

CHILDREN'S LANGUAGE

Volume 6



edited by Keith E. Nelson
Anne van Kleeck



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IASCL

This book is dedicated to the International Association for the Study of Child Language, IASCL. Shorter foundation papers for each of the chapters in the book were presented originally at Austin, Texas, as part of the third international congress for IASCL (1984). Earlier congresses were held in Tokyo, Japan (1978) and Vancouver, British Columbia (1981). IASCL invites international applications from all professionals who share an interest in enhancing understanding of children's acquisition and use of languages.

Lund, Sweden, is hosting the Fourth International Congress for the Study of Child Language just as this book reaches the presses, in July, 1987. The theme of this Lund meeting is "The Active and Creative Child." In the long light days of this summer meeting, we wish for continued progress, openness, sharing, and light among co-workers in the field of children's language.

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Volume 6

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Preface

This series, *Children's Language*, reflects the conviction that extensive work on entirely new fronts along with a great deal of reinterpretation of old-front data will be necessary before any persuasive and truly orderly account of language development can be assembled. For all volumes in the series there is a common scheme of operation with two tactics. First, to give authors sufficient planning time and freedom to arrive at a chapter-length account of their area of thinking which vividly shows both the progress and the problems in that area, with the author of each chapter free to find a workable proportion of new experimental contributions, review, and theory. This flexible approach means that formats vary. It also insures that none of the chapters are simply reviews, and that none of the volumes are “handbooks” or “reviews” or introductory texts. Rather the volumes try to capture the excitement and complexity of thinking and research at the growing, advancing edges of this broad field of children's language. The second tactic concerns the selection of topics for each volume. Again eschewing the general handbook or review approach there is no stress placed on representing all of the facets of children's language in one volume. The chapters placed within one volume are chosen because there are some common themes that tie subsets of them together and because each chapter is “due” in the following sense—the author's theoretical and experimental program has come to a point where a systematic account will be stimulating and perhaps catalytic to the work of other investigators.

In line with these goals for the *Children's Language* series the present volume includes coverage of a fairly wide range of topics and subtopics. The authors for each chapter will weave their own story and we leave to them the introduction of their main plots and the major and minor characters in their scientific stories.

Here we will just briefly emphasize a few important themes and connections across the varied chapters.

We find four overlapping areas in which the authors of the present chapters have particularly interesting insights and data. The first area encompasses children's language structures at successive developmental points. Perhaps this is the area where progress over time would most be expected, because the study descriptively of children's language structures is the oldest and most differentiated part of the field. The present investigators contribute by providing new and more differentiated accounts of structures in syntax, semantics, phonology, discourse, and discourse timing. A second area of study in the present volume is individual differences in the ways in which children learn complex language systems. Part of this contribution focuses on what the child manages to do across time in constructing language, but increasingly the literature generally, and the present chapters in particular, show how individual differences in interactional patterns with others influence children's language acquisition and language use. A third line of interconnection between chapters is the increasing differentiation of the processes and mechanisms involved in language acquisition. The authors move well beyond any simple nativist account and any simple interactional account to provide intriguing details about postulated learning mechanisms and how they are applied to the actual data and evidence available to individual children.

The final theme we would like to emphasize across chapters is a concern with how children stretch their current language and cognitive resources to help themselves make further progress without yet knowing exactly where they are headed in the next rounds of advance. This kind of process involves going beyond the information given and also going beyond the operations and hypotheses so far constructed. In many cases, as the child takes new steps forward, interactions with others will provide facilitators and stepping stones and bridges that help to explain the fascinating ways in which a child with only a few kinds of phrases or a few kinds of sentences increasingly incorporates more and more complexity in language at each new level. But in certain ways the child in any culture will find at certain points that he or she must in effect provide pieces of their own scaffolding. Children sometimes must actively forge new bridges and new hypotheses relying on the language chunks and rules already in place and the resources of their own active mind. As we will see in the current volume, there are many metaphors for this child centered learning activity. But in one way or another they all point to a kind of boosting up or a kind of winding up for the next stages of analysis that the child provides to herself or himself.

In Chapter 1, Shatz prefers the metaphor of bootstrapping. In her account she considers several different operations by which the child may bootstrap. One kind of operation involves procedures for eliciting from others the kinds of information and the kinds of support that can be helpful in working out new levels of language structure. A second kind of related activity by the child concerns entering into conversation and entering into representational systems

many pieces of language or frames of language that are not fully understood. Here the child succeeds in maintaining active communication and active representation of both known structures and puzzling structures for an interim time so that more complete analyses can be worked out. A third area of bootstrapping discussed by Shatz concerns various expansions and manipulations of language structures as part of an active process of analysis. Children do not simply use language rules and language structures, they actively organize and reorganize the language resources they have and in discourse often lay out sequences of manipulated structures in ways that invite new comparisons and analyses. As Shatz notes, "Children use what they know to learn more, thereby achieving their own success. In idiomatic language, they pull themselves up by their bootstraps" (p. 1). These processes are held to apply for each child, but to assume different patterns for different children and their interactional partners.

Mannle and Tomasello in Chapter 2 use a bridge metaphor to capture the kinds of stretching of linguistic resources that a child may engage in when confronting nonprimary caretakers in conversation. Consider a child who spends most of her time talking with her mother, but spends some time talking with a sibling or a father for a short stretch of conversation towards the end of the day. The child then may confront challenges that simply did not arise in the more everyday, familiar, smoother exchanges with the mother. The data presented by Mannle and Tomasello indicate that fathers and siblings are in fact less "tuned in" than mothers to the child's language level. In the course of stretching and bootstrapping to meet the needs of conversational partners who are different from the child's most frequent caretaker, the child may also learn to construct appropriate discourse structures of a code switching sort that allow towards the end of language mastery a smooth accommodation and a quick accommodation to new communication constraints. In addition, the material in Chapter 2 fits with the theme of individual differences. Both in terms of differences between children and in differences between varied fathers and varied siblings in their conversational behavior, it is evident that any adequate theory of language development will need to accommodate individual differences both on the child's side and on the input side.

