Cognitive Prerequisites for the Development of Grammar\footnote{The growth of the ideas set forth in this paper has been greatly stimulated by discussion with many students and colleagues. It is a pleasure to acknowledge some of them here: H. David Argoft, Melissa F. Bowerman, Ursula Bellugi, Thomas G. Bever, Roger Brown, L. Dezső, Susan Ervin-Tripp, John Gumperz, Paul Kay, Jonas Langer, David McNeill, Melanie Mikeš, Lubisa Radulović, Grace Wales Shugar, Peyton Todd, Plemenka Vlahović. Part of the work reflected here has been supported by the Language-Behavior Research Laboratory of the University of California at Berkeley, which is supported by PHS Research Grant No. 1 ROI MH 18188-02 from the National Institute of Mental Health. This support is gratefully acknowledged. This paper was originally presented at the Fifth Meeting of the Southeastern Conference on Linguistics (SECOL V), University of Maryland, May 9, 1971. My thanks to the organizer of that meeting, William Orr Dingwall, for allowing me to reprint this paper here. The references to this paper are included in the general bibliography at the end of the volume.}

— Dan I. Slobin

Language-Definitional Universals
Content and Form in Child Speech
The Primacy of Cognitive Development
A Method for Revealing Language Acquisition Strategies
A Test Case: Development of Locative Expressions
Constraints on Linguistic Performance
Suggested Universals in the Ontogenesis of Grammar

Word Order
Surface Preservation of Underlying Structure
Clear Marking of Underlying Relations
Overregularization
Semantic Motivation for Grammar
Conclusion

Every normal human child constructs for himself the grammar of his native language. It is the task of developmental psycholinguistics to describe and attempt to explain the intricate phenomena which lie beneath this simple statement. These underlying phenomena are essentially cognitive. In order for the
child to construct a grammar: (1) he must be able to cognize the physical and social events which are encoded in language, and (2) he must be able to process, organize, and store linguistic information. That is, the cognitive prerequisites for the development of grammar relate to both the meanings and the forms of utterances. This paper represents a preliminary attempt to explore these cognitive prerequisites in the light of cross-linguistic comparison of the ontogenesis of grammar.²

The past decade in developmental psycholinguistics has brought a vast increase in our knowledge of how English-speaking children acquire their native language.³ The present decade promises to place those findings in broader perspective. Developmental psycholinguists are beginning to reach out to other language communities, in order to study children acquiring other native languages and in order to make contact with the findings of foreign colleagues (see table). At the same time we are beginning to relate our work to the psychology of perceptual and cognitive development (see papers in Hayes, 1970). Developmental psycholinguistics is thus moving from particularism to universalsm in two significant ways: from the particularism of English to the acquisition of language in general, and from the particularism of linguistic development to cognitive development in general. We are just beginning to sense the intimate relations between linguistic universals and cognitive universals, and are far from an adequate developmental theory of either.

The psychology of cognitive development promises an eventual universal theory of the growth of the mind (see, for example, papers in Mussen, 1970). The psycholinguistic aspects of this theory will require detailed information on the acquisition of a variety of native languages. The value of cross-linguistic comparison, of course, is to avoid drawing conclusions about child language development which may, in fact, be limited to the acquisition of languages like English. The hope is to find similar developmental processes in different sorts of languages. At present, we have suggestive acquisition data on at least 40 languages from 14 or so major language families (see table). Although the data for most of these languages are still rather scanty, striking developmental uniformities can be discerned (Bowerman, 1970; Braine, 1971b; Slobin, 1970). To the extent that a universal course of linguistic development can be confirmed, a language-free acquisition model is called for (see Bever, 1970a; and papers in Slobin, 1971b). Such a model bases itself on the assumption that the child brings certain operating principles to bear on the task of learning to speak, regardless of the peculiarities of the particular language he is exposed to. In this paper I will present some first guesses as to the nature of some of these operating principles.

My major concern here is with the order of development of various grammatical devices and with the child's strategies for organizing language. This focus leaves aside the problems of how language begins in the child, and why linguistic universals exist. That is, I take for granted the fact that all human children are able to learn language, and ask: Are there common orders of acquisition of different linguistic features across languages?

### AVAILABLE MATERIAL ON THE ACQUISITION OF 40 DIFFERENT NATIVE LANGUAGES

<table>
<thead>
<tr>
<th>Indo-European Family</th>
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<tbody>
<tr>
<td><strong>Romanian</strong></td>
<td>Sălăci-Cazacu (1957, 1960, 1962, 1968)</td>
</tr>
<tr>
<td><strong>Italian</strong></td>
<td>Antinucci and Parisi (1972, in press); Frontali (1943–1944); Parisi (in press); Parisi and Antinucci (1970)</td>
</tr>
<tr>
<td><strong>French</strong></td>
<td>Bloch (1913, 1921, 1924); Cohen (1925, 1933, 1962); de Boysson-Bardies and Mehler (1969); Ferreiro (1971); Ferreiro and Sinclair (1971); Grégoire (1937, 1947); Guillaume (1927a,b); Piclevi (1968); Sinclair-de-Zwart (1957)</td>
</tr>
<tr>
<td><strong>Spanish</strong></td>
<td>Gili y Gaya (1960); Kernan and Blount (1966)</td>
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</tbody>
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<table>
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<tr>
<th>Germanic Branch</th>
<th></th>
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<tbody>
<tr>
<td><strong>English</strong></td>
<td>(See footnote 3)</td>
</tr>
<tr>
<td><strong>Dutch</strong></td>
<td>Kaper (1959)</td>
</tr>
<tr>
<td><strong>German</strong></td>
<td>Ament (1899); Lindner (1882, 1885, 1898, 1906); Grimm (1971); Park (1970); Roepner (1972a,b); Scupin and Scupin (1907); Stern and Stern (1907)</td>
</tr>
<tr>
<td><strong>Danish</strong></td>
<td>Jespersen (1916); Rasmussen (1913, 1923)</td>
</tr>
<tr>
<td><strong>Swedish</strong></td>
<td>Bolin and Bolin (1916, 1920); Söderbergh (1971)</td>
</tr>
<tr>
<td><strong>Norwegian</strong></td>
<td>Borgström (1954); Ravem (1968, 1970)</td>
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<table>
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<tr>
<th>Slavic Branch</th>
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<tbody>
<tr>
<td><strong>Russian</strong></td>
<td>Bogoyavlenski (1957); Dingwall and Tunik (in press); Ef'konov (1958, 1959); Feofanov (1958, 1962); Gvozdev (1948, 1949); Karpova (1955, 1967); Leon't'ev (1969); Markova (1969); Menchinskaya (1957); Mukhina (1969); Pavlova (1924); Popova (1958); Rozengart-Pupko (1967); Slobin (1966a,b); 1968c); Sokhin (1959); Ushakova (1970); Zakharova (1958)</td>
</tr>
<tr>
<td><strong>Polish</strong></td>
<td>Kaczmarek (1953); Pfauhauser (1930); Shugar (1971); Skorupka (1949); Smoczynski (1955); Szuman (1968); Wawrowska (1938); Zaremba (1955)</td>
</tr>
</tbody>
</table>

³ The research on English child language development carried out in the sixties is too vast to list in a bibliographical footnote. The interested reader can find broad bibliographical coverage and valuable comment in the following recent and forthcoming publications: Braine, 1971b; Brown, in press; Ervin-Tripp, forthcoming; Hayes, 1970; McNeeil, 1970; Menyuk, 1969; Slobin, 1971b; and, of course, in this volume.
AVAILABLE MATERIAL ON THE ACQUISITION OF 40 DIFFERENT NATIVE LANGUAGES*—continued

**INDO-EUROPEAN FAMILY**

- **Czech**: Pačovská (1968); Průcha (1971); Sedláčková (1967)
- **Slovenian**: Kolarič (1959)
- **Serbo-Croatian**: Mikš (1967, 1971); Mikeš and Vlahović (1966); Pavlovitch (1920); Radulović (forthcoming)
- **Bulgarian**: Denev (1969); Gheorgov (1905, 1906, 1908); Kospartova (1969); Manova-Tornova (1969)

**Baltic Branch**

- **Latvian**: Rūķe-Draviņš (1959, 1963)

**Greek Branch**

- **Greek**: Drachman and Malkouti-Drachman (1971)

**Armenian Branch**

- **Armenian**: Geodakyan and Kurginyan (1970); Tutundzhyan (1971)

**Indo-Iranian Branch**

- **Hindi**: Christian (1971b)
- **Gujarati**: Christian (1971a)
- **Bhojpuri**: Christian (1971b)

**SEMIFIC FAMILY**

- **Hebrew**: Bar-Adon (1971); Grossman and Scholes (1971); Scholes and Grossman (in press)
- **Arabic**: Omar (1970)

**SOUTH CAUCASIAN FAMILY**

- **Georgian**: Imedadze (1960)

**URALIC FAMILY**

- **Hungarian**: Balassa (1893); Dezső (1970); Deže and Vlahović (in press); Endrei (1913); Kelemen (1970); Kenyeres (1926, 1927); MacWhinney (forthcoming); Meggyesi (1971); Mikš (1967, 1971); Mikeš and Vlahović (1966); Mikes and Mattjevs (1971); Simonyi (1966)
- **Finnish**: Argoff (forthcoming); Bowerman (1970)
- **Estonian**: Vihma (1971)

**TURKIC FAMILY**

- **Turkish**: Slobin (in preparation)

**KOREAN FAMILY**

- **Korean**: Park (1969)

**JAPANESE-RYUKYUAN FAMILY**

- **Japanese**: Kuniga (1969); McNeill (1966a); McNeill and McNeill (1968); McNeill et al. (1971); Murai (1970); Murato (1968); Nakazima (1969–1970); Ohwaki (1933); Otomo (1967); Sánchez (1968, 1970); Takahashi (1967)

**HAN CHINESE FAMILY**

- **Mandarin**: Chao (1951)

**BODO-NAGA-RACHIN FAMILY**

- **Garo**: Burling (1959)

**AUSTRONESIAN FAMILY**

- **Samoan**: Kernan (1969, 1970); Talmy (1970)

**EASTERN SUDANIC FAMILY**


**ATHAPASCAN FAMILY**

- **Navaho**: Spolsky (1970)

**MAYAN FAMILY**

- **Tseltal**: Stross (1969, 1970)

**QUECHUMARAN PHYLUM**

- **Quechua**: Solberg (1971)

**NATURAL SIGN**

- **American Sign Language**: Bellugi and Klima (in preparation); Schlesinger and Meadow (1971)

* This is not a complete list of all available material; for fuller bibliographical information see Slobin (1967, 1972) and Siarla-Cazacu (1969). In addition to the languages listed above, I am aware of ongoing research on the following 13 native languages: Slovak, Ukrainian, Albanian, Persian, Kurdish, Tatar, Koya, Thai, Tagalog, Tok Pisin (Neo-Melanesian), Swahili, Zulu, and Yucatec Maya. A listing of ongoing investigations and addresses of researchers can be found in Appendix A of Slobin’s bibliography (1972). The language classification (with the exception of American Sign Language) comes from Voegelin and Voegelin (1966).

