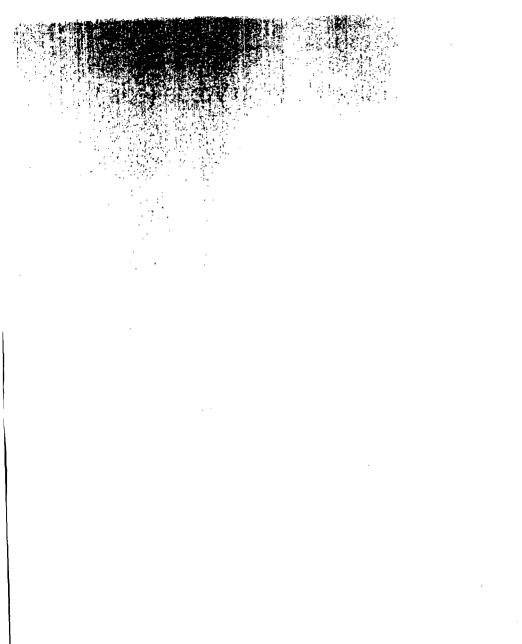Sascha W. Felix/Henning Wode (eds.)

Language Development
at the Crossroads

Papers from the Interdisciplinary Conference
on Language Acquisition at Passau

GRAMMAR IN MINDS OF ADULTS, CHILDREN, AND LINGUISTS

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This paper is about the often turbulent relationship between psychologists and linguists. While attempting to offer some kind of recent historical perspective on that relationship, I also hope to suggest that the study of language universals with respect to psychological processing might be the most fruitful route for collaboration at the present moment in history. The paper is roughly divided into two parts. The first section might be seen as a projective test for the participants of this conference, and is presented in that spirit. Being neither a historian of psychology nor being old enough to have experienced first – hand much of the going-on in the field of psycholinguistics, yet wanting to present some sort of historical vision, I have resorted to the sophomoric technique of looking up all the reviews of psycholinguistics that appeared in the *Annual Review of Psychology* since 1953 and presenting a collage of their contents in the order of their appearance. I have made the effort to include most of the major issues that have interested researchers in the field, the mentioning of which I hope will arouse the memory cells of the participants of this conference and stimulate discussion. The second section summarizes some of my recent developmental work in Japanese, which is presented in the context of the study of language universals.

A Collage of Psycholinguistics
Pre-1953

Georg Miller's review (1953) was entitled "Communication". It was completed in May, 1953, when I was six months old. The organization of the paper is by individual researchers who made significant contributions. Roman Jakobson and his work on distinctive features is given first billing, Miller writes: "an important consequence of the emphasis on features rather than phonemes is that it encourages the linguist to accept the psychological nature of many linguistic problems" (p.403). Miller contrasts Jakobson's work with Zellig Harris's distributional techniques of linguistic analysis, where subjective concepts such as "meaning" are held as a stong deterrent to the progress of rigorous scientific inquiry. Although these two linguists enjoy the primacy effect in the review, the bulk of the emphasis resides in Shannon's information theory, and the work inspired by it. The review reflects the spirit of the times, where measurement of information through redundancy and math modelling of its flow was held at a premium. The engineer's contribution to the study of communication is transparent. Charles Osgood's semantic

differential technique in measurement of meaning is seen as highly promising. Throughout, Miller identifies three trends. First, an increasing awareness of the importance of verbal context over physical absolutes; second, a persistent interest in meaning; and third, a strong interest in using normative models. Regarding the last of these trends, Miller observes: "This normative approach is attributable in part to engineering, in part to economists, and it makes many psychologists uncomfortable" (p. 418).

1954-1958
The review by Herbert Rubenstein and Murray Aborn (1959), entitled "Psycholinguistics", surveys much of the systematic data collection performed by psychologists over the years. However, unlike Miller's review in which the emphasis was on normative modelling of language behavior, the Rubenstein and Aborn manuscript reflects the increasing if undifferentiated mass of studies in the spirit of the following sentence which appeared in the opening paragraphs: "Psycholinguistics is not a well-integrated field of study, and one can hardly speak of anything like a general trend in the field as a whole" (p.291). Perhaps the spirit of the times can be best summarized by continuing to quote from some of their major conclusions: "(a) Differential exposure to language segments (letters, words, etc.) produces in the individual a set of correlated probabilities of emitting those segments. (b) Since segments in natural language are characterized by inequality in frequency of occurence, experience with language – both in sending and receiving messages -- imparts to the individual an isomorphic response hierarchy" (p. 291), and so on and so forth. The bulk of the work can be described as an obsession with the variables of frequency and redundancy and their effects on response strengths. Thus, one finds pages of the review devoted to study after study on the effects of stimulus redundancy and frequency on subjects' performance on a variety of psychological tasks, such as serial learning, recognition of words and phonemes under varying conditions of noise. Studies of word association are quite salient. By the time of this review, Osgood, Suci and Tannenbaum's monograph on semantic differential ratings on a large number of words has appeared, as have numerous cross-cultural studies with an eye towards testing the Whorfian hypothesis.