Instead of looking at variations between conversational partners, Chapters 3, 4, and 5 look in considerable detail at the structure of communicational exchanges in particular kinds of situations. There is much valuable data and discussion in the chapter by Conti-Ramsden and Friel-Patti and in the one by Snow, Perlmann, and Nathan concerning direct comparisons between situations that vary in these terms: (a) the degree of familiarity of the situation, (b) the toys and books and other available materials, and (c) the predictability or "scriptedness" of the situation. In these analyses the child in each case converses with his or her mother but the situation varies across analyses. In Chapter 5 by Speidel, the focus of analysis is on a reading setting for children who are acquiring standard English dialect after having first acquired Hawaiian English. Here the co-conver-

sationalists for each child are teachers and other children in the class. Despite the school setting, there is strong evidence that the teachers have achieved a naturalistic, conversational quality of communicative exchange. The authors of these three chapters do a good job of discussing the complexities of understanding how the tasks, the situations, the co-conversationalists, and scripts may all influence what occurs in a particular session of conversation and what the child learns over stretches of many months. In addition, individual differences arise that illustrate quite powerfully that not every script or task or situation will bring out the same communication quality in either children or adults. Nevertheless, there are some common suggestions that arise from the laboratory situations examined in Chapter 3, the home situations examined by Snow et al. in Chapter 4, and the classroom situation examined in Chapter 5. In contrast to the consideration of certain advantages arising from unfamiliarity provided by Mannle and Tomasello, these three chapters point up certain potential advantages of familiarity of situation, sequence and conversational partners. Given familiarity and predictability, the child may do a fair amount of risk taking and bootstrapping to push the use of his or her available linguistic resources as far as possible. Less attention and less processing capacity needs to be given to analyzing the situation and making and monitoring new plans for behavior in the situation. For the adult, the circumstances that are high in familiarity and predictability may motivate the adult to provide more flexibility and space for the child in discourse to initiate and to try out their linguistic resources. The adult also may have a greater readiness when the child does offer a conversational gambit to come back with a reply that is contingent on what the child says, but which goes beyond that and provides some kind of challenge linguistically. Putting the observations of these three chapters together with the chapters by Shatz and by Mannle and Tomasello provides a good antidote to a highly simplified view of language learning that posits standard input to a child who behaves in a stereotyped and consistent way. Instead new data and theory takes us in the direction of seeing how children with considerable individual differences in language skills and language styles encounter adults whose own skills and styles are deployed in different ways in different tasks and situations. Older reports in the literature primarily concentrated on what children were learning in language acquisition. The present accounts move us closer to differentiated pictures of who learned what from whom when.

Roth's work in Chapter 6 brings us to a consideration of children who are very early in language learning level, around 12 months-of-age. Here again we see considerable individual differences. Babies vary in their rate of vocalization and mothers vary in how much they share the child's attentional focus, how quickly they respond to the child's vocalizations, and in how often they provide semantically relevant encoding of the child's actions and other foci of attention. At these early points in language learning prompt and semantically relevant re-

sponses from mothers may provide very important stimulation for the child's analysis of language units and of relations between language and context.

In Chapter 7 Bernstein-Ratner also looks in fine detail at the kind of maternal input provided to children in the early stages of language learning. She argues that there are rich acoustic clues provided in adult speech to children, but that on the methodological level considerable care and sophistication is required to detect these clues. Her discussion converges with those in earlier chapters in stressing that adult speech will not always be rich in the same ways regardless of the goals and tasks and situations in which adult-child conversation occurs. So it is essential to look for those circumstances in which useful rich acoustic information is provided to children even though not every adult or every situation will contain rich clues to language structure. Another important caution urged by Bernstein-Ratner is close attention to the child's language level. This injunction applies to researchers who need to look for possible sensitive adjustments by adults to the child's language level and also to reduction of cues to children after they achieve certain levels of mastery. In addition, the injunction takes the form of advice to parents. In her view, parents may be better facilitators of language learning if they do adjust their cuing to the child's language level, if they provide clarification phonologically of new information and messages, and if they provide frames for analysis of word and phrase boundaries by using different instances and different realizations of the same words and phrases. You might say that even if children are going to have to do a lot of bootstrapping in the early stages of language learning, the responsive adult can do a lot through timing and emphasis and discourse structure to make the bootstraps a bit closer and more noticeable for the child.

Cross cultural comparisons have proved a valuable tool in revealing variations in the nature of language and in the nature of conversational interaction. Any adequate theory of language acquisition will have to take into account important cross cultural observations. In Chapter 8, Pye, Ingram, and List apply the cross cultural research strategy to consonant acquisition by babies learning a Mayan language (Quiché) in Guatemala and babies learning American English. In this case, good attention to the structural detail of the child's phonological systems helps to guide inferences towards more detailed conceptions of the processes by which children abstract language structure from the input they hear. The authors find systematic differences between the babies in the two cultures which challenge all prior theories of phonological acquisition. They emphasize children do not just learn sound systems but learn sound systems in connection with meaningful differences in language. Theories that rely heavily on factors such as ease of articulation will have difficulty dealing with their findings. Part of the bootstrapping process, even in very early stages of language learning, is that children will bootstrap by learning how to learn, by letting the results of early hypothesis testing against the particular local language influence the kinds of new hypoth-

eses that they construct. The further the child goes in learning a language, the more the child is able to rely upon prior categories and rules and structures that have already been abstracted to selectively form new hypotheses that have high probability of success in their local language (for example, Quiché) but which would be less likely to succeed for a child working out the structure at a similar level of mastery for a different language (e.g., English). As the authors say, "Children must monitor the speech of others for forms with detectable meanings. Once these are found the forms can be stored by reference to their meanings. . . The adult phonological system inserts its influence during the child's search across different lexical types since the more frequent phonological contrasts should be the easiest to find (p. 181).

As we have just seen, sound analysis and semantic analysis do not proceed independently. Similarly, the analysis of new semantic lexical entries does not proceed independently of the analysis of nonlinguistic events and objects. Gopnik and Meltzoff show us that new word acquisitions of particular types tend to co-occur with new levels of understanding for related nonlinguistic events. For example, advances in understanding disappearances of objects are correlated in time with the acquisition of words for describing disappearance, such as "all gone." In line with many of the other chapters in this volume, the emphasis here is on the fine structure of acquisition. It is argued that if very broad measures of semantic development and of nonlinguistic development are used or if very global time periods are employed then interconnections would be missed. With new data of the sort reported in this volume, models of acquisition gradually will be able to specify links between language and cognition, ties between input variations and the acquisition of phonology, syntax, semantics and discourse, and links between development in each of these areas.

Relations between verbal representations and nonverbal representations are also the focus of the next chapter, Chapter 10 by Dent. Four-year-old children may be quite competent at verbally telling you about their concepts of giraffes and buildings and horses and dancers. The same children may also understand quite a bit about metaphor without being able to explicitly verbalize some of this knowledge. Dent provides insights into the children's nonverbal understanding by having them create novel hybrid constructions to show metaphor meaning. A child confronted with the metaphor, "The building is a giraffe," or the metaphor, "The horse is a dancer," could form a hybrid construction piece by piece to specify topic-vehicle relations. The task is new and the metaphor is new to the children. But by using what they know as a firm foundation, children are able to twist, turn, stretch and bootstrap their way to reasonable new constructions.

Across metaphors and across languages there are many ways of dividing up and representing the world and mapping these representations to distinctions in language. Matsumoto, in Chapter 11, reviews the ways in which Japanese carries information about multiple objects such as pencils and boats and mountains. These classes of objects, and many other classes as well, require differentiation

of classifiers. For example, the classifier “-hon” in “*ni-hon-no enpitsu*,” “two pencils,” would not be used for referring to cars or boats or horses. By attending to the interesting fine structure of classifier use in adults, Matsumoto is able to generate many experimental tasks to reveal information about the order of acquisition of these classifiers by Japanese children. One important result is some striking individual differences. A second general result is that a full account of the details of acquisition order requires moving beyond semantic complexity theories and input frequency theories to a more complex and differentiated theoretical account.