**LANGUAGE-DEFINITIONAL UNIVERSALS**

In order to begin at this point, therefore, it is necessary to take as given what may be referred to as “language-definitional” universals. That is to say, children (and adults) everywhere have the same general definition of the form and function of language. Everywhere language consists of utterances performing a universal set of communicative functions (such as asserting, denying, requesting, ordering, and so forth), expressing a universal set of underlying semantic relations, and using a universal set of formal means (such as combinable units of meaning, made up of combinable units of sound, etc.). Furthermore, language—everywhere—is grammatikal, in the sense that the meaning of a message is not fully determined by any combination of the meanings of its elements. In all language which I will consider—child and adult—there is a non-direct relation between the surface, acoustic form of messages and their underlying meanings. It is in no way surprising that children should define language in the same way as adults: indeed, they could not learn language if they did not share this definition. In fact, one could argue that human language could not be so defined if it...
were not so defined by children, because, in a profound sense, language is created anew by children in each generation. Language-definitional universals are what David McNeill calls "strong linguistic universals," and I follow his proposition that such universals reflect "a specific linguistic ability and may not be a reflection of a cognitive ability at all" (1970, p. 74). While much argument has centered on the issue as to whether language-definitional universals are innate, I will avoid this issue here, and merely point to them as basic linguistic capacities which are prerequisites to the questions which I want to consider (cf. Bever’s "basic linguistic capacities" [1970a]). We will meet the child at the point when he knows there are meaningful words which can be combined to produce meaningful utterances. And at this point we will pose the question advanced above: Are there common orders of acquisition of different linguistic features across languages?

CONTENT AND FORM IN CHILD SPEECH

The first and most obvious point that comes to mind is that language is used to express the child’s cognitions of his environment—physical and social—and so a child cannot begin to use a given linguistic form meaningfully until he is able to understand what it means. It should be possible, then, to rank linguistic forms in terms of the psychological, or cognitive complexity of the notions they express. For example, no one would expect a child to be able to form conditionals before he could make assertions, to make statements about time before making statements about place, and so on. Is it possible, then, to trace out a universal course of linguistic development on the basis of what we know about the universal course of cognitive development? (Can one take Piaget as a handbook of psycholinguistic development?)

In fact, many such expectations (including those suggested above) are supported by data. The earliest grammatical markers to appear in child speech seem to express the most basic notions available to the child mind. For example, in languages which provide a vocative inflection, this is typically one of the earliest grammatical markers to emerge in child speech (Hungarian, Serbo-Croatian [Mikēš, 1967; Mikeš and Vlahović, 1966]; Polish [Shugar, 1971]). One of the earliest semantic relations to be formally marked in child speech is that of verb-object. In order languages, like English, this relation is marked early by consistent word order. In languages which provide an inflection for marking the object of action (accusative), this is typically an extremely early inflection to emerge—often the first (Finnish [Argoff, forthcoming], Latvian [Rūķe-Draiva, 1959, 1963], Russian [Gvozdev, 1949; Imedadze, 1960]). In Luo the first inflections are subject and object affixes on verbs (Blount, 1969). In every language for which relevant data are available, there is an early form of negation in which a negative particle is affixed to a simple sentence. In languages as diverse as English, Arabic, Czech, Latvian, Japanese, and Samoan, early yes-no questions are formed by rising intonation.

Numerous findings such as these offer support for the notion that the first linguistic forms to appear in child speech will be those which express meanings consistent with the child’s level of cognitive development. But striking surprises occur in some languages. For example, yes-no questions in adult Finnish are not formed by rising intonation, but by attachment of a question particle to the word questioned and movement of that word to the front of the sentence. And, strangely enough, Melissa Bowerman, in her recent dissertation on Finnish acquisition (1970), reports that little Finnish children simply do not ask yes-no questions—at least not in any formally marked way. And Margaret Omar, in a recent dissertation on the acquisition of Egyptian Arabic (1970), reports that the noun plural “is the most difficult and latest aspect of the language structure to be mastered; older children in this study erred in pluralizing even familiar nouns” (p. 367). And older children, in her study, meant children as old as 15! The reason apparently lies in the extreme complexity of plural marking in Arabic. Briefly: there is a small class of regular plurals, but most nouns fall into a large number of fairly irregular classes in regard to plural formation. There is also a special dual form; a distinction between pluralizing “counted” and “collected” nouns (for example, “trees” as a group, or “trees” as a collection of individual trees); what is more, the numerals 3–10 take the noun in the plural, while numerals above 11 take the singular.

So although one can talk about order of acquisition in terms of semantic or cognitive complexity, there is clearly a point at which formal linguistic complexity also plays a role. I think we can learn a good deal from discovering just what constitutes formal linguistic complexity for the child. If we can order linguistic devices in terms of their acquisition complexity, we can begin to understand the strategies used by the child in arriving at the grammar of his language. To put it the other way, a definition of what is simple for a child to acquire is a definition of the child’s first guess as to the nature of language. The child must successively modify such first guesses until he ends up with the conception of language shared by the adults in his community.

Studies of bilingual children yield valuable suggestions as to what sorts of formal devices may be simpler to acquire than others. If a given meaning receives expression at the same time in both languages of a bilingual child, this suggests that the formal devices in the two languages are similar in complexity. For example, Imedadze (1960), studying the linguistic development of her Russian-Georgian bilingual daughter, noted the simultaneous emergence of the genitive and the instrumental in both languages. She concludes that: “The ease of acquisition and the simultaneous appearance of these forms of the genitive and instrumental cases can only be attributed to the fact that these forms express the very same semantic relationships in analogous fashion [in Russian and Georgian].”

If a given semantic domain receives expression earlier in one of the two languages, a difference in formal complexity is suggested. A useful example comes from studies by Melanie Mikeš and Plemenka Vlahović of Serbo-
Croatian—Hungarian bilingual children in Northern Yugoslavia (Mikés, 1967; Miks and Vlahović, 1966). Well before they were two years of age, two bilingual girls were productively and appropriately using a variety of Hungarian case endings on nouns indicating such locative relations as illative, clative, subitutive, and supposessive—that is, in plain English, the children were using inflections to express the directional notions of “into,” “out of,” and “onto,” and the positional notion of “on top of.” At the same time they had barely begun to develop locative expressions in Serbo-Croatian, which requires a locative preposition before the noun along with some case inflection attached to the end of the noun.

Now, the fact that this cross-linguistic discrepancy occurs within a single child speaking both languages, rather than between two monolingual children, poses a central question in clear focus: When the child speaks Hungarian, she appropriately uses directional and positional locative inflections, and one is confident to credit her with the semantic intentions to express such notions as “into,” “onto,” and so forth. What are we to say of the same child, however, when she fails to grammatically signal such intentions with the corresponding prepositions when speaking Serbo-Croatian? It seems clear to me that if, for example, she puts a doll into a drawer, saying, in Serbo-Croatian, “doll drawer,” we must credit her with the same semantic intention as when, describing the same situation in Hungarian, she adds an illative inflection to the word for “drawer.”

The point I am trying to make, of course, does not depend on the child’s bilingualism. The example merely illuminates the general proposition that a child’s underlying semantic intentions can contain more information than his surface utterance. The speech of very young children is nearly always interpretable in context, and the very young child is neither able nor feels constrained to express his total intention in a single utterance. Lois Bloom (1970) has made this point abundantly clear in her recent book describing early grammatical development in three American children. For example, a child said “Mommy sock” in two different situations: when mommy was putting a sock on her, and when she picked up mommy’s sock. Bloom is confident in labelling the utterance in the first situation as “subject-object,” and the second as “genitive,” and I think she is right. Previous descriptions of children’s grammar were too bound to surface characterizations of word distribution, and failed to differentiate between the several meanings of homonymous utterances, such as “Mommy sock” (e.g., Braine, 1963b; Brown and Fraser, 1963; Miller and Ervin, 1964). More recent approaches to child language (and to linguistic theory) pay increasing attention to the semantic substratum of speech, and to the functions of utterances (e.g., Antinucci and Parisi, this volume; Bloom, 1970; Blount, 1969; Bowerman, 1970; Brown, in press; E. Clark, 1970, 1971, this volume; H. Clark, 1970; Cromer, 1968; Ervin-Tripp, 1970a, b, 1971; Kernan, 1969; Parisi and Antinucci, 1970; Schlesinger, 1971; Slobin, 1970; Talmyn, 1970).