Also appearing in this review is a substantive section on speech perception. The work of Alvin Liberman and his associates demonstrating the categorical perception of certain phoneme boundaries received special attention. A section on language learning appears, which can be summarized by the observation: "Relatively little substantial research on language learning appeared during the period covered by this review" (p. 307).

Oddly enough, and in some sense ironically, Chomsky's *Syntactic Structures* receives a citation in this review. It is mentioned in a section on language disturbances in a discussion of developing methods for analyzing the content of psychiatric interviews. A paragraph is devoted to describing grammatical transformations and how they capture relationships between sentences. The authors suggest that this may be a useful tool in analyzing discourse. They also mentiom that "Chomsky suggests that the study of transformations may also shed some light on ambiguity" (p. 311). Little were they aware of other suggestions that might be heard from Chomsky in subsequent years.

1958-1965
Susan Ervin-Tripp and Dan Slobin (1966) reviewed the field during this period. The choice of reviews is worthy of some note, since both researchers have a characteristic developmental orientation, as contrasted with the human factors orientation of the authors of the previous review. The scope of Ervin-Tripp and Slobin's review is very extensive, as reflected for example in the number of citations: 328 as compared with 35 and 155 in Miller and in Rubenstein and Aborn respectively.

The issues addressed in the prior reviews continue to have their marks in the prese review. The associationist approach to meaning and in particular, Osgood's semantic differential have continued to produce a steady parade of studies. Word association is still a robust area of research. Speech perception, in particular the Haskins approach, has continued to produce good evidence for categorical phoneme perception, and the motor theory of speech perception has made its appearance, although not without critics. There is little foreshadowing of the important work on speech perception in infants, an issue critical to the problem of innate linguistic biases in humans. However, considerable attention is paid to Lenneberg's claim (and evidence) that "man may be equipped with highly specialized, biological propensities that favor and, indeed, shape the development of speech in the child and that roots of language may be deeply grounded in our natural constitution as, for instance, our predisposition to use our hands" (Lenneberg, 1964:579).

The most striking novelty in the Ervin-Tripp and Slobin review is the impact made by Chomsky's ingenious linguistic research. Ervin-Tripp and Slobin begin by defining the field of psycholinguistics as "the study of the acquisition and use of structured language . . . The word 'structure' is significant in our definition. A major focus of recent psycholinguistic research is on syntactic organization, a key defining feature of human language. The analysis of language structure has made demands on present psychological theories which have yet to be met" (p. 435). Only scattered remnants can be found of studies that use Markovian processes to model grammatical behavior. Rather, the central concern "is to account for the remarkable fact that little children, each exposed to a different sample of language, rapidly develop competence of the sort described by linguists for adult speakers" (p. 437). The section on "Grammar and Verbal Behavior" is dominated by studies using transformational grammar as a normative model for predicting performance on a variety of psychological tasks, such as sentence-matching, memory, and comprehension. Optimism for success of the Derivational Theory of Complexity is at its height, unaware of the impending collapse of the paradigm.

1965-1969
By the time Samuel Fillenbaum's (1971) review appeared, the Derivational Theory of Complexity had met its downfall (Fodor & Garrett, 1966). Nevertheless, Fillenbaum summarizes the period 1965 through 1969: "it is clear that work in linguistic theory or more particularly work on generative transformational grammar has had a continuing and growing impact in substantive ways, leading, for example, to new theoretical perspectives on language acquisition and to much experimental work seeking to establish the psychological reality, at least, of some of the linguistic structures described by the linguists, and inquiring as to the psychological status of linguistic rules" (p. 252).

Psychologists, though still uncomfortable with the distinction between competence and performance, were willing to explore its consequences. What does it mean to say that a performance model "incorporates" a competence component? It appears clear that in many ways, the psychologist's variables were bullied out of the experimental arena. Fillenbaum writes, "with regard to most attempts at [fragments of] a performance model, one thing is rather striking, -- there has been very little recourse to what is generally known about attentive mechanisms, short term and longer term memorial processes, temporal constraints on information processing, etc. Whether because such materials were unknown to the investigators, or whether they were deemed irrelevant is not clear. What is clear is that such performance model building as there has been has been relatively distinct and separate from other work in perception, cognition, and learning" (p. 254).