As in chapters by Dent, Matsumoto, and Nelson, White in her chapter (12) relies on focused experiments as a prime tool for revealing details of children’s language and language growth. Her analyses concern children’s systems for dealing with various verbs and their direct and indirect objects. Children in her experiments were asked to act out sentences such as “The monkey is drawing a picture for the doll,” or “The doll is opening the monkey the door.” Children often overgeneralize constructions that are appropriate for one verb to verbs that will not accept the same construction. The result is acceptance of sentences that are ungrammatical from an adult point of view, such as the second sentence above. It is essential to see that these errors do not occur at the early points of syntax development. Instead they develop when children are about 4½ to 5½ years-of-age, after they have built up a firm foundation both for appropriate generalizations and for active generalizations that prove to require correction in the longer run. Her theoretical argument again leads us to close consideration of the particular input that children receive and how differences in exemplars presented to children may lead to different rules and different generalizations for certain periods in development. Nearly all children work out in English the correct object verb relations, but different children get to mastery through different sequences of steps.

Nelson in Chapter 13 considers together and helps to integrate many of the observations and theoretical discussions of the preceding chapters. The theoretical framework employed is one labeled “a rare event cognitive comparison theory of language acquisition.” As in previous chapters stress is laid on describing and accounting for individual differences rather than aiming for one overall simplified model of how a child (“the child”) acquires language. Each child is held to approach language acquisition with RELM, a powerful general learning mechanism that opens the way to considerable individual variability. Precisely because RELM is so powerful, children are sensitive to input but they are not overly dependent upon closely tailored, finely adjusted, explicit input that points out to children each new step they need to take in order to become more fluent in language. By relying on powerful long-term memory storage and retrieval systems and powerful analytic mechanisms, the child is able to put together for analysis related examples that are spread out over many days, weeks, and months of conversational interaction. From the dance of conversations on many separate

stages and situations, the child is able to extract important but rarely occurring patterns. This kind of model attends to the fine structure of the child's current hypotheses, the fine structure of the child's storage and retrieval and analysis processes, and the fine structure of the interactional conversational patterns that individual children encounter. Together with the insights of the preceding chapters this kind of work indeed takes us closer to a differentiated and persuasive account of how children work out the mysteries of language. In line with the imagery of the following poem by Elizabeth Bishop, we have come to some clear angles of understanding and some clear patterns of explanation, with many startling revelations in what we have thus far come to understand.

Across the floor flits the mechanical toy,
fit for a king of several centuries back.
A little circus horse with real white hair.
His eyes are glossy black.
He bears a little dancer on his back.

She stands upon her toes and turns and turns.
A slanting spray of artificial roses
is stitched across her skirt and tinsel bodice.
Above her head she poses
another spray of artificial roses.

His mane and tail are straight from Chirico.
He has a formal, melancholy soul.
He feels her pink toes dangle toward his back
along the little pole
that pierces both her body and her soul

and goes through his, and reappears below,
under his belly, as a big tin key.
He canters three steps, then he makes a bow,
canters again, bows on one knee,
canters, then clicks and stops, and looks at me.

The dancer, by this time, has turned her back.
He is the more intelligent by far.
Facing each other rather desperately—
his eye is like a star—
we stare and say, "Well, we have come this far."*

*This poem, *Cirque d'hiver*, appears in *Elizabeth Bishop, The Complete Poems* published by Farrar, Straus and Giroux in New York in 1977.

1

Bootstrapping Operations in Child Language

Marilyn Shatz
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When children start to talk, they often produce naively inappropriate and even contradictory, if cooperatively intended responses, as exemplified in (1)–(3).

- (1) E: What do you wear on your head? (to an 18-month-old)
C: (looks at E, smiles, pats the top of her head)
- (2) E: What color is this? (holding out a yellow ball to a 24-month-old)
C: Green.
E: What color?
C: Red.
- (3) M: Do you want a cookie? (to a 14-month-old)
C: (reaching for the cookie) No.

Instances such as these are often passed over as merely charming indications of the young child's ignorance or contrariness. However, child language researchers should take them more seriously, for they are evidence of the kind of partial knowledge children have and regularly make use of as they simultaneously try to solve the dual problems of interacting and learning to communicate conventionally. Children must engage in the unfamiliar world of conventional communication from a very early age, and they have a variety of behaviors that help them get by on the little they know while at the same time assisting in the construction of a more adequate knowledge base. That is, children use what they know to learn more, thereby achieving their own success. In idiomatic language, they pull themselves up by their bootstraps.

The idea of bootstrapping is not new to child language theory. However, the scope of the notion and the diversity of its functions proposed here are new. Previous notions of bootstrapping were proposed primarily as part of endeavors

to explain the acquisition of syntax. In these earlier uses of the term, syntactic knowledge was said to build on some more basic understanding, either semantic or pragmatic, and one of two assumptions underlay the relations between the more basic level and the derived syntactic level. One assumption was that the structural relations in the two levels were isomorphic; hence, understanding in one level made the other necessarily apparent. One well-known example of isomorphic bootstrapping is Bruner's (1975) suggestion that the structure of agent-action-object-recipient relations in the world is revealed through parent-child interactions with objects and then reflected in basic word-order patterns. However, as Slobin (1982) has noted, languages that do not adopt this pattern as their basic order are no more difficult for children to learn than languages that do.

The other assumption is somewhat weaker, postulating one-to-one relations, rather than isomorphic ones. Pinker's (1984) system exemplifies this approach. For example, in his theory, the child's early understanding that some words designate objects and others actions forms the basis for distinguishing the grammatical categories of nouns and verbs. Although the formal basis of grammatical categories is given innately, the child discovers the particular expression of grammatical categorization in her language by mapping the simple semantic categories to the syntactic ones. Since the one-to-one assumption does not require that the structural description of the derived knowledge be strictly related to that of the more basic kind, it is weaker and less reductionist than the assumptions of isomorphic description. Nevertheless, it does assume that semantic distinctions are more transparent or available to the child than syntactic ones. (See Pinker, 1984 for further discussion of the Semantic Bootstrapping Hypothesis.)

The notion of bootstrapping proposed here is even weaker and more fluid than Pinker's. It is weaker in that it is less restrictive because some instances of bootstrapping do not have to obey even the one-to-one constraint. That is, the ways in which bootstrapping operations promote learning are assumed to be more varied than just by the creation of one-to-one correspondences. It is more fluid than earlier approaches in that bootstrapping operations are assumed to function as mechanisms of acquisition for all sorts of knowledge about communication and not just for syntax. Thus, the child is expected to use whatever aspects of language are available to her to illuminate the unknown, even, for example, using primitive syntactic understandings to shed light on pragmatic or semantic conventions.

