syntax. Thus there are fewer restrictions on imagining how semantic and cognitive principles can be "learned" in a way heavily dependent on the environment. Suppose that linguists had no knowledge of syntax. One might then imagine that sentences consisted of associations between words. It would be relatively straightforward to begin to construct a theory of how these associa-

tions could be learned (details would differ from theory to theory). We would not need too much in the way of innate principles, except for a few principles of association. Such theories have been tried in the past and are not totally nonexistent at present. Of course, the theories ignore the principles of syntax that have been discovered by linguists. If we ever determine precise and adequate structural theories for semantics and cognition (possible in principle but, especially for cognition, not realized as yet), it might turn out that these principles are not "learned" in a way heavily dependent on the environment. Until we have such principles, speculation may be of little value. As Chomsky has written,

I think it is fair to say that these empiricist views are most plausible where we are most ignorant. The more we learn about some aspect of human cognition, the less reasonable these views seem to be. No one would seriously argue today, for example, that our construction of perceptual space is guided by empiricist maxims. The same, I think, is true of the language faculty, which relates more closely to the essential nature of the human species. I suspect that the empiricist position with regard to higher mental functions will crumble as science advances towards an understanding of cognitive capacity and its relations to physical structures (1975a, 126).

47
LAS refers to Language Acquisition System, the same as LAD (see note 42). The "meager and degenerate" characterization is from Chomsky (1968, 68), as quoted by Slobin (1975b, 283–284):

I think that if we contemplate the classical problem of psychology, that of accounting for human knowledge, we cannot avoid being struck by the enormous disparity between knowledge and experience—in the case of language, between the generative grammar that expresses the linguistic competence of the native speaker and the meager and degenerate data on the basis of which he has constructed this grammar for himself.

Since "meager and degenerate" is not an exact term, it is difficult to know whether it is "a bit too severe." More important is to note that the characterization of the data is to be taken in relation to the ultimate knowledge of language that an adult speaker has. Certainly nothing like the rich structures that linguists have uncovered in language are part of the data available to a language learner. In fact, the very argument of those we have quoted that language input consists of simple aspects of language tends to make the input meager. As to "degenerate," I suppose it is true that the great bulk of language addressed to a child is grammatical, lacks false starts, etc. Still, as Chomsky (personal communication)
points out, even a very small number of ungrammatical sentences has
to cause a problem for an uninformed learner.

In our view, the arguments here are qualitative arguments, which of
course will be subject to controversy, since notions such as meager and
degenerate can be interpreted differently by different authors. The es-
34 sential point, as Slobin writes, is that the characterization of the input
given by students of BT "in no way solves the problem of language
acquisition posed by Chomsky." In our opinion, the ultimate resolu-
tion of these issues depends on a precise characterization of the rela-
tion between input and attained grammar, as we are attempting to
(partially) accomplish in this book.

NGG appeared in Snow and Ferguson (1977), in which Brown's article
appears as the Introduction; his discussion of the nature of BT and its
role in language acquisition is based on the articles in the collection.
NGG, as we have indicated, is a particularly sound study of these
questions. It is interesting, therefore, that of the sixteen papers in the
collection, the only one that Brown does not mention is NGG. (NGG,
at 41 pages, is the longest article in the collection.)

Snow (1977) points to the interactional aspects of speech between a
mother and child. Of course, interactional effects exist and are im-
portant if one is trying to explain why particular utterances occur. The
child's response affects what the mother says and vice versa. How
34 could it be otherwise in conversation? But, as always, we must not
confuse the role of a concept in explaining, on the one hand, why
certain utterances are made and, on the other hand, how language
acquisition takes place. Even if it could be shown that interactional
aspects of the language learning situation are crucial for language ac-
quisation (for example, as motivation), this would still not vitiate the
need for structural assumptions.

Consider the development of vision. Surely even here there is in-
teraction. Mothers will point to objects, bring them into the child's line
of sight, draw attention to special features. We know from animal
studies that the crucial effects of experience on the development of
vision involve the organism having experience at an early age (see
Blakemore 1974 for a review). But nothing special in the way of tutor-
ing is required for the development of vision. Of course, certain expe-
riences might help the organism to learn particular things; for example,
seeing a chair will help the organism to recognize chairs. There is no

reason to believe that tutoring is more essential to the development of
language than to the development of vision.