Fillenbaum's review is divided into three sections: one on the biological foundations of language, the second on language acquisition, and the third on experimental psycholinguistics. The questions of species-specificity and task-specificity of language make an appearance, particularly with regard to the contrast between the Chomsky-Lenneberg position and the Piagetian approach. The studies of language acquisition concentrate on the question of how the child acquires specific constructions. The major tension concerns proponents who attempted to specify the content of the Language Acquisition Device (LAD) in terms of linguistic universals (e.g., McNeill) versus more "process" oriented theorists, such as Slobin and Braine. The emphasis remains on syntactic, rather than semantic development, and Braine is quoted as saying: "knowledge of phonological development has hardly increased at all during the last 10 years, and as yet there is essentially no systematic knowledge of lexical and semantic development. . .the field as a whole is in the middle of a spate of work on grammar acquisition" (p. 269). This period, of course, witnessed the bulk of the work on early grammar acquisition by Brown and his colleagues, where specific structures such as negation and interrogatives were targeted and analyzed within the framework of transformational grammar.

In the realm of experimental psycholinguistics, one finds studies of judgements of grammaticality, paraphrase, and a thorough review of experiments motivated by the Derivational Theory of Complexity. The relevant variables are, naturally, those identified by the study of linguistics.

The study of semantics is seen as virtually non-existent, due primarily to the lack of an adequate normative theory. However, semantics does make its appearance in a section called "processing strategies", where it is held important in certain comprehension situations, such as the difference between reversible and nonreversible passives, in which the syntactic processing may be short-circuited. In addition, the important work of Sachs showing poor retention in memory for form is seen as underscoring the importance of meaning. All in all, however, the role of semantics in the psycholinguistics of the late 1960's is marginal, and syntax, in particular generative grammar, had a field day.

1969-1973

Starting with the review by Philip Johnson-Laird (1974), the area is narrowed down to "Experimental Psycholinguistics". Language acquisition, by now considered more in its own domain under the name "child language", has split off and is covered in the reviews of developmental psychology. This split is not a random occurrence, but perhaps more a reflection of the movement within the field of language acquisition to capture overlaps between its domain of inquiry and the more traditional areas of developmental psychology. Syntax was no longer "hot", and researchers regressed in the age of the child studied, first to the study of the development of semantic relations expressed during Brown's Stage I, and subsequently to the study of early pragmatics manifested in the study of the transitional period from non-verbal communication to the first words uttered by infants embedded in pragmatic envelopes of mother-child interaction.

Johnson-Laird, deferring to Fillenbaum's comprehensive review, restricts his contribution to the study of comprehension. As he puts it in the opening paragraph, "the fundamental problem in psycholinguistics is simple to formulate: what happens when we understand sentences? " (p. 135). The review is organized around the traditional sequence of how sentence perception is seen to proceed: parsing the sentence into its underlying grammatical structure, then searching the semantic network to understand the meanings inherent in the individual lexical items.

The study of the perception of syntax can be seen, not as testing the isomorphism between transformational rules and mental operations, but rather as testing the reality of a distinction between deep and surface structure. The famous "click" experiments bear heavily here. The surface structure cues that might serve to recover the underlying structure are seen as important, as argued by Bever and his colleagues. The evidence for separate conceptions of deep and surface structure are best seen as tentative, and explanations of much of the click phenomena can be attributed, at least in part, to factors other than the deep structure, such as semantic complexity. As Johnson-Laird sums it, "for obvious historical reasons most psycholinguists have maintained a continued intellectual loyalty to the basic tenets of transformational grammar. Yet if Chomsky and his colleagues had not postulated the existence of deep structure, psycholinguists might never have invented it" (p. 139).

The review, in discussing the comprehension of words, makes reference to the artificial intelligence studies of semantic memory (e.g., Collins and Quillian), the beginning of a new trend in psycholinguistics. Eleanor Rosch's initial research on degree of category membership is beginning to make its splash into the literature. These two lines of research constitute a marked departure from earlier attempts to study word meanings based on word-referent associations. One finds the class of studies testing sentence verification latencies against various models (Clark and Chase).