WHY BOOTSTRAPPING?

There are several reasons for extending the bootstrapping construct in these ways. The first is that, although syntax has been the focus of the question of how language gets learned, it is not the only complex aspect of language a child must

master. The child must also learn her culture's way of cutting up semantic space as well as its pragmatic practices, and these are hardly ever error-free or speedy acquisitions (Carey, 1985; Shatz, 1981). It seems unreasonable then to assume that semantic understandings for all facets of language are more transparent than some relevant syntactic knowledge, or that the social rules underlying language use are always in place before the rules of grammar. Rather, if the child has to acquire a complex array of communicative knowledge on various levels, it seems likely that she uses bits and snatches of whatever she knows to learn more. Thus, in this approach, the direction of facilitation is not limited to that from semantics or pragmatics to syntax, but can vary.

The second reason for extending the bootstrapping construct concerns the role of the child in the acquisition process. Over the last decade, there have been repeated claims that the child is an active participant in the creation of her language (Newport, Gleitman, & Gleitman, 1977; Shatz, 1981, 1982). Much of the evidence in favor of this position has been of a negative sort. Direct interpretable correlations between maternal linguistic input and subsequent child behaviors have been relatively few (Newport et al., 1977; Gleitman, Newport, & Gleitman, 1984; also see Hoff-Ginsberg & Shatz, 1982, for a review). Similarly, attempts to identify maternal pragmatic or nonlinguistic behaviors that can function as explanatory bases for the course of communicative development have not been especially successful (Shatz, 1982, 1984). In addition, there is some positive evidence for an active child, in both the child's selective uptake from input (Kuczaj, 1982) and the child's creative speech, from overregularized past tenses (Cazden, 1968; Ervin, 1964) to overgeneralized causatives (Bowerman, 1982) and specifically marked form-function distinctions (Karmiloff-Smith, 1979). Among the most compelling of such examples is Karmiloff-Smith's discovery that children sometimes formally mark a functional distinction that the adult language user does not. She found that French children progress through a stage of using two different forms to mark explicitly the determiner and numerical functions expressed by single form *un(e)* in the conventional language. These examples, and others like them, indicate that the child's route to mature language use is not determined wholly by all and only the input received. A comprehensive effort is needed to integrate data like these with a model for how the child controls the building of a communicative system over time. The extension of the bootstrapping construct forms the basis for describing the set of mechanisms required to explain the child's progress over time in achieving a conventional communicative system.

Three types of bootstrapping operations proposed here, elicitation, entry, and expansion operations, allow the child maximally to utilize the social environment for the learning of her culture's communicative system. Although the operations have different functions and different behavioral manifestations, taken together they form a larger complimentary set motivated by two characteristics of the child learner. Some of the operations are required because the child controls her

own progress and hence must assure adequate input to the learning device. Others are a consequence of the learner's limited processing capacity, and the fact that the child must do other things while language learning progresses.¹ Neither of these two characteristics of the child as learner, limited processing capacity and self-control over the learning process, are presently well understood, but the latter is perhaps more controversial than the former and thus warrants a more explicit defense.

Executive control of language learning could be housed externally in the environment or internally in the learner. If it were located in the environment, that environment would have to be extremely sensitive to the state of the learner to be effective and efficient. This is true especially because the learner is a limited capacity processor and cannot learn anything and everything provided for it at any moment in time. Moreover, even if the environment were sensitive to the limited capacity of the learner and provided information in orderly, suitably sized packets, it would still have to be able to monitor the learner's uptake of such packets and frequently adjust its output to provide just the information needed by the learner to maintain continued development. In this model, even moderate deficits of monitoring sensitivity in the environment might have serious consequences, leaving the learner highly vulnerable to disruptions of the growth process.

By contrast, learners with internally directed developmental programs can select from environments differing in sensitivity but still relatively rich in information the amount and kind of material they need when they need it. The environment needs only to be sufficiently rich that the learner can at any point in time discover what she needs; it need not be especially sensitive to just what it is that the child requires at a given time. Hence, disruptions of the developmental program due to misreadings of or insensitivity to the state of the child are avoided.

This is not to derogate the role of the environment. There is ample evidence that absence of a communicative environment, or a highly impoverished one, is devastating to language learning (e.g., Curtiss, 1977). The point is that an internally controlled acquisition system does not need an especially sensitive environment, although it must still have an available one; whereas an externally controlled one must have both. Evolution theorists suggest that one of the main problems faced by organisms is the maintenance of developmental integrity despite environmental vagaries (Waddington, 1957, 1974). Hence, it seems reasonable that an important acquisition such as communication would be protected from all but the most severe environmental deficiencies by housing the

¹Note that the question of whether the child has less processing capacity than the adult is irrelevant here. Even if the child processes as much as an adult, adult limits must be her asymptote, and hence limited on-line processing is a given (e.g., Anderson, 1983).

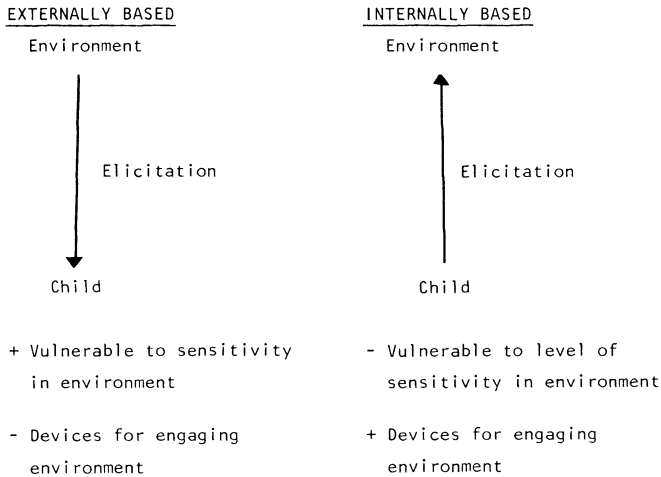


FIGURE 1.1. Alternative control systems for language learning.

primary engine of development in the learner. (See Shatz, 1985, for further discussion of this point.)

However, there is a price to pay for the robustness an internally controlled system displays in the face of relative insensitivity in the environment. If one were designing an externally controlled system, satisfying the requirement of sensitivity could allow easy satisfaction of the requirement of availability. In an internally controlled system, where sensitive monitoring devices in the environment are no longer required, the learner must have some means for assuring ready availability to relevant data. This tradeoff between the vulnerability of the learner and the learner's need for ways to engage the environment is illustrated in Fig. 1.1.

This brings us to one new function for bootstrapping operations: Children need them to elicit data for their language induction processes to operate on. Devices that allow learners to use what they already have to gain more information from the environment are called elicitation operations.

The other two kinds of bootstrapping, entry and expansion operations, are more directly motivated by the processing capacity limitations of the learner. They compensate for those limitations by allowing preliminary representations of data that can be analyzed and elaborated over time. Thus, entry operations allow new elements to enter the language store, even in the absence of full analysis or understanding of them. Expansion operations allow understanding to grow as capacity becomes available to analyze in more depth and detail what has been stored in preliminary fashion.