Snow (1977, 36) writes that "the broad outlines of mothers' speech to
children—that it is simple and redundant . . . —are quite well estab-
lished." She adds,
The central theme of mothers' speech research, of course, one which
was present implicitly if not explicitly in all the studies mentioned
above, is the relevance of mothers' speech to language acquisition. The
generality of mothers' speech, including young children's ability to
produce it, had to be established in order to show that all language-
learning children, even those raised by fathers or older siblings, have
access to a simplified speech register. No one has to learn to talk from a
confused, error-ridden garble of opaque structure" (p. 38).

Since Snow offers no quotations, we don't know whether she means
that someone has suggested that children learn to speak from a "con-
used error-ridden garble." This is not the view as put forth in the
literature. Presumably Snow intends that an utterance is opaque if its
structure is not immediately evident from surface aspects of the dis-
course. With regard to many of the properties that linguists have dis-
covered are true of natural language, it is difficult to see how these are
evident in the linguistic input, and Snow offers no evidence that they
are. Her claim that all children have "access to a simplified speech
register" is not substantiated by the NGG findings, at least with respect
to most indices of syntactic simplicity.

What is the evidence for syntactic complexity of BT in the papers
that Snow cites, in which she says "description of the characteristics
of the speech was primarily accomplished"? Aside from mean length
of utterance and a few other measures, she writes, "very few measures
have really been intensively studied" (p. 32). However, she says that
one paper (Pfundt 1969) does concentrate on syntactic complexity.
We don't have this paper available to us, but it is summarized in An-
dersen (1977, 363-364), the annotated bibliography to Snow and Fer-
guson (1977), in the following way:

This study indicates that a mother's speech to her child becomes
increasingly complex during the child's second and third year. It is
suggested that simplification in baby talk is directly correlated to the
language production or comprehension of the child.

We do not know how Pfundt measured syntactic complexity, but
from the summary it does not appear as if the measures of complexity
were compared with measures of the adult speaking to another adult
(as in NGG). Also, the results summarized are the opposite of what NGG find. From what is summarized in Snow, there does not appear to be much evidence that BT is syntactically simple, in the sense of commonsensical notions of language lessons. Of course, that speech to children is short makes certain measures of complexity appear to be simpler for children. And NGG argue from their studies (p. 123) that "even the finding of low propositional complexity is probably better interpreted in terms of a gross bias toward brevity in maternal speech rather than in terms of a metric of syntactic simplicity."

McTear (1978), in a review of Snow and Ferguson (1977), writes that the notion that adults "reduce their syntax in order to teach their children syntax in a sort of language-teaching programme . . . is given very little support in the papers in this volume" (p. 524). Also, "Although many studies of BT suggest some relationship between BT and language acquisition, there has been little evidence of actual effects" (p. 528).

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Another analysis performed by NGG concerns the effect of repetition on language growth. A common claim is that repetition by the mother aids language growth. A number of studies have found that the more advanced the child's age and linguistic abilities, the less the repetition by the mother. The usual interpretation is that as the child comes to know more about his language, he needs repetition less. But another interpretation is possible, as NGG point out. It may simply be that younger children are less likely to understand or attend to an utterance, and so it is repeated. In fact, "Newport (1976) showed that the child's tendency to respond to an utterance was unrelated to the serial position of that utterance in a repetition sequence" (NGG, 142). In NGG's data, the partial correlation between maternal repetitions and child growth scores is in fact negative, not positive (p. 142). Once again, the use of sounder methods of empirical analysis leads to a noneffect of what had been believed to be an effect of input.

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Interestingly, Brown (1977) seems to share this conclusion, with respect to the intentions of parents, not their effects. He explicitly (p. 12) argues against the notion that parents' intentions are "to provide language lessons." But in a section entitled "What Does Baby Talk Accomplish?" Brown makes his remark about the evidence of BT refuting "overwhelmingly" the need for an "elaborate innate component." Therefore he must think that although intentions of parents are to communicate, the effects of the process are to strongly help somehow