To sum up thus far: Cognitive development and linguistic development do not run off in unison. The child must find linguistic means to express his intentions. The means can be easily accessible (as, for example, the Hungarian locative), or quite unaccessible (as, for example, the Finnish yes-no question or the Arabic noun plural). The problem is: What makes a given linguistic means of expression more or less accessible to the child?

In posing the question in these terms, I am assuming that there is a fairly autonomous development of intentions to express various semantic notions. This claim must be defended before answering the questions of relative accessibility of formal linguistic devices, for one may be tempted to pose the counter-argument that grammar plays a leading role in cognitive development.

**THE PRIMACY OF COGNITIVE DEVELOPMENT**

Let us return to the Hungarian—Serbo-Croatian bilingual example, and agree that we will assess semantic intention on the basis of the use of utterances in clear contexts, and not on superficial linguistic marking of such intentions. We will probably find, on deeper investigation, that the child intends to express the same locative relations when speaking either language. (The only alternative to this approach would be to claim that the problem of expressing locatives in Serbo-Croatian is such a bother to him that he avoids speaking of moving and placing objects when speaking Serbo-Croatian. I think this alternative can be safely rejected—though it is, of course, open to investigation.)

Why the precocious marking of locative expressions in Hungarian, then? One line of argument would be to say that the abundance of clear locative inflections in Hungarian drew the child’s attention to the relevant notions, and that he learned them earlier than if he had been speaking only Serbo-Croatian. This is a sort of Whorfian notion of linguistic determination on the grammatical level, and I think it will turn out to be false when all the data are in. It seems unlikely that the structure of a particular language would draw attention more clearly to the possibilities of putting in, taking out, and so on, than would a child’s everyday experience. It is difficult to imagine children not talking about such things. And, in fact, the cross-linguistic data suggest that children begin to express basic locative notions by noun-noun and noun-verb combinations at the two-word stage in all languages. Two-word utterances in Serbo-Croatian, Bulgarian, Russian, English, Finnish, Hebrew, and Samoan all seem to express the notions of “in” and “into,” “on” and “onto,” and “from”—at first with no inflections or prepositions. This can be quite reliably assessed from context, as when a Russian child said the equivalent of “pot above,” pointing to a pot on the stove; when Roger Brown’s famous “Adam” said “put box” when putting something into a box; and so on. In addition, locative notions are expressed at early stages by prolacatives and demonstratives, such as the English “there,” “inhere,” “on,” and the like, and their equivalents in Bulgarian (Gheorgov, 1908), German (Leopold, 1939; Park, 1970), Finnish (Arghoff, forthcoming), and other languages.
Furthermore, the order of acquisition of locatives seems quite certainly to be based on a sequence of cognitive development which goes beyond language. For example, Parisi and Antinucci (1970), following the work of Piaget, suggest an order of acquisition of locatives based on the development of spatial notions from simple topological notions (expressed by terms like "in" and "on"), to locatives involving notions of dimensional or Euclidean space (like "in front of," "below," "beside"), to locatives expressing more complex spatial notions (like "along" and "through"). They present some preliminary evidence from Italian children supporting this order of acquisition, and all of the cross-linguistic work of which I am aware supports a sequence such as this.

If the order of acquisition of locative notions is an aspect of general cognitive development, it does not seem likely to me that the development of these notions is very amenable to linguistic manipulation. Although the general question is not at all closed, a good deal of work emanating from Piaget's research institute in Geneva suggests that the rate of cognitive development cannot be significantly altered by teaching the child the vocabulary needed in order to function at a higher level of cognitive development (Sinclair-de-Zwart, 1967, 1969). On the basis of current findings and theory (Furth, 1969; Piaget, 1967, 1970), it seems to me that the pacemaker in linguistic growth is the child's cognitive growth, as opposed to an autonomous linguistic development which can then reflect back on cognition. As Piaget has put it: "...language is not enough to explain thought, because the structures that characterize thought have their roots in action and in sensorimotor mechanisms that are deeper than linguistics" (1967, p. 98).4

The argument that language is used to express only what the child already knows can be supported by another line of evidence, coming from an examination of linguistic development from both a formal and a functional point of view. Studies which have considered the supposed intended meanings of children's utterances support a far-reaching principle which could be phrased as follows: New forms first express old functions, and new functions are first expressed by old forms. It turns out that this is a familiar principle in the psychology of cognitive development, and it is not surprising to find it in linguistic development as well. For example, Werner and Kaplan state (1963, p. 60):

wherever functional shifts occur during development, the novel function is first executed through old, available forms; sooner or later, of course, there is a pressure towards the development of new forms which are of a more function-specific character, i.e., that will serve the new function better than the older forms.

Numerous examples could be offered from grammatical development in support of this principle. I will mention only a few.

We already have the locative example. The use of utterances in context indicates that locative relations are intended; when the appropriate new forms enter—be they prepositions, postpositions, inflections, or what have you—they will be new forms expressing old functions.

Roger Brown (in press, Chap. II, pp. 120–121) has performed a detailed analysis of the emergence of inflections in the English of the three children who have been studied in great longitudinal detail at Harvard. He discovered that the first verb inflections to emerge marked just those functions already implicit in verb use at the previous stage, when all verbs were unmarked. At the beginning stage, when verbs occurred simply in their bare, uninfluted form, Brown noted that they were used to express four kinds of meanings: (1) "naming an action or state...of temporary duration and true at the time of the utterance," or (2) referring to the immediate past, or (3) as a statement of the child's immediate wish or intention, or (4) as an imperative. The first verb markings to emerge were used to express just these functions: (1) the progressive -ing, (2) the past tense, and (3) catenative verbs ("gonna," "wanna," and "haifa"). The last function, the imperative, continues, of course, to be expressed by an uninfluted verb in English, but Brown notes that "please," as an imperative marker, entered at about the same time as these other verb markings. Brown also found that his three children understood the semantics of possession well before they attained the possessive inflection. In all of these cases, then, the appearance in child speech of a new formal device serves only to code a function which the child has already understood and expressed implicitly.

How does a child go about expressing a new meaning—that is, how does he find the linguistic means for newly-developed cognitive notions? Here we have the other half of the principle proposed above: New functions are first expressed by old forms. Richard Cromer (1968) found many examples of this principle in studying the development of temporal expression in English. For example, shortly before emergence of the perfect tense, a subject attached "now" and "yet" to statements about the past, producing utterances which performed the same function as the perfect tense (for example, "I didn't make the bed yet");

4 A related argument for the primacy of cognitive development comes from linguistic analyses of Samoan child speech carried out by Talmy (1970). In one of the first studies to apply a complex modern semantic theory to child language data, Talmy was repeatedly impressed by the children's early command of semantic rules. He notes (pp. 12–13): "...it is clear...that the children make many grammatical errors—often in omitting functors words and affixes—and make few semantic errors—either in the assignment of correctly delimited ranges and correctly filled-in componentry to lexical items, or in applying these lexical items correctly to realworld events... Apparently the developing child achieves a close approximation of the adult semantic map and its use before he does the same for the adult grammar. One might tentatively conclude that the human language-acquisition mechanism is geared to a primacy and integrity in content-words and a secondariness in grammatical form, is sooner attuned to a control over organically-interrelated implicit components than to the expression of temporally-concatenated overt components, and is organized to manifest the expressively meaningful before the mechanical aspects of communication."
"Now I closed it"). Such forms were soon replaced by the perfect ("I haven't made the bed"); "I've closed it"). Here it is clear that cognitive development has given rise to semantic intentions for which new means of expression must be forged. In fact, children's temporary idiosyncratic linguistic forms often are cues to the fact that the development of a new notion has engendered a search for new means of expression. Miller and Ervin-Tripp (forthcoming) note this explicitly in their longitudinal studies:

In all cases [of idiosyncratic rules], it appears that the non-standard rules developed because the child's semantic development had outstripped his formal grammatical development.

Acquisition of the complexities of English auxiliaries and negatives provide many familiar examples, as when my three-year-old daughter said such things as "anything is not to break—just glasses and plates" [ = "Nothing is breakable except glasses and plates"], or, when recovering from an illness, "I must have getting weller and weller."

The picture we have so far, then, is the following: In order to acquire language, the child must attend both to speech and to the contexts in which speech occurs—that is, he must be trying to understand what he hears, and be trying to express the intentions of which he is capable. This means that he must have both cognitive and linguistic discovery procedures available—in order to formulate internal structures which are capable of assimilating and relating both linguistic and non-linguistic data, and which are capable of realizing intentions as utterances. The emergence of new communicative intentions must bring with it the means to decode those intentions in the speech the child hears, and this makes it possible for him to discover new means for expressing those intentions. Cromer summarizes this argument cogently in his thesis (1968, pp. 218–219):

prior to the development of particular cognitive abilities, the child has been exposed to forms, structures, and words—some of these with a very high frequency—which he fails to acquire. For example, forms of the perfect tense are found in the mothers' utterances from the earliest protocols, and though the child has a span sufficient to produce these and has the elements to do so at his disposal [i.e., auxiliary "have" and past participles], he does not produce the perfect tense until after age 4½. He has been barraged by a multitude of time words, but he does not use entire classes of these sometimes for years.

On the other hand, once certain cognitive abilities have developed, we begin to find that the child uses forms he had been previously using only in particular limited ways, to refer to and express new ideas. . . . Furthermore, once certain cognitive abilities have developed, we also find an active search for acquisition of new forms. Suddenly forms (and words!) which the child has been exposed to for years become a part of his own speech.