Before we turn to some examples of operations and evidence for them, some clarifications are in order. What the three kinds of operations have in common is

that they all help the child to use partial knowledge she already has to acquire more. Although there is an obvious logical order for any particular acquisition, from elicitation to entry to expansion, no stage theory of development is implied. Rather, it is assumed that all of these operations go on for extended periods of time, in waves, as it were, with ongoing analysis and reanalysis as more data arrive. Essentially, the operations are strategies for language learning. Although some may be specific to language learning, others may be more general learning strategies. Which are specific and which more general is an empirical question I do not address here. Similarly, whether all children or just some manifest particular operations is an empirical matter. However, because I have claimed that the three types of operations are consequences of characteristics of the language learner, it is essential that every normal child normally acquiring language manifest at least some behavioral evidence for each of the three types of operations. Indeed, predictions about language learning deficits can be made on the basis of the tripartite model and the presumed absence of a particular type of operation. I shall return to this point in the last section of the paper. Finally, whereas some behaviors the child produces may clearly function as only one type of operation, others may have multiple functions. Communicative behaviors are not meant to be categorizable exclusively as one kind of bootstrapping operation or another. Again, how they function is an empirical question. This becomes clearer as we examine now in more detail examples of the various kinds of operations.

ELICITATION OPERATIONS

Since most children in normal environments are surrounded by speech, one might ask why children need special devices to elicit input. Why can't the child just make use of what she hears, or overhears? The problem is that the child occasionally has to know what is being talked about. Every current theory of language acquisition assumes that some meaning can be assigned to the strings to be analyzed (e.g., Anderson, 1983; Pinker, 1984). At the very least, the child needs to be able to identify the objects and events being talked about some, if not all, of the time. One way to assure this is for the child to identify what she wants talked about. Even before the child is capable of indicating this in speech, she can do so via an intermediary interaction system. Gestural behaviors are a good candidate for such a system. Unlike other prelinguistic devices for interaction such as smiling and crying, hand gestures can be used to direct the attention of an interlocutor towards objects and events beyond the dyad. If the interlocutor then responds to those gestures with language and appropriate gaze direction, the child can be fairly certain what the referential space of the language is. At the stage in which word learning is particularly important, gestural indicators on the part of the child are likely to elicit referent-matching statements (Hoff-Ginsberg & Shatz, 1982). For example, children pointing to objects in books or during

play sessions often have those objects named for them (see Masur, 1982; Murphy, 1978).

If child gestures serve the function of eliciting speech rich in referential information, they should be especially frequent during the period in which the child is acquiring a vocabulary of labels. The data on early gesturing confirm this. Children begin to gesture communicatively sometime between 9 and 12 months, at just about the time they become mobile and start word learning in earnest. These early gestures drop out as the child becomes more proficient in word use, particularly as combinations of words become more frequent (Goldin-Meadow & Morford, 1985). Certainly gestures return to the communicative system at a later point in development; as we know, adults gesture when they talk. However, it is not until about 10-years-of-age that the full array of mature gestures is found in children's communicative behavior (McNeill & Levy, 1982). The hiatus in gestural behavior, and its change in form as well, supports the proposal that the early gestural system has a different functional role from the later system. (See Abrahamsen, Cavallo, & McCluer, 1985, and Shatz, 1985, for similar arguments.)

Further evidence that early gestures are not an integral part of a growing linguistic system but something preliminary to it comes from experimental studies of children's responses to gestured and ungestured language. Children under two were very likely to respond to gestured language by producing some action in response, regardless of whether gestures and language were consonant with one another or in conflict (for example, a speaker pointing to a cow, but asking, "What says woof-woof?"). In response to ungestured speech, children were more likely to vocalize (Allen & Shatz, 1983). Moreover, 2-year-olds also tended to respond with action to gestured language, and when so doing, produced less appropriate verbal responses than when they responded to ungestured language with speech only (see Shatz, 1984, for a report). Nor were the children's action responses a substitute for appropriate speech. For example, in response to "What says woof-woof?" a child might have simply pointed to a toy dog that was close at hand. Nevertheless, only a small fraction of the children's nonverbal behaviors were of this appropriate sort. Rather, the studies on young children's responses to gestured and ungestured language suggest that gestures and language are not yet integrated into a single communicative system.

Another study, examining the influence of maternal gestures on child language, is highly compatible with the view that early gesture serves to focus joint attention beyond the dyad on objects and events that can be talked about. Schnur & Shatz (1984) found that maternal gesturing functioned to direct the child's attention to a common focus, but had little influence on the appropriateness of the child's responses. Thus, taken together, the studies of both maternal and early child gesturing suggest that gesture serves to situate parent-child attention at a time in the child's development when the child's knowledge of language itself is insufficient to do so.

A repertoire of attentional gestures is unlikely to suffice as elicitors of speech for very long, however, Parents get bored with naming games, and children eventually need to know more than names for things. The child has to have other means as well for keeping the linguistic interaction going. Normal children very early on demonstrate a variety of response behaviors that convince parents they are cooperative interlocutors and that keep parents conversationally engaged. For example, having learned common actions on commonly labeled objects, children pull familiar labels from utterances and act accordingly on the objects mentioned, without having to analyze much about either the intention behind the utterances or the grammatical relations expressed in the string. Thus, 2-year-olds and under often respond with action to a variety of utterances which do not explicitly request it (Shatz, 1978).

Children also early on learn that some kinds of utterances require something more than or other than action. Even before 18 months, they recognize that yes/no questions take a special response, and they often use either *yes* or *no* indiscriminately in response to such questions, although their use can be totally inappropriate from the semantic or pragmatic point of view. For example, one 24-month-old observed in England responded to her mother's question, "Do you want your Teddy?" by saying, "No, please." At about the same time, children learn that wh-questions require some sort of verbal response different from *yes* or *no*, but they do not know just what it should be, and they produce some other vocal responses that are often semantic hash. (See Shatz & McCloskey, 1984, for a review of children's early question-answering behavior.)

Other response strategies gleaned from adults' discourse behavior have also been reported. Children pick up words or phrases they observe being used as responses, but they adapt them in often inappropriate ways to their own need to respond in circumstances when their knowledge is insufficient. One child picked up the *hmmm* that her mother regularly used in responding to her child when the child had said something incorrect but the mother did not want to criticize or correct directly. (4) is an example of such an instance of the mother's use of *hmmm*.

- (4) C: (showing the mother an object) A basket.
M: Hmm. I think it's a bowl.

The child's use was quite different.

- (5) M: Where does it (a toy car) go?
C: Hmm.
M: Where does it go?
C: Hmm.
M: Does it go in the garage?
C: Hmm.
M: Yeah, it goes in the garage.