Finally, the review ends with several sections that address issues that were not originally in the domain of psycholinguistics, namely the study of inference from the original text and memory for connected discourse. Johnson-Laird spells out the directions for future research, where he states that "the ultimate problem in the study of connected discourse is to discern what factors make for its maximum cohesion and how it is mapped into some form of memorial representation" (p. 154), an agenda addressed by students of cognitive psychology and cognitive science.

1973-1979

The most recent review, by Danks and Glucksberg (1980), takes the most radical departure from the traditional, syntax-centered psycholinguistics, and into the world of discourse and text comprehension. The authors liken their departure from a sentence-based psycholinguistics to the earlier shift, from word-association-based psycholinguistics to the sentence-based enterprise. They justify the trend away from sentence based psycholinguistics on two grounds: first, that sentence comprehension cannot be understood independently from discourse contexts; and second, that the sum of individual sentence comprehension mechanisms do not add up to the understanding of the large units, such as conversations and stories. As the authors write, "one result of this trend has been far less reliance on theoretical linguistics for insights and working hypotheses and more attention to cognitive and social psychology, sociolinguistics, and artificial intelligence. We eventually may have, as the title of a recent paper suggests, 'psycholinguistics without linguistics'" (p. 392).

The review can be construed as a critique of the formal linguistic approach to the study of language comprehension. Danks and Glucksberg draw heavily on the distinction between "bottom-up" versus "top-down" processing (and the related family of similar distinctions, such as interpretive versus constructive), and argue that the formal linguistic, bottom-up approach is inconsistent with data. Context effects are found in studies ranging from word recognition to sentence comprehension, at all levels of analysis, and their review consists of outlining the evidence. The spirit of the paper is that comprehension must involve larger units than the sentence, and that while such context effects may be hard to make explicit (i.e. vague), such models would be far more plausible from the psychological standpoint.

The review ends with a description of attempts to formalize stories as schema or "grammars". Such story grammars, in my opinion, while attempting to satisfy the formalist's appetite, are quite lean in constraints and, as Danks and Glucksberg admit, difficult to distinguish between competing models through data.

A Pause for Reflection

The preceding collage of the field of psycholingustics, undoubtedly selective, documents the turbulent relationship of psychology with linguistics. While there are many observations one can make, which can be saved for the discussion, I would like to make two.

First, the Danks and Glucksberg review gives the distinct impression that the linguist is about to be thrown out of the house. There is a somewhat glorious sense in which the reviewers conclude that the current work in psycholinguistics "implies rejection of the standard, linguistically based model of language processing" (p. 410). While recent work has convincingly shown that context plays a significant role in sentence processing, even in the narrow confines of the experimental laboratory, it should not imply that work in linguistics need no longer be taken seriously by the student of psycholinguistics. Questions that have been asked, such as how the child acquires syntax (or, more precisely, what mechanisms we must postulate in order for the child to acquire language) are not answered by studying discourse structure. Rather, these questions simply were left unanswered.

The linguistic model that dominated most work in psycholinguistics was the 1965 version of Chomsky's *Aspects*. Failure to confirm the psychological relevance of this particular model should be taken as a sign to reject that model, not all of linguistics. For one thing, generative grammar has undergone considerable change over recent years, resulting in some proposals (independently motivated for linguistic considerations) to reduce the transformational component (e.g., Bresnan, 1978; Jackendoff, 1977), and even to eliminate it completely in favor of phrase structure rules (Gazdar, 1981). Although far beyond the scope of this paper, such proposals have vast implications for the learnability of languages (cf. Pinker, 1979), and hold promise for both language acquisition and psycholinguistics.

A second observation that can be made from the literature is the extreme linguistic parochialism of American research. Now, monolingualism is a classically American disease, but one cannot help but be surprised by the lack of studies in languages other than English. Cross-linguistic research of strategically selected languages, both in acquisition and in adult sentence processing, have been enormously fruitful in revealing what might be truly universal about language (e.g., Slobin, in press; Bates, McNew, MacWhinney, Devescove & Smith, in press; MacWhinney & Bates, 1978; Hakuta, 1981, in press; Hakuta, De Villiers & Tager-Flusberg, in press). Research in the linguistic study of language universals (in most cases, the substantive rather than the formal universals of Chomsky [1965]) has also accumulated rapidly, as can be witnessed in the works of Joseph Greenberg and his colleagues (Greenberg, 1978) and works of Li (1975), Lehmann (1976), and Keenan and Comrie (1977). Most of these universals are stated in such a way as to be immunized against the shifts in theoretical paradigms within linguistics, as they are mostly stated in terms of surface configurational properties. Some of these universals may be significant others accidental consequences of diachronic change. The task for the psychologist is to determine in what important ways these facts about the distribution of human languages have a bearing on psychological processing. The facts wait to be explained, much in the way that the ornithologist's careful notes of avian behavior await explanation. In the course of such work, significant inferences can be made as to the biases that the human information processing system brings to learning and using language.