A METHOD FOR REVEALING LANGUAGE ACQUISITION STRATEGIES

Given the primacy of cognitive development in setting the pace for the development of linguistic intentions, it follows that many linguistic forms cannot appear in the child's speech until he is capable of grasping their meaning. If the stages of cognitive development are universal—as I would like to believe—than a very strong developmental psycholinguistic universal can be set forward: The rate and order of development of the semantic notions expressed by language are fairly constant across languages, regardless of the formal means of expression employed. (Note that this proposition applies to semantic intentions, rather than the formal marking of intentions. Thus, for example, Brown's children would be credited with the four verb meanings, in this sense of intention, at the stage when all of their verbs were in the root, uninflected form.)

If this universal is true, and if communicative intentions can be reliably assessed from a combination of contextual and partial linguistic cues, then we have a powerful research tool for probing the information processing devices used and developed by children to understand speech and to construct grammars. What is needed is a taxonomy and coding scheme for pre-linguistic intentions. We are beginning to develop such a system at Berkeley, in the hope that it will be possible to establish a stable and universal sequence of pre-linguistic communicative intentions.8 If this is the case, then one can measure the lag between the appearance of a communicative intention and the mastery of the conventional linguistic form which the child's native language offers for the realization of that intention. (See footnote 6 for a criterion of mastery.) The lag between the first attempts to express a meaning and the acquisition of the relevant linguistic forms should vary from language to language, determined by the psycholinguistic complexity of the formal means used by a particular language to express the intention under consideration. With sufficient information on the sorts of formal devices which appear difficult to learn, we will be in a position to make a much clearer formulation of the capacities and strategies involved in language acquisition. It is necessary to compare formal devices used to express the same semantic intentions in order to insure that the children studied are at roughly the same level of cognitive development, and that the devices are used for similar purposes.

A TEST CASE: DEVELOPMENT OF LOCATIVE EXPRESSIONS

In effect, this research tactic attempts to separate the bilingual child into two monolingual children who are following the same sequence of communicative intentions. A useful test case of the proposed method, therefore, begins with

8 The current version of our analysis is based on an enrichment of Fillmore's "case grammar" (1968). A similar approach is currently being followed by Martin Braim at Santa Barbara (personal communication). Francesco Antinucci and Domenico Parisi, at the Istituto di Psicologia in Rome, are developing what promises to be an extremely valuable model on the basis of generative semantics (see the paper by Antinucci and Parisi, reprinted below).
a re-examination of locative development in the Hungarian-Serbo-Croatian bilingual girls mentioned above. Our procedure will be to compare development of the formal means of locative expression in several languages; to propose a developmental universal based on inductive generalization of these findings; and to propose a psycholinguistic operating principle which may be a partial determinant of the general finding. The locative example will clarify the procedure.

You will recall that the development of Hungarian locative inflections was in advance of Serbo-Croatian locative prepositions. Why should the Hungarian locative expressions be easier for the child to acquire? In order to attempt an answer, it will be necessary to look briefly at the grammatical devices for locative expression in the two languages. Hungarian has an abundance of nominal inflections which express combinations of position and direction. For example, with the word hajó ‘boat,’ there are forms such as hajóban ‘located in the boat,’ hajóból ‘moving out from inside of the boat,’ hajótol ‘moving away from next to the boat,’ and so on. The inflections are all monosyllables, and systematically encode position, motion toward a position, and motion away from a position. They apply to all nouns (there is no grammatical gender in Hungarian). Serbo-Croatian, like English, has a number of prepositions which encode locations: the equivalents of “in,” “on,” “from,” and so on. And, like English, some of these prepositions encode direction (as English “to” and “from”), while some do not distinguish between direction and position (compare: “Put it in the box” and “It is in the box”). In addition, unlike English, Serbo-Croatian encodes the distinction between position and direction by means of noun inflections. The accusative is used when an ambiguous preposition like u “in” is used directionally, and the locative case is used when such a preposition is used positionally (e.g., kuća ‘house,’ u kući ‘into the house,’ u kući ‘located in the house’). The situation is even more complex in Serbo-Croatian, because of a variety of semi-arbitrary pairings of preposition with case. For example, blizu ‘near,’ do ‘as far as,’ and iz ‘from/from out of’ must take genitive nouns; k ‘towards’ takes the dative; pri ‘at/near’ takes the locative; etc. In both Serbo-Croatian and English, position vs. direction is sometimes uniquely signaled by one preposition or compound preposition (such as “towards,” “out of,” and so on), and sometimes one preposition fails to distinguish between the two senses (as “in” and “on”). Serbo-Croatian is more complex, however, in that every preposition governs a noun inflection. Sometimes this inflection is meaningful, distinguishing position from direction, and sometimes it is redundant. Furthermore, the particular phonological realization of a given inflection is determined by the gender and by the final sound of each particular noun.

Why, then, is the Hungarian locative acquired before the Serbo-Croatian locative in bilingual children? In the most general terms, it seems obvious that the Hungarian means of locative expression is simpler: the locative marker is always at the end of the noun only, always unambiguously and consistently indicates both position and direction to or from. The example demonstrates—at the very least—that a system which can be described by a small set of consistent and regular rules is easier to learn than one less consistent and regular—even by children under the age of two. But we can go beyond impressionistic statements such as these. The value of such cross-linguistic examples—I have proposed—is to teach us something about the ways in which children process speech.

The Hungarian locative is expressed by noun suffixes. This fact may facilitate acquisition, in that the end of a word seems to be perceptually salient. Little children will often imitate only the last part of a word, saying, for example, raff for giraffe in English, säym for mishnasdyim in Hebrew (Bar-Adon, 1971), hibb for ‘am-yibb in Arabic (Omar, 1970), etc. Unstressed initial syllables, pre-fixes, and prepositions are very frequently omitted in child speech, as virtually all observers have noted. Furthermore, evidence from Czech, where all words receive initial stress, suggests that the ends of words are perceptually salient even if unstressed. Pačesová (1968), reporting on a detailed longitudinal study of a Czech boy, presents numerous examples of omission of initial stressed syllables in Czech child speech. She notes that if “stress were to be the relevant factor in the abbreviating operation, the syllabic prepositions, being stressed in Czech, should have been early in appearance and, as for shortening, they should have been preserved, which is certainly not the case” (p. 205).

Another argument for perceptual salience of word endings comes from studies in acoustic phonetics. A paper by Kim Oller (1971) has brought to my attention the fact that phoneticians have noted the existence of final-syllable lengthening in many languages (e.g., Russian [Zlatoustova, 1954]; Swedish [Lindblom, 1968]; English, Spanish, German, French [Delattre, 1966]). Oller (p. 13) entertains a suggestion of Ernest Haden (1962) “that final-syllable lengthening cues listeners to the fact that a linguistic unit has terminated.” Thus there is additional support for the argument that word endings attract the child’s attention.

In regard to our bilingual example, this suggestion of differential perceptual salience could be checked carefully by having children imitate Hungarian and Serbo-Croatian sentences and note what is omitted. This check remains to be carried out, but other evidence supports the suggestion that part of the difference in ease of acquisition has to do with the pre- or post-nominal location of locative markers in the two languages. The prepositions are missing from the earliest stages of Serbo-Croatian monolingual child speech, and inflections begin to emerge before prepositions (Mikès, 1967; Mikše and Vlahović, 1966; Pavlović, 1920). Inflections are word-final, and would be more perceptually salient on the above interpretation. The best support for this suggestion is the finding that Serbo-Croatian children begin to express the difference between position and direction by adding noun inflections rather than prepositions.

Additional evidence comes from cross-linguistic comparison. Russian, which is extremely similar to Serbo-Croatian, demonstrates the same pattern of prepositional and inflectional acquisition described above (Gvozdev, 1949). The first locatives are noun-noun combinations, as in the example given earlier of “pot stove.” At the next level, the first inflections emerge, and the child
distinguishes between position and direction by contrasting the locative case with the dative and accusative cases. At this stage the child is expressing the locative notions ‘in’ and ‘into,’ ‘on’ and ‘onto,’ and ‘towards,’ using inflections and no prepositions. Later, when prepositions emerge, it is first just these prepositions which are used—performing the same functions as the earlier prepositionless utterances. Several months later a flood of prepositions comes—the equivalents of “under,” “behind,” “through,” “along,” and so on.

Růžička (1959, 1963) presents the same picture in Latvian, with early in-flectional marking of ‘in,’ ‘on,’ and ‘from,’ and later emergence of prepositions. She notes that “Endings, as case markers, generally occur earlier than the corresponding prepositions” (1963, p. 141); and that prepositions are learned gradually, with difficulty, and are often omitted even after they emerge in Latvian child speech.

In English, too, prepositions tend to be omitted in early child speech, but the English-speaking child has no inflections available to use in the place of prepositions. When prepositions do emerge in English, the first ones are “on” and “in.” (Brown, in press, chap. II), followed almost immediately by a large number of other prepositions (Brown, unpublished data). It is as if the child had to develop to the point where he could attend to prepositions; he then uses them first for well-practised locative notions, and quickly develops the means for expressing a wide range of such notions.

The suggestion of perceptual salience can be approached obliquely in English. Well before the acquisition of prepositions, English-speaking children are using locative verb particles like “on,” “off,” “down,” and so on. These tend to occur in the utterance order of adult speech addressed to the child: “Put the shirt on,” “Take your shoes off,” and so on. Some of these particles are frequently present as one-word utterances (Braine, 1963b; Leopold, 1939; Miller and Ervin, 1964). The same is true of analogous German verbal particles, such as ab, an, auf, mit, and so on (Leopold, 1939; Park, 1970). By contrast, Slavic verbal particles of this sort are prefixed to the verb (the equivalents of “down-fall,” “off-take,” etc.). Grace Shugar (1971), in longitudinal studies of Polish child speech, reports that locative verbal prefixes of this sort emerge at the same time as prepositions in Polish—that is, relatively later than they do in English. For example, od ‘off’ and ‘away from’ emerges simultaneously as a verb prefix (e.g., odjechał ‘rode away,’ odpalił ‘fell down’) and as a preposition (e.g., od mamy ‘away from mama’). Since the Polish locative particles are placed before the verb, they are probably at the same level of perceptual salience as prepositions.