All of the above response behaviors, action responding, common question-response pairs, and frequent but idiosyncratic response modes, recruit partial knowledge of language use to the task of signaling to the interlocutor that the child is an attentive and cooperative participant in the interaction. Research on parents of autistic and retarded children tells us that, in the absence of such child behaviors, whatever propensity parents have to talk to and interact frequently with their children is diminished (e.g., Cunningham, Rueller, Blackwell, & Deck, 1981). Thus, the children's ability to take turns in conversational interactions, even when they can make only partial touch with the thread of the discourse, importantly functions to keep parents engaged with them.

The use of partial understandings to carry on discourse results in some rather surprising findings about children's semantic knowledge. It is often assumed that children first learn basic level or specific labels for referents before having an idea about the superordinate domain to which a term belongs. Color terms, however, appear to follow a different developmental course. Even children who cannot reliably identify the proper referent for color terms are able to answer the question, "Do you know the name of a color?" with at least one color term (Bartlett, 1977; Rice, 1980). Hence, they know the domain to which specific words belong before they know particular referents for those words. Moreover, they know the set of words appropriate to answer the question "What color is this?" before they are able to answer the question correctly, as (6) illustrates.

- (6) M: What color trousers has she got on?
 C: Um-blue.
 M: No.
 C: Red.
 M: No.
 C: Blue.
 M: No.
 C: Red.
 M: No. You said those. Try another one. G—
 C: G—
 M: G—for?
 C: Red.
 M: G—for green.
 C: G—for green.

As with the children who knew something about the discourse domain for yes/no responses before understanding their particular semantics, this 29-month-old understood something about the appropriate discourse contexts for color words before understanding their particular meanings. Her willingness to use her partial knowledge elicits a language lesson on color terms from her mother.

An especially intriguing aspect of these elicitation behaviors is that the child does not appear to be particularly conservative about using the little language she

knows to keep the interaction going. Unlike some other aspects of language learning, for which it has been argued that the child is a rather conservative learner, typically avoiding constructions she is unsure of, here the child seems willing to risk using a response she does not have full semantic or intentional control over. One reason why these liberal uses of partial knowledge may occur is that, inadequate though they may be, the child may discover early on that the best way of getting speech input is to try talking. For example, Masur (1982) and Ninio & Bruner (1978) both found that parents label more in response to their children's labeling attempts than to their gestures.

As for the kinds of facilitation that might occur as a consequence of these behaviors, I have already noted that gestural behavior would likely result in labeling under easy referent matching conditions and hence might facilitate word acquisition. Discourse cohesive but semantically inadequate responses might elicit specific language lessons or corrections. Indeed, Brown & Hanlon (1970) report that parents correct their children's semantics, and a study now being done suggests that children about the age of two elicit many language lessons similar to the one illustrated in (6) (Shatz & Ebeling, 1987). However, direct corrections or lessons are not a necessary outcome for facilitation to occur. Parental responses may be more subtle. For example, a reformulation of the situation using the correct form might occur and could be helpful if the child had a means for comparing what she had just said with the parent's reformulation. The work of Nelson and his colleagues (Nelson, Denninger, Bonvillian, Kaplan, & Baker, 1984) and of Hoff-Ginsberg (1985) shows that parents do make such reformulations and that children can take advantage of at least some of them.

However, it is important to note that these are examples of how facilitation could occur. No one-to-one correspondence between a given operation and a particular sort of linguistic information to be gained is being postulated. Rather, what particulars the child might learn from conversation-eliciting behaviors will more often than not be governed by factors other than the particular behavior produced. Primarily the behaviors function to keep the child and parent engaged in linguistic interaction and to provide opportunities for the child to gain data on which to work. For example, one of the most primitive devices available to the child is that of imitation. Children have been reported to use imitation as a response that indexes attention to the conversation and the willingness to take a turn in it. Yet, clearly, it does not direct subsequent parental behavior toward any specific additional information need. Indeed, longitudinal research suggests that continued reliance on imitation may not be an efficacious strategy past the early periods of language learning (Nelson, Baker, Denninger, Bonvillian, & Kaplan, 1985). In contrast, the much more sophisticated direct questioning about language that many 30-month-olds do, as illustrated in (7) (from Shatz & Ebeling, 1987), affords the opportunity to receive quite specific and relevant information.

- (7) Mother and child are looking at a picture book.
M: I can see something that begins with B.

- C: Bicycle.
 M: Bocyte (in teasing tone).
 C: What are bicycle call means?
 M: Bicycle? Bicycle's a bike with two wheels.

Thus, elicitation behaviors can result in the reception of either general or focused information, and their appropriateness and usefulness can vary depending upon the linguistic level and age of the child. Without even the most primitive of them, however, it is unlikely parents would have the fortitude and diligence to stick with the often unrewarding task of talking to an unresponsive listener.

ENTRY OPERATIONS

Thus far, the focus has been on how the child elicits information from the environment. However, that information is only as useful as the child's ability to utilize it. Entry operations get the information into the language learning system in a format that promotes further analysis and learning by the child.

There are several reported phenomena in the literature that qualify as entry bootstrapping operations. Taken together, they suggest two characteristics of the data entered into the child's memory store for language. First, entry operations regularly take as the unit represented something larger than the word, for example, a noun phrase composed of modifier and label, or a discourse sequence, comprised of an overture-response pair. Second, words are often stored along with more familiar words or in typical utterance frames, even though they themselves are poorly understood. Thus, items enter the memory store in a linguistic context that will facilitate their eventual analysis and elaboration.

Examples of larger-than word size, unanalyzed or partially analyzed units abound. They include some of the discourse sequences already mentioned, contracted terms such as *where's*, *what's*, and *gonna* and *wanna*, and rote phrases such as *what's that?* (Brown, 1983; MacWhinney, 1982). Children often use words in contexts that help explicate them, although they do not know the exact meanings of the words. For example, a 4-year-old said, "I pricked my finger" after she had stuck herself with a needle. She then asked, "What does prick mean?" Keil & Carroll (1980) report that early adjectival terms are often used with a range of familiar exemplars only, with no apparent understanding of their meaning in specific featural terms, and the same is reported for the first uses of comparative forms. (Also see Carey, 1978). Children who are comfortable using the comparative of *big* find it hard to do so for *dirty* and *red* (Gathercole, 1979). These data suggest that representing some new or only partially understood information in the presence of old may help to cue the meaning of the new; it seems to be easier to assign meaning to *tall* with reference to *tree* rather than to *column* (Keil & Carroll, 1980). Moreover, storing new information with some context allows for comparison of contexts across instances and provides further

insights into meaning and privileges of occurrence. Recent data on word learning in children suggests that this is just how lexical acquisitions occur (Miller, 1984).

Evidence for the representation of larger than word-size units can also be found at a more abstract level. Slobin & Bever (1982) investigated whether children assigned agent-patient relations on the basis of a first noun agent, second noun patient strategy. Whereas that strategy seemed to apply to N-V-N sentences, the children performed randomly when verbs were in first or final position. That is, the children had a sense of the basic configuration of declarative English sentences, and could not apply their rule of case relation assignment when that sense was violated.