Thus the argument is that if a language expresses locative notions by means of inflections and post-verbal particles (and, by extension, postpositions), acquisition of the verbal expression of locative notions will be facilitated. This can now be checked by comparison with other languages of this sort. Preliminary data on the acquisition of Turkish (my data), Finnish (Argoff, forthcoming), and Korean (Park, 1969)—all similar to Hungarian in this respect—suggest that this is the case. The argument can now be re-phrased, by inductive generalization, as a suggested universal of grammatical development:

**Universal:** Post-verbal and post-nominal locative markers are acquired earlier than pre-verbal and pre-nominal locative markers.

This developmental universal is undoubtedly not limited to the expression of locatives. In fact, it seems to reflect a general early tendency on the part of the child to attend to the ends of words when scanning linguistic input in a search for cues to meaning. This is a sort of general heuristic or operating principle which the child brings to bear on the task of organizing and storing language. Phrased roughly, one can say that the following is one of the basic “self-instructions” for language acquisition:

**OPERATING PRINCIPLE A:** Pay attention to the ends of words.

We have seen this operating principle reflected in data on word imitation and in the acquisition of locative expressions. It is also evident in the acquisition of other inflectional systems. For example, accusative and dative inflections are very early acquisitions in inflected languages like Russian, Polish, Serbo-Croatian, Latvian, Finnish, Hungarian, and Turkish—where they are realized as noun suffixes. But these inflections are relatively late in the acquisition of German (Stern and Stern, 1907), where they are realized as forms of pre-nominal articles. English articles are also lacking at early stages of development. It is not the semantic nature of articles which accounts for the omissions in German and English, because the Bulgarian article, which is a noun suffix, appears early in child speech (Gheorgov, 1908). Apparently Operating Principle

*The notion of “earlier” is crucial to the understanding of such proposed developmental universals. There are two operational criteria of “earlier”: (1) if both means of expression are available in a given language, one will appear in development at a younger age than the other. This can be ascertained in either longitudinal or cross-sectional studies. If A and B are linguistic devices taken to be ordered in psycholinguistic complexity, one would expect to find a given child using either A or both A and B, but not B alone. (2) If only one means of expression is available in a given language, the relevant variable is the time from first reliable unmarked intention to express the notion encoded by the linguistic form and the first reliable and appropriate use of that form. Only longitudinal study is applicable in this case. Brown (in press) has proposed a useful criterion of reliable and appropriate mastery of a linguistic form. He suggests that one examine the contexts in a corpus of child speech in which a given grammatical form is obligatory, and set an acquisition criterion in terms of “output-where-required.” He has found it useful to define mastery of grammatical morphemes as appropriate production in 90% of obligatory contexts. For purposes of cross-linguistic test of a universal, one would measure the lag between the intention to express the content encoded by A and B and the mastery of A or B in terms of Brown’s 90% criterion. The lag between emergence of communicative intent and the acquisition of A should be shorter than the lag between the emergence of intent and the acquisition of B.*
A is at work here as well, making it relatively difficult for the child to detect
German inflections. The principle also accounts for the finding (Grégoire, 1937)
that the first negative element in early French speech is pas—the final member of
the separated pair ne ... pas.

All of these findings taken together suggest a general developmental
universal, based on the supposition that Operating Principle A is one of the first
operating principles employed in the ontogenesis of grammar:

Universal A1: For any given semantic notion, grammatical realizations
in the form of suffixes or postpositions will be acquired earlier
than realizations in the form of prefixes or prepositions. 7

In order for this universal to be manifested, a number of language-
definitional universals must be taken for granted (e.g. that there are words, that
the meaningful unit is smaller than the word, that sounds can express grammat-
ical relations as well as make reference, and so on). In addition, the emerg-
ence of inflections requires at least one other basic operating principle:

OPERATING PRINCIPLE B: The phonological forms of words can
be systematically modified.

Numerous observers have reported a period of playful modification of
words which precedes the emergence of inflections. Werner and Kaplan, reviewing
the European diary literature, note (1963, p. 155):

there are some indications reported in the literature which suggest that long
before the child grasps the role of form-changes as grammatical devices, he
grasps the fact that forms of vocables may be modified to express some qualifica-
tion of, or affective reaction to an event.

They cite many examples of playful reduplication, suffixing, and so forth. In
languages which provide inflectional diminutive or affective forms, such
inflections are among the first to emerge. Shugar (1971), for example, cites early
Polish diminutives for names (e.g., tatunia [= tata ‘father’] and mamunia

7 Greenberg (1957) presents a closely related argument in terms of the psycholinguistic
bases of linguistic change. He explores Sapir’s observation, corroborated by his own
experience, “that prefixing is far less frequent than suffixing in the languages of the
world” (p. 89). Greenberg adds a number of possible psychological causes for a
regular historical development away from prefixes to suffixes and finally to isolating
linguistic systems. Greenberg examines this phenomenon as an example of the role of
psychological factors in language change. The suggestions made here about attention
to suffixes in child language development provide an important link to his chain of
reasoning. Of course, additional sorts of psycholinguistic factors will have to be intro-
duced to account for development of an isolating language into either a prefixing or
a suffixing one. In consonance with the present argument, however, Greenberg notes
that the latter course of historical development is more frequent [p. 93].
relative ease of acquisition of Hungarian locative inflections: the inflections are presumably perceptually salient, and the child is presumably prepared to manipulate the forms of word endings in his production. These principles both relate to ongoing speech processing—the deployment of attention in speech perception and the production of grammatical markers in speaking, although they also have implications for the kinds of linguistic rules which will be formed. Another set of determinants of case of acquisition has to do more directly with rule organization factors—both simplicity and consistency of rules from a formal point of view, and semantic consistency. In the Hungarian system the locative marker is directly bound to the noun, while in the Serbo-Croatian system it is divided between a pre-nominal preposition and an inflection. In addition, the choice of formal markers for locative expression is semantically consistent and non-arbitrary in Hungarian, but is much less principled and orderly in Serbo-Croatian. A full answer to the question posed in our test case, therefore, will require operating principles for rule formation as well as for language processing. Principles of this sort will be advanced later in the paper, in connection with broader ranges of data. (See Operating Principles D and G, below.) The test case has played its role in demonstrating the types of cognitive prerequisites to grammatical development which can be revealed by the method outlined above.

Broadly speaking, there are three classes of such prerequisites: (1) those related to the underlying semantics of utterances, (2) those related to the perception and production of speech under short-term constraints, and (3) those related to the organization and storage of linguistic rules. The first class of prerequisites falls within the domain of the general psychology of cognitive development; the remaining prerequisites must be elaborated by developmental psycholinguistics. These are essentially language processing variables which can be conceptualized in terms of operating principles such as those proposed above. A number of such operating principles, and the predicted developmental universals which flow from them, will be proposed in the last section of this paper. Such operating principles guide the child in developing strategies for the production and interpretation of speech and for the construction of linguistic rule systems. The operating principles function within a framework of constraints on linguistic performance. These constraints must be considered before enumerating specific operating principles in more detail.

* Cf. the distinction made by Braine (1971a) in his recently-proposed "discovery-procedures" model of language acquisition between (1) concept learning, (2) the scanner, and (3) the memory component. The operating principles proposed here are aimed at specifying some of the properties to which the scanner is sensitive and some of the organizational features of the memory. In addition, Braine's model posits a preferential order or hierarchy among the properties noticed by the scanner. The property hierarchy (cf. Chomsky's "simplicity metric") for a given language would result from the application of the operating principles (e.g., the suggested preference for word-final markers), as well as a possible preferential order of application of some operating principles.

** CONSTRAINTS ON LINGUISTIC PERFORMANCE **

By and large, the language processing variables to be discussed below are determined by the fact that human language is produced and received in rapid temporal sequence. That is to say, because we communicate through the rapidly-fading, temporally-ordered auditory modality, we must have strategies for quickly programming and deciphering messages. The sorts of processing variables considered here are therefore closely linked to general perceptual and performance-programming principles. Some of them may well be special biological adaptations for language processing, or may have evolved in connection with language—but the issue of evolutionary origin need not be decided here. The constraints on linguistic performance are both short-term and long-term. The short-term have to do with the ongoing use of speech, and the long-term with the storage and organization of the linguistic system. Child and adult alike must operate under pressures of fading signal and fading auditory image; child and adult alike must have ready access to stored linguistic rules in programming and interpreting utterances. Although short-term sentence processing span increases with age, similar performance constraints are present in childhood and adulthood. Bever (1970a, e) has proposed that certain linguistic structures are not found in human language because they cannot be processed perceptually; it is likewise true that certain linguistic structures are not found in child language because they exceed the child's processing span. Because this span increases with age, it is evident that many universals of linguistic development are based on increasing temporal scope of processing operations. This is, of course, true of speech production as well as speech perception.