In addition to the advantages already mentioned, the storage of strings of words allows analysis to go on at a more leisurely pace with less serious loss of information. Resources can be devoted to representing more of the string, rather than doing on-line analysis of only a part of it. This helps to mitigate the limited capacity problem, which constrains the ability to analyze on line more than it apparently does analysis and reorganization off line. It is hard to imagine a child doing instantaneous analysis of new elements of grammar as she hears them, at the same time that she also has to generate a response in a conversation.² It is more reasonable to assume that she has some capacity to represent strings of only partially analyzed speech for later comparative analysis.

To summarize, we now have a child who has various ways of using what she knows to stay in interactions, and she manages to elicit speech as a consequence. She can relate some of what she hears to her ongoing activity and/or perceptions of the world, and she has stored snatches of that speech and scanned it for basic sentence patterns. Now, there have to be ways that she can operate on these representations to create a more elaborated system.

EXPANSION OPERATIONS

There are various behaviors documented by child language investigators (e.g., Braine, 1971; Clark, 1982; Kuczaj, 1983; Rogers, 1978; Weir, 1962), that seem to involve common opportunities for language analysis. These behaviors include language practice, language play, and spontaneous repairs. They all involve substitutions of words into sentence frames, or the combining and separating of words into larger and smaller strings or segments. For example, a 24-month-old produced the following sequence as part of a conversation about the family wash with her mother.

²There is evidence that engaging in discourse is a drain on cognitive resources. Children produce less sophisticated utterances as responses than they do as spontaneous initiations (Bloom, Rocissano, & Hood, 1976).

- (8) My tight.
 My tight.
 Penny tight.
 Penny tights.

The same child at 28 months, in an argument with her older sister, modified her utterance until it was clear and grammatical.

- (9) No my read!
 My read!
 Me read!
 Let me read!
 Let me read the book!

Of course, some repeated tries do not result in better-formed utterances, as spontaneous sequence (10) illustrates.

- (10) C: (to her older brother) Do it properly.
 Do properly.
 Do your properly, Scott.

Possibly some of these buildup and breakdown operations, as Kuczaj (following Weir) called them, are a consequence of difficulties in the motor programming of speech; that is, children may think more extended or complex strings than they can say. (See Scollon, 1976, for a similar argument.) Even so, they are also opportunities for the child to examine the components of the strings, as well as to manipulate strings stored previously as incompletely analyzed wholes. Other examples illustrate this kind of experimentation with language very clearly. For example, a 26-month-old had learned a new phrase, and in a period of about 10 minutes, produced the following utterances as she trailed her mother around the kitchen.

- (11) Cheese, isn't it?
 My chair, isn't it?
 Heavy, isn't it?

At still younger ages, one sees children not only experimenting with word order and word substitutions but attending to phonological similarities as well. Sound play examples between children have been reported (Keenan, 1974); even children playing by themselves produce them (Garvey, 1977), as in (12), said by an English 24-month-old playing with the vacuum cleaner.

- (12) Hoover up. Hoover, Hoover here. Hoover here.
 That's your ear. That's your ear. That's your ear.

Spontaneous repairs are also evidence of the child's monitoring of her own productions and working towards some internalized model. The first turn of (13) was produced by a 24-month-old, who monitored her speech at the phonological level, but Scollon (1976) has reported phonological repairs in a one year old. A 30-month-old produced the semantic repair in (14) and the morphological repair in (15) 2 months earlier.

(13) C: Hom here. Home 'ere. Come here.

M: Can't you open it?

C: No. Come here.

(14) A dolly - baby stuck.

(15) And a pears.

And a pear.

Categorization, generalization, and reorganization are other devices for expansion of the knowledge system. The evidence for these operations often appears somewhat later in the language learning process, after 2-years-of-age. This is not surprising if some of the earlier productions are rote or partially analyzed segments. However, even primitive grammatical categories would help children gain knowledge because they could make inferences about common uses for terms of the same class on the basis of limited experience. There is at least some evidence for early classification of nouns. Girls as young as 17 months are able to use the presence or absence of a determiner to decide on the common or proper noun status of a label (Katz, Baker, & Macnamara, 1974; also see Gelman & Taylor, 1984), and even 2-year-olds have the beginnings of a mass and count distinction (Gordon, 1985).

Other evidence for the formation of grammatical categories is found in the third year-of-life. In a study of auxiliary acquisition, children who received enriched input consisting of the auxiliary *could* in initial sentence position grew faster in their use of modal auxiliaries than did children who received sentences with *could* in middle position. Moreover, their learning was not limited just to *could* or to front position, although it was limited only to modal auxiliaries (Shatz, Hoff-Ginsberg, & MacIver, 1986). This finding suggests that the children had some idea of the common privileges of modal words. A more explicit description of their knowledge and how they acquired it awaits further research, but Maratsos and Chalkley's (1980) distributional analysis proposal and Pinker's (1984) suggestion of paradigm representations seem particularly promising avenues to investigate further.

Some productions from 2-year-olds suggest that children often generalize on the basis of surface configurations without fully understanding the syntactic implications of those configurations. British children often hear positive tag questions such as, "Got it now, have you?" The post-posed subject construction

was transferred inappropriately to declaratives by 3 of 6 children in my sample, although it never attained high frequency. (16) lists examples of their utterances, with meanings in parentheses.

- (16) Have one me. (I'll have one.)
 Want see it me. (I want to see it.)
 Sort you out. (You sort it out.)
 You show me. (I'll show you.)

Such instances, I believe, are less common in American children, who are more rarely exposed to post-posed subjects, and hence less likely to generalize.

Many other examples in the literature show that overgeneralizations can be explained as the outcome of reorganization processes consisting of analysis and errorful or constrained reassembly. For example, Bowerman described her child who used verbs prefixed with *un-* correctly, but then when she analyzed them into the prefix-verb construction, she made overgeneralization errors such as "I'll never unhate you" or "Wait 'til it unfuzzes" (about a Coke). Not until the further semantic constraint of applying *un-* to verbs with a "covering, closing, or surface-attaching meaning" was learned did the child realize the proper scope of her analysis (Bowerman, 1982). Thus, expansion operations can sometimes result in interim stages of excessive productivity.

Internal organization operations also have been the explanation for distinctions children sometimes make that do not appear in the input language. As noted earlier, Karmiloff-Smith (1979) reported that French children go through a stage of marking the difference between indefiniteness and singularity, even though in French *a* and *one* are both expressed by *un(e)*. The overmarking of such distinctions clearly indicates that the child goes through a process of actively analyzing the input data and organizing and reorganizing the results of that process.

To summarize expansion operations, I suggest that children manipulate sequences of words by substitution, build-up, and breakdown operations that allow them to explore common privileges of occurrence and to notice similarities and differences in patterns at a variety of levels of analysis. These commonalities that are thus noticed and explored probably provide the basis for preliminary categorization and generalization operations, which in turn allow more productivity that invites feedback and increased input. As more information comes into the system and can be absorbed, the child reorganizes her information to approximate more fully the adult model.