Processing span at first is quite literally limited to the number of terms which can occur in an utterance. Almost all investigators report a two-word (or two-morpheme) stage of development. During this period the child can typically express such relations as agent-verb, verb-object, and agent-object, but cannot unite all three terms into a single utterance. The advance from two-word to three-word utterances involves filling in a three-term sequence with fragments which earlier occurred as two-word utterances (cf. Brown, in press, Chap. 1; Bowerman, 1970). That is, with maturation, the child reaches the point at which all of the sub-parts of an agent-verb-object sentence can be spoken in a single utterance. Adjective-noun combinations, which also occur earlier as two-word utterances, can be combined into three-word sentences as well, but this requires deletion of one of the other terms—generally the subject—producing verb-object strings with a nounphrase in object position. Thus the child can say, for example,

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10 It may well be that human skills associated with auditory pattern perception, production and perception of rapid temporally-ordered auditory sequences, and so forth, originally evolved to subserve the function of linguistic communication. Once evolved, however, such skills can be applied to a broader range of functions. For example, music may owe its existence to skills originally evolved for linguistic purposes.
“Mama drink coffee” and “Drink hot coffee,” but not “Mama drink hot coffee.”

At this early stage, then, output length limitations are quite severe—literally limited to words rather than to structures or to linguistic operations. Such limitations do not occur in adult speech, and this aspect of development seems purely to be based on maturation of a very simple sort of short-term processing capacity. At somewhat later stages, however, one finds the same sorts of processing limitations as in adult linguistic performance—but down to child scale. For example, both adults and children have difficulty dealing with material interposed between related parts of a sentence (cf. Operating Principle D, below). The only important age difference is in terms of how much material can be interposed without losing track of one’s place in a sentence. For example, children may have difficulty in dealing with a doubly modified object noun between verb and particle—as in “He called the little old lady up”—whereas adults may tolerate a longer intervening string. But for both children and adults short-term limitations constrain the amount of material which can be interpolated before production or interpretation of utterances breaks down. In similar fashion, children are limited in the number of grammatical operations which can be performed in an utterance (Bellugi, 1968), but this limitation does not differ in kind from limitations on adult linguistic performance.

I am proposing, therefore, that the short-term limitations under which children operate—beyond the very early limitations on absolute sentence length—are universal human limitations on sentences processing, and that they are based on general perceptual and information-processing principles. The nature of their development can be revealed by the general psychology of perceptual development.

Constraints on production and comprehension are intimately related—especially in child speech, where the forms the child uses in his own speech must be those he has been able to perceive in the speech of others. Thus the operating principles proposed below relate closely both to comprehension strategies (cf. Bever’s “perceptual mapping rules”) and to the sorts of linguistic rules originally preferred by the child. To a great extent, the form of linguistic rules is determined by the short-term processing limitations, because the rules refer to a system which is represented in the auditory-acoustic modality, and because they must be called into play during rapid speech processing. In fact, at the beginning levels, it could be that there is little difference between short-term processing strategies and linguistic rules. That is to say, the child’s knowledge of language—beyond the definitional knowledge proposed at the outset—is represented chiefly by the techniques he uses to interpret and produce sentences.  

11 Beyond these language-specific constraints, however, many linguistic universals are undoubtedly shaped by general constraints on the kinds of rules which the human mind can function with. I suspect that if other complex domains were formally described to the extent that language has been so described we would find similar constraints on the abstract structure of rules.

SUGGESTED UNIVERSALS IN THE ONTOGENESIS OF GRAMMAR

In the remainder of the paper I propose some very specific language processing strategies. The approach is to define a set of presumably universal operating principles which every child brings to bear on the problem of language acquisition. From these operating principles, a number of more specific strategies can be derived, finally resulting in language-specific strategies for the acquisition of aspects of a given native language. Although the operating principles and universals have been arrived at through the same procedures spelled out in the locative test case reviewed above, the format in the following section is more terse, working down from broad operating principles to suggested developmental universals, summarizing data which support those universals (marked by § in the text below). The universals are hopefully phrased in such a way that they can be supported, modified, or abandoned in the light of future research.

Word Order

One of the earliest and most pervasive operating principles has to do with attention to order of elements in an utterance. It seems that a basic expectation which the child brings to the task of grammatical development is that the order of elements in an utterance can be related to underlying semantic relations.

OPERATING PRINCIPLE C: Pay attention to the order of words and morphemes.

Universal C1: The standard order of functor morphemes in the input language is preserved in child speech.

§ No observers report deviant orders of bound morphemes. Burling (1959) found that post-verbal and post-nominal morphemic order was always correct in Garo, where long strings of ordered suffixes occur. The same is true of Turkish, Finnish, and Hungarian child speech. The elements of the English auxiliary phrase always occur in their proper order (e.g., “has not been reading,” “will not be able to come,” etc.).

Universal C2: Word order in child speech reflects word order in the input language.

The phrasing of this universal is purposely vague, because the data are, as yet, imprecise. Earlier, limited data had suggested that children would adhere to fixed word order regardless of the degree of freedom of word order in the input language (Slobin, 1968c). More recent data (Bowerman, 1970) indicate considerable individual differences between children in this regard.

§ Word order in child speech is typically reported as more consistent in languages with fixed word order (e.g., English, Samoan) as opposed to languages
§ American children tend to retain word order in sentence imitation (Brown and Fraser, 1963; Fraser, Brown, and Bellugi, 1963), whereas Polish children (Shugar, 1971) and Russian children (Dingwall and Tuniks, in press) frequently change word order in imitating sentences.

§ A Finnish child studied by Bowerman (1970) seemed to have acquired the dominant word orders of adult Finnish by the time his mean utterances length was 1.42 morphemes. Bowerman presents the following figures on the frequency of occurrence of various orders of subject, verb, and object in the speech of the child and his mother (figures represent numbers of utterances in recorded natural conversation):

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<tr>
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<th>CHILD</th>
<th>MOTHER</th>
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<tr>
<td>VS</td>
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<tr>
<td>VO</td>
<td>4</td>
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<tr>
<td>OV</td>
<td>1</td>
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<td>SYO</td>
<td>7</td>
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<td>OVS</td>
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<td>VSO</td>
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<tr>
<td>SOV</td>
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<td>1</td>
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</tbody>
</table>

Universal C3: Sentences deviating from standard word order will be interpreted at early stages of development as if they were examples of standard word order.

§ Fraser, Bellugi, and Brown (1963) found that English-speaking pre-schoolers would interpret passive sentences as if the order of elements were subject-verb-object. For example, "The girl is pushed by the boy" is matched with a picture of a girl pushing a boy. In other words, children's interpretations conform to the order principle, but reverse meaning. Bever (1970a, p. 298) has proposed as a general strategy of English sentence interpretation: "Any Noun-Verb-Noun (NVN) sequence within a potential internal unit in the surface structure corresponds to actor-action-object." He presents extensive data in support of this strategy. McNeill (1970, p. 124) proposes a similar strategy.

§ Conjoined sentences referring to two temporally ordered events are first given the interpretation that order of mention matches order of occurrence, even if the conjunction indicates otherwise (E. V. Clark, 1971; Cromer, 1968; Hatch, 1969). (E.g., it is relatively more difficult for children to understand sentences of the form "Event 2 after Event 1" and "Before Event 2, Event 1" than sentences of the form "Event 1 before Event 2" and "After Event 1, Event 2".)

§ Universal C3 is apparently applicable even in inflected languages, which allow more flexibility of word order than English. Roepner (this volume) investigated German children's attention to word order and inflection. The standard word order for German imperatives is verb indirect object-direct object (V-IO-DO), with inflected articles indicating the roles of IO and DO. The inflections make it possible for adults to vary the order of the two nouns without losing sense or grammaticality. When offered V-DO-IO sentences for imitation, some children tended to switch articles, placing the dative article on the first noun and the accusative on the second. That is, children showed their command of the inflections and their reliance on word order; they interpreted the first noun after the verb as the indirect object, and inflected the article preceding that noun accordingly. Similarly, in a comprehension task, Roepner found that V-DO-IO sentences were frequently comprehended as if they were V-IO-DO. Thus in both imitation and comprehension many children tended to rely on word order over inflections as a guide to grammatical relations. 12

§ Chomsky (1968) and Cromer (1970) have demonstrated that children have difficulty in correctly interpreting sentences of the type "John is easy to see," where the surface subject corresponds to the object in deep structure. Children as old as six interpret the first noun in such sentences as subject.

Surface Preservation of Underlying Structure

Psycholinguistic research suggests another sort of operating principle which is tied to the fact that speech is produced and processed sequentially in a rapidly fading modality. In its most general form, this principle states that interruption or rearrangement of linguistic units places a strain on sentence processing—both in production and reception. In other words, there is a pressure to preserve the internal or underlying structure of linguistic units in their surface manifestations. A number of strategies can be related to this principle—both strategies for speech perception and strategies for the formation and use of rules of production.

OPERATING PRINCIPLE D: Avoid interruption or rearrangement of linguistic units.

Universal D1: Structures requiring permutation of elements will first appear in non-permutated form.

§ English yes-no questions first appear in non-inverted form (e.g., "I can go?"). inversion of subject and auxiliary is also absent in the first forms of wh-questions (e.g., "Where I can go?") (Brown, Caazan, and Bellugi, 1969; Kiima and Bellugi, 1966).

12 The operation of language processing variables can also be discerned in the process of language change (cf. Bever and Langendoen, 1971). For example, inflections are replaced by word order in the development of pidgin forms of a language, thus suggesting that order is a more basic device than inflections. It is also probably the case that all languages make use of word order as a basic linguistic means of signalling underlying relations, while the use of inflections is not universal.
§ The first relative clauses in English appear in sentence-final position without inversion (e.g., “I know what that is”) (Menyuk, 1969).

Universal D2: Whenever possible, discontinuous morphemes will be reduced to, or replaced by continuous morphemes.

§ Slavic case inflections are first used to express the contrast between position and direction, in the absence of prepositions—i.e., the locative notion is, at first, not marked on both sides of the noun (as discussed above).

§ The first form of the English progressive is the verbal inflection -ing with no pre-verbal auxiliary (Brown, in press, Chap. II; and many others).

§ The first form of French negation is pas, the final part of the discontinuous morpheme, ne...pas (Grégoire, 1937).