SUMMARY AND DISCUSSION

I have argued for a description of the language learner that includes a set of devices allowing the child to be an active participant in the language acquisition process. The child is equipped with procedures for eliciting language input in

TABLE 1.1
Examples of Types of Bootstrapping Operations

Elicitation	Entry	Expansion
early gestures	rote phrases	language practice
action responding	familiar exemplars	language play
discourse pairings	canonical sentence	spontaneous repairs
imitation	patterns	categorization
direct questions	sentence frames	generalization
		reorganization

relevant situations, for maintaining discourse, for entering linguistic information into her representational system even without full understanding, and for subsequently analyzing those representations. Such a system takes account of the inability of the child to do much on-line processing of unfamiliar material, it allows for reorganization and reanalysis in light of new data, and it is sensitive to environmental influences without being completely at the mercy of them—an evolutionarily sound system. Evidence for the description comes from a review of the literature reporting a variety of behaviors children produce over the course of language learning. These are summarized in Table 1.1. The list is meant to be exemplary rather than fully inclusive.

In addition to the studies already mentioned, other work in the field bears some similarity to one aspect or another of the proposed model. Holzman (1984) has suggested a reciprocal model of language acquisition that gives considerable weight to the role of the child. Grimm (1987) suggests that normal language acquisition depends on early gestalt-like processes, and Keil and Ballerman (1984) note that storing unanalyzed wholes may be a basic strategy for naive learners. MacWhinney (1982) has suggested that many early productions are essentially unanalyzed, and Peters (1983) has proposed that early language units may differ in size from those in the adult language.

Some researchers have suggested that approaching language holistically versus analytically may simply be a function of personal style rather than a necessary stage through which all children pass (e.g., Nelson 1973; Nelson et al., 1985). Undoubtedly children differ in degree to which a particular approach to language is utilized. However, it is difficult to imagine even the most analytic of children not occasionally using a word or construction stored in memory before it is fully analyzed. The opportunities for learning via such use are just too great to pass up completely. It is important to remember that style characterizations of children in the literature as “gestalt” or “analytic,” (or equivalent labels) are gross dichotomies. They can not be taken as evidence that some children learn language without recourse to the entry operations involving rote or unanalyzed wholes. Indeed, how much children use unanalyzed segments is likely to depend on their level of language competence as well as on the structure of the language they are learning.

Nonetheless, acquisition models utilizing unanalyzed segments, including the model proposed above, must ultimately deal with the knotty problem of how analysis of early internal holistic representations proceeds. What triggers analysis? How much data must be entered into the system for analysis to proceed? What are the constraints on analysis and reanalysis? These are difficult questions on which language acquisition researchers are just beginning to make some progress. (For example, Nelson et al., 1984, show that the level of complexity in maternal recasts of child utterances is a determinant of language learning facilitation.) Questions like these recall concerns for which earlier cognitive development theories positing serious reorganization were criticized. (See, for example, Fodor's (1975) critique of Piaget's and Bruner's theories of changes in modes of representation.) Despite such problems, there seems to be no viable alternative that accounts as well for the *developmental* data of language acquisition. Children simply do not learn language instantaneously; the evidence points to a system that expands over time as piecemeal organizations and reorganizations are accomplished, leaving a trail of often charming and revealing errors behind.

In addition to being a developmental model, the present proposal has the advantage of going beyond the nature-nurture debate that has for so long bedeviled the study of language acquisition. The present model is compatible with whatever degree of innate mechanisms is found to constrain the shape of natural human languages. The problem addressed here has been the question of how the child learns the particular language she is exposed to, not how she learns any language at all. The larger question of language acquisition involves both issues, and must take into consideration the developmental factor as well.

The current model has some implications for three areas of research closely allied with work on first-language acquisition: second-language learning, language disorders, and individual differences in learning. As for second-language learning, the main implication is the prediction of serious differences between patterns of first- and second-language learning, especially as the ages at which the two languages are learned diverge. Whereas both first- and second-language learners are likely to utilize the same general set of active learning operations proposed, the particulars of those operations are likely to differ. For example, elicitation operations may be different because something like early gestures to set up mutual interaction may no longer be available. Rather, other kinds of behaviors for keeping interactions going may be available, but they surely will have different meanings attached to them and carry social implications that are different from those pertaining to the social role of the young child.³ Second, while entry operations may in principle be similar, they may be harder for second language learners to carry out. Adults may be too analytic to pay as much

³Certainly adults use gesturing to communicate in a foreign country, but they often are mimetic gestures going far beyond the simple attentional ones young children produce.

attention to prosodic or other cues that facilitate the storage of unanalyzed segments, and they may focus more on individual words and neglect surrounding context. Their strategies for later analysis and expansion are also likely to be different from first-language learners, given their different cognitive and linguistic levels of experience, and they will be variably advantaged and disadvantaged by those differences.

As for language disorders, different sorts of disorders should result from disruption of different kinds of operations. For example, children unable to enter unanalyzed segments would be expected not to achieve broad productive expression, but only narrow ranges of expression having little in common with the patterns of the input language. This is just what Grimm (1987) claims to have seen among dysphasic children studied in Germany. On the other hand, retarded children might be able to represent the gestalt-like sequences, but not perform the full program of analysis and reanalysis necessary for the complete learning of more complex constructions. Although surface forms might look quite adequate, the subtleties of the language would be beyond them. Preliminary data suggest this may indeed be the case (Gleitman, 1983).

Finally, as already noted, although it is assumed that all children must have some of each of the elicitation, entry, and expansion operations, not every particular operation must be exhibited or utilized to the same degree by every child. Thus, there is the opportunity to account for individual differences in language acquisition paths as a consequence of differing utilization patterns of operations. Given this, one might ask whether the model overpredicts individual differences in learning. A more fully elaborated version of the model would not. For one thing, the selection of certain operations is undoubtedly constrained by cognitive development. Thus, 18-month-olds might look more like one another than 30-month-olds would because their repertoires are more limited. Second, some of the operations may indeed be universal, and mandated by innate constraints. Only further research will clarify which operations are universal and which highly probable due to cognitive developmental factors.

In summary, the problem of becoming a native speaker is a complex one for the child; it involves juggling many balls at once. Reaching equilibrium in the adult language system is not a linear process, building syntax on top of semantics on top of pragmatics. To think that only one kind of information necessarily forms the foundation for another limits us from appreciating the full range of the child's achievement. The child has to use what she knows about language, communication, and interaction to learn more. She is equipped with processes that allow her to do just that. If a homely and homey metaphor might be allowed, it is more like getting a fitted sheet on a bed. The best way to do so is by a system of approximations, adjusting one corner a bit as another is partly fit into place. Thus, bootstrapping is a pervasive process, facilitating the child's gradual but determined progress toward communicative competence.