§ The discontinuous Arabic negative /maa...s/ is acquired later than the prefixed negative /maa/ by Egyptian children, although both are equally frequent. Children under 3;6 have a general negation rule of /maa/ + S, even when incorrect by adult standards (e.g., /huwa ma'al-rik/ instead of /huwa ma'al-rak/ ‘he is not well’). Above 3;6, the discontinuous /maa...s/ is never substituted for /maa/, but the opposite substitution does occur (Omar, 1970).

Universal D3: There is a tendency to preserve the structure of the sentence as a closed entity, reflected in a development from sentence-external placement of various linguistic forms to their movement within the sentence.

§ Early negative forms in English are attached to primitive sentences (“No do this”), later moving within the sentence (“I no do this”) and, with auxiliary modal development, “I can't do this”). (Bellugi, 1967; Klima and Bellugi, 1966; Menyuk, 1969; Snyder, 1914).

§ Finnish yes-no questions require attachment of a question particle to the word questioned, and movement of that word to the front of the sentence. Acquisition of this form of question is exceptionally late in Finnish children (Aruff, forthcoming; Bowerman, 1970). An earlier form of yes-no question in Finnish child speech consists of a sentence-final interrogative particle (S + vai or S + yako) (Aruff, forthcoming).

§ Sentence-final relative clauses (“I met a man who was sick”) are earlier to develop than embedded relative clauses (“The man who was sick went home”) (Brogan, 1968; Menyuk, 1969; Slobin and Welsh, this volume).

13 But Shugar (1971) reports early sentence-internal placement of a negative particle in Polish, and proposes: “It would seem that relative freedom of word position in sentences as well as experience with diminutive inflection might facilitate such re-arrangements within linguistic units like sentences in the Polish language.”

Universal D4: The greater the separation between related parts of a sentence, the greater the tendency that the sentence will not be adequately processed (in imitation, comprehension, or production).

§ Brogan (1968), in analyzing unpublished imitation data gathered by Carolyn Wardrip, found that sentences (1) and (2) were easy for preschoolers to imitate, while (3) posed considerable difficulty:

1. He knows how to read because he goes to school.
2. I saw the man who fell down.
3. The man that fell down ran away.

Note that sentence length and number of embedded sentences do not account for these findings. What is difficult is not embedding, but self-embedding, as exemplified in (3). Similar findings are reported by Menyuk (1969); Slobin and Welsh (this volume), and Smith (1970).

Clear Marking of Underlying Relations

Children scan adult sentences for cues to meaning, and are aided by overt morphological markers which are regular and perceptually salient. Such markers probably play a similar role in production, helping the child keep track of where he is in the transition from thought to utterance. With maturation and psycholinguistic development, the child develops an increasing ability to derive deep structure from minimal cues. Bower (1970a, p. 350) has set forth “a view of sentence complexity according to which the more internal structure material that is implicit in the external structure, the harder the sentence, since the child must contribute more information to the sentence itself.”

Children apparently prefer that grammatical functors be not only present wherever possible, but also that they be clearly marked acoustically. In fact, functors may be more clearly marked acoustically in child speech than in adult speech. Levinson has noted that for Russian children clarity and accuracy of pronunciation appear first of all in the inflections. At the same time the word stem continues to sound inarticulate. . . . The work carried out by the child in connection with rudimentary distinctions of grammatical meanings . . . facilitates more articulate perception of the acoustic composition of words at this stage (quoted by Leont’sv, 1965, p. 101).

Rüge-Dravina (1963) notes that in Latvian child speech newly acquired conjunctions and other connecting words are stressed, even if unstressed in adult speech.

14 This is, in fact, not a developmental universal, but a statement of a general psycholinguistic performance constraint. As pointed out above, the only age difference is in severity of the constraint. Watt has phrased this universal in terms of a “theory of cumulative assignments” (1970, p. 151): “...psycholinguistic parsing complexity increases with the amount of deep structure whose correct assignment is postponed; with the length of sentence over which the postponement must be carried; and with the complexity of misassignments whose rescission returns the processor to an earlier point in the sentence.”
OPERATING PRINCIPLE E: Underlying semantic relations should be marked overtly and clearly.

Universal E1: A child will begin to mark a semantic notion earlier if its morphological realization is more salient perceptually (ceteris paribus).

§ The notions of "more salient perceptually" and "ceteris paribus," of course, are in need of more precise definition. Operating Principle A and the discussion of locative expressions offer some support for Universal E1. (Cf. early acquisition of the Hungarian locative inflections, the Bulgarian suffixed article -al-ta-to, etc.)

§ The Hungarian–Serbo-Croatian bilingual children acquired the Serbo-Croatian accusative inflection -u earlier than the corresponding Hungarian inflexion -u, using it on words of both languages.

§ The development of the passive is late in Indo-European languages, where it typically requires several morphological changes, as well as a change in word order in many languages. By contrast, the Arabic passive is learned early by Egyptian children (Omar, 1970), where it is formed by a prefixed -bi- on the past tense of the verb, with obligatory agent deletion and preposing of underlying patient. Although several factors are at play in this comparison, the marking of the passive by a single clear prefix is probably one of the reasons for its early acquisition in Arabic.

§ The following finding, reported by Shugar (1971) for Polish child language development, suggests a role for perceptual salience in inflectional development: "The following oppositions emerged: singular vs. plural in nouns, verbs, and pronouns; first vs. second person singular in verb endings; nominative vs. accusative case for feminine nouns; masculine vs. feminine gender both in pronouns and verb-endings. Most of the above differences seem to rest upon a new phonological acquisition: an acoustically clear differentiation of /a/ and /e/.

Universal E2: There is a preference not to mark a semantic category by \( \emptyset \) ("zero morpheme"). If a category is sometimes marked by \( \emptyset \) and sometimes by some overt phonological form, the latter will, at some stage, also replace the \( \emptyset \).

§ The Russian noun singular accusative is marked by \( \emptyset \) for masculine non-human and neuter nouns. Such nouns are first marked with the acoustically salient feminine accusative -a by Russian children (Gvozdev, 1949; Pavlova, 1924; Slobin, 1966a, 1968c; Zakharova, 1958). The very same is true of Serbo-Croatian language development (Mikes and Vlahović, 1966; Pavlovich, 1920).

§ Gvozdev's (1949) Russian child used the masculine and feminine -ov for all plural genitive nouns, replacing the feminine plural genitive -a.

§ Arabic nouns are given in the singular (\( \emptyset \)) with numerals over 10; but Egyptian children tend to use plural noun forms with all numerals (Omar, 1970).

Universal E3: If there are homonymous forms in an inflectional system, those forms will tend not to be the earliest inflections acquired by the child, i.e., the child tends to select phonologically unique forms, when available, as the first realization of inflections.

§ The first noun instrumental inflection used by Russian children is the masculine and neuter -om, rather than the more frequent feminine -ov (Gvozdev, 1949; Pavlova, 1924; Slobin, 1966a; 1968c; Zakharova, 1958). The suffix -om has only one homonym (masculine and neuter locative adjectival inflection), while -ov represents five homonymous inflections (singular adjective inflections for masculine nominative and feminine genitive, dative, instrumental, and prepositional cases).

Universal E4: When a child first controls a full form of a linguistic entity which can undergo contraction or deletion, contractions or deletions of such entities tend to be absent.

§ Bellugi (1967) has noted the clear enunciation of "I will"—even in imitations of sentences containing "I'll"—at a developmental stage at which special attention is paid to the auxiliary system.

§ Slobin and Welsh (this volume), in a longitudinal study of elicited imitation, found numerous examples in which their subject supplied elements in her imitation which had been optionally deleted in the model sentence (e.g., Model: "I see the man the boy hit." Child: "I see a man who a boy hit.")

Universal E5: It is easier to understand a complex sentence in which optionally deletable material appears in its full form.

§ This statement is a version of Bever's suggestion that "the child . . . has some difficulty with constructions that depend on active reconstruction of deleted internal structure" (1970a, p. 351). Psycholinguistic research on adults, such as that carried out by Fodor, Garrett, and Bever (1968), has shown that multiply self-embedded clauses are very difficult for adults to understand (e.g., "The pen the author the editor liked used was new"). There are, presumably, too many interruptions to keep track of. Such sentences can be made significantly easier for adults to understand if each embedded clause is marked by a relative pronoun (e.g., "The pen which the author whom the editor liked used was new") (Fodor and Garrett, 1967; Hakes and Cairns, 1970). The notion here is that one
scans a sentence perceptually, searching for cues to underlying meaning, and that the relative pronoun facilitates a particular strategy for interpreting multiply embedded sentences—namely, that in a sequence of noun-relative pronoun-noun-transitive verb, the first noun is object and the second subject of the following verb.

Children, of course, cannot understand multiply self-embedded sentences, but they can begin to understand sentences with one embedded clause. For example, Charles Welsh and I found that a two-year-old girl could imitate many sentences with embedded clauses marked by relative pronouns, and that her imitations showed that she understood the appropriate underlying relations (e.g., Model: “The man who I saw yesterday got wet.” Child: “I saw the man and he got wet.”). Note that her imitation has preserved meaning, showing that she was able to decode the structure, but that she has avoided interruptions in her version. She gives back the full forms of the two underlying sentences, supplying the deleted repetition of the subject: “I saw the man” and “He got wet.” (This is further evidence for Operating Principle D.) At this stage of development, the child is unable to interpret sentences from which the relative pronoun has been deleted (e.g. Model: “The boy the book hit was crying.” Child: “boy the book was crying”). These structures were clearly beyond her competence at this level, and were treated as word lists. (Cf. the example given above under Universal E4, drawn from a later stage in the development of the same child. In that example the deleted relative pronoun is supplied by the child in her imitation, indicating her ability to interpret the deletion, along with the need to mark the relative clause overtly with the pronoun in her own production.) (Slobin and Welsh, this volume).

§ Olds (1968) found that boys aged seven, nine, and eleven responded more quickly to instructions in which a relative pronoun was present (e.g. “The piece that your opponent moved may be moved two spaces”) than to the corresponding shorter sentences from which the pronoun had been deleted (e.g. “The piece your opponent moved may be moved two spaces”).

§ C. Chomsky (1969) and Olds (1968) found that children were less likely to misinterpret the verbs “ask” and “tell” when a pronoun indicated the underlying subject of an embedded sentence. For example, (1) and (2) were more difficult to interpret than (3) and (4):

1. Ask Laura what to feed the doll.
2. Tell Laura what to feed the doll.
3. Ask Laura what you should feed the doll.
4. Tell Laura what she should feed the doll.

Overregularization

Perhaps the most widely-noted aspect of child speech has been children's tendency to overregularize or overgeneralize. Virtually every observer has noted some examples of analogical formations, over-extension of regular principles, etc., and a comprehensive list of examples cannot be attempted here. Rules applicable to larger classes are developed before rules relating to their subdivisions. There is a tendency to apply a linguistic rule to all relevant cases. In short:

OPERATING PRINCIPLE F: Avoid exceptions.

Universal F1: The following stages of linguistic marking of a semantic notion are typically observed: (1) no marking, (2) appropriate marking in limited cases, (3) overgeneralization of marking (often accompanied by redundant marking), (4) full adult system.

§ A classic example is the development of the English past tense, as represented by the following schematic sequence of stages of strong and weak forms in past tense contexts: (1) break, drop; (2) broke, drop; (3) breaked, dropped; (4) breakted, dropped; (5) broke, dropped (Slobin, 1971a).

§ Stage (3) can consist of substages of successive overgeneralizations, in which one form drives out another (cf. the discussion of "infectious imperialism" in Slobin, 1968c). For example, Russian children first use the masculine and neuter -em inflection for all singular noun instrumentals; then replace this with the feminine -oy; and only later sort out the two inflections (Zakharova, 1958). Similarly, Russian children first use the feminine past tense for all verbs, regardless of the gender of the subject noun; then use only the masculine for all verbs; followed by a period of mixed usage and eventual separate marking of verb past tense to agree with gender of subject noun (Popova, 1958).

§ The Arabic plural has a number of irregularities and inconsistencies, as described earlier in this paper (a large number of irregular forms; a separate dual; singular nouns with numerals over 10; separate forms for "counted" vs. "collected" senses of given nouns). The regular feminine plural suffix is widely overgeneralized, and "was strongly preferred for pluralizing nonsense nouns by children of all ages" (Omar, 1970, p. 375).

Universal F2: Rules applicable to larger classes are developed before rules relating to their subdivisions, and general rules are learned before rules for special cases.

§ Gvozdev's (1949) Russian child did not distinguish between mass and count nouns, requiring that every noun have a singular and a plural form. Thus he pluralized mass nouns (bomagi 'papers'), counted mass nouns (odna sakharo 'one sugar'), and invented singulars for plural nouns which have no singular forms in Russian (e.g. *iyut as the singular for the collective noun ludy 'people'). Similar phenomena have been frequently reported for English-speaking children.

§ Masculine animate nouns take a special accusative inflection in Russian. Subdivision of the noun class into the categories of animate and inanimate
masculine for purposes of accusative inflection is typically late in Russian children, who prefer to use a single accusative form for all nouns (Gvozdev, 1949; Solov'yeva, 1960).

§ C. Chomsky (1969) found late acquisition of the special rules involved in the use of the verbs "promise" and "ask" in English. "Promise" is a special case in that it violates the "Minimal Distance Principle" (Rosenbaum, 1967) generally used to decide on the subject of an infinitival complemt verb; e.g., in (1) the subject of the complement verb is "Bill," but in (2), where "promise" appears, the subject is "John."

1. John wanted Bill to leave.
2. John promised Bill to leave.

"Promise" consistently violates the Minimal Distance Principle, while "ask" is inconsistent—cf. (3), where "Bill" is the subject of the verb in the complement, and (4), where "John" is the subject:

3. John asked Bill to leave.
4. John asked Bill what to do.

While "promise" is consistently exceptional, "ask" is inconsistent. Chomsky found that full comprehension of "promise" came at an earlier age than full comprehension of "ask," suggesting that it is easier to learn a consistent exception than an inconsistent exception.

Semantic Motivation for Grammar

The overgeneralizations engendered by Operating Principle F are always constrained within semantic limits. The child applies an appropriate inflection or function word within a grammatical class, failing to observe a detailed subdivision of that class, but errors in choice of functor are always within the given functor class. There are numerous examples in the cross-linguistic data of the principle that rules relating to semantically defined classes take precedence over rules relating to formally defined classes, and that purely arbitrary rules are exceptionally difficult to master (see footnote 4). Simply stated:

OPERATING PRINCIPLE G: The use of grammatical markers should make semantic sense.

Universal G1: When selection of an appropriate inflection among a group of inflections performing the same semantic function is determined by arbitrary formal criteria (e.g. phonological shape of stem, number of syllables in stem, arbitrary gender of stem), the child initially tends to use a single form in all environments, ignoring formal selection restrictions.

§ The examples cited under Universals E2 and F1 also support Universal G1. For example, a common error in both Russian and Serbo-Croatian child speech is to use the frequent and perceptually salient feminine accusative -a on masculine and neuter nouns as well as feminine nouns. But, when it is used, the -a inflection is added only to nouns, and not to other parts of speech, and only to indicate the direct object of action or the goal of directed movement. Thus the proper inflection is picked to express semantic intention (accusative inflection), though the child does not yet follow the subselections within that class on the basis of gender and phonology. For each particular grammatical case category, the Slavic child apparently selects one salient case ending to express the semantic of that case in connection with all nouns. The underlying grammatical rule, therefore, is semantically appropriate, but only formally deficient.

§ In languages requiring agreement between adjective and noun, case and number agreement is acquired before gender agreement. In Russian, for example, the child uses a single adjective inflection for each case and number combination, but does not make gender distinctions (e.g., one singular nominative for all genders, one plural nominative, etc.) (Gvozdev, 1949).

§ Mikeš and Vlahović (1966) report for Serbo-Croatian that case distinctions and the singular-plural contrast are acquired before gender distinctions (both selection of gender-conditioned noun inflection and agreement between noun and modifier in gender). They note that children stop themselves before expressing proper gender much more frequently than for other grammatical decisions.

Universal G2: Errors in choice of functor are always within the given functor class and subcategory.

§ Gvozdev (1949) points out that although there are many confusions as to the proper suffix to employ within a given Russian case category, the child never uses one case instead of another. For example, although the Russian child uses an instrumental noun inflection which fails to agree with the noun in gender, he does not express the notion of the instrumental case by means of a dative inflection, a verb tense inflection, etc.

§ English-speaking children at first fail to appropriately subdivide prepositions according to their detailed semantic functions, but do not confuse prepositions with conjunctions or other parts of speech, and so forth. Miller and Ervin note, in summarizing their longitudinal study: "The children seldom used a suffix or function word with the wrong lexical class" (1964, p. 26).

Universal G3: Semantically consistent grammatical rules are acquired early and without significant error.

§ A Samoan child studied by Kernan (1969) had learned to appropriately use the articles le + common noun and 'o + proper noun/pronoun at the two-word stage. Thus a choice of articles based on a clear semantic feature—[± human]—was acquired at a very early stage of development.

§ Roger Brown (in press, Chap. II) has found that the English progressive is the only inflection which never overgeneralizes in American child speech. That is, children never add the progressive to "state" verbs, saying things like "wanting," "liking," "needing," "knowing," "seeing," or "hearing": but they freely
use the progressive with a large number of "process" verbs. Brown argues that there is a clear semantic distinction between verbs which take the progressive inflection and those which do not. Those not allowing the progressive all indicate involuntary states, while those allowing the progressive indicate processes which can be voluntary when predicated of people. This is the only subclassification of English words, for inflectional purposes, which is semantically principled. There is no principled basis for remembering, for example, that some verbs form irregular past tenses, or that some nouns have irregular plurals. These lists must be learned by rote, and the result is that such forms are overregularized in child speech. It is easier to apply a rule uniformly than to block it for unprincipled reasons, and so, long after they show their knowledge that one cannot say "I am knowing," children persist in saying things like "I knowed" and "two sheeps."

CONCLUSION

What has been sketched out on the preceding pages is only an outline of what some day may evolve into a model of the order of acquisition of linguistic structures. It has several major components, all of which must be elaborated. The first component, I have argued, is the development of semantic intentions, stemming from general cognitive development. The child, equipped with an inherent definition of the general structure and function of language, goes about finding means for the expression of those intentions by actively attempting to understand speech. That is to say, he must have preliminary internal structures for the assimilation of both linguistic and non-linguistic input. He scans linguistic input to discover meaning, guided by certain ideas about language, by general cognitive-perceptual strategies, and by processing limitations imposed by the constraints of operative memory. As in all of cognitive development, this acquisition process involves the assimilation of information to existing structures, and the accommodation of those structures to new input. The speech perception strategies engender the formation of rules for speech production. Inner linguistic structures change with age as computation and storage space increase, as increasing understanding of linguistic intentions leads the child into realms of new formal complexity, and as internal structures are interrelated and re-organized in accordance with general principles of cognitive organization. All of these factors are cognitive prerequisites for the development of grammar. While we can disagree about the extent to which this process of developing grammars requires a richly detailed innate language faculty, there can be no doubt that the process requires a richly structured and active child mind.

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