Language Universals and Psycholinguistics

The remainder of this paper is not as ambitious as this title implies. It involves a description of some of my own research findings that attempt to map the relationship between language universals and language acquisition. It is hoped that not only can distributional facts about languages illuminate us in discovering relevant psychological variables, but that the reverse may hold true as well: psychology can provide an explanation for the existence of linguistic universals. By taking distributional facts across languages as the primary unit of analysis in this iterative process, the biases of the beast may become clearer.

1. **Configuational patterns of constituents (in the surface structure) are the determining force underlying sentence complexity.**

The position of the head noun of a relative clause with respect to the modified clause is correlated with the basic order of the language (Greenberg, 1963). Lehmann (1973) has observed that for OV languages, the relative clause is on the left of the head noun, while for VO languages, the relative clause is to the right of the head noun. The situation can be observed in Table 1, which lists the logically possible configurations of nouns and verbs in cases where the grammatical role of the complex noun phrase is Subject or Object, and where the role of the head noun within the relative clause is Subject or Object. (The notations SS, SO, OS, and OO refer to the sentences that are created with the combinations of the two variables above). Of the six configurational types that are logically possible, Lehmann's observation was that there was a very strong tendency for only three of them (boxed in Table 1) to occur.

Table 1: Logically possible configurations of nouns and verbs in sentences containing relative clauses, where verbs in both the main and subordinate clauses are transitive. The most frequent patterns found in human languages are boxed.

Basic order	Sentence type	Head noun position	
		N[RS]	[RS]N
SVO	SS	N [VN] -V-N	[VN] N-V-N
	SO	N [NV] -V-N	[NV] N-V-N
	OS	N-V-N [VN]	N-V- [VN]N
	OO	N-V-N [NV]	N-V- [NV]N
SOV	SS	N [NV]-N-V	[NV]N-N-V
	SO	N [NV]-N-V	[NV]N-N-V
	OS	N-N [NV]-V	N-[NV]N-V
	OO	N-N [NV]-V	N-[NV]N-V
VSO	SS	V-N[VN]-N	V-[VN]N-N
	SO	V-N[VN]-N	V-[VN]N-N
	OS	V-N-N[VN]	V-N-[VN]N
	OO	V-N-N[VN]	V-N-[VN]N

Why might we find such a pattern of distribution? Kuno (1974) and others have speculated that this pattern can be explained by the difficulty of center-embedded sentences in comprehension. The general thrust of this conjecture is supported by data from Japanese children, although the story turns out to be somewhat more complex. Japanese is an SOV language with the possibility of an alternative OSV order, although the latter is quite infrequent. As with SOV languages, the relative clause in Japanese is placed to the left of the head noun. The configurational arrangement of sentences containing relative clauses in Japanese can be found in the middle row of the right hand column in Table 1. When such sentences are presented to Japanese children for comprehension, the children invariably find the left-branching, noncenter-embedded sentences easier. They become confused by the sentence initial NNV sequence at the beginning of the center-embedded sentences.

How do we know that it is the configurational property of the sentence, and not the meanings encoded in the particular sentence types, that is important? Since Japanese has a relatively flexible word order, the ordering of the matrix sentence constituents can be scrambled around relatively easily. For example, the sentence labelled OS, which has the configuration N-[NV]N-V in the SOV order can be scrambled to yield the configuration [NV]N-N-V when it is in the OSV order. Similarly, the configuration for the sentence labelled SS can be scrambled from the SOV order, which the children find easy, to the difficult N-[NV]N-V configuration in the OSV order. The different configurational patterns that result from the SOV and OSV orders are summarized in Table 2.

Table 2: Four types of complex sentences in Japanese appearing in both SOV and OSV orders.

Sentence type	Order	
	SOV	OSV
SS	[N-o V]N-ga N-o V	N-o[N-o V]N-ga V
SO	[N-ga V]N-ga N-o V	N-o[N-ga V]N-ga V
OS	N-ga[N-o-V]N-o V	[N-o V]N-oN-ga V
OO	N-ga[N-ga V]N-o V	[N-ga V]N-oN-ga V

Additionally, through right dislocation, the configurational arrangement of the sentences can be readily modified. When such experimental manipulations are introduced, and the details can be found elsewhere (Hakuta, 1981), it can be shown that configurational arrangement of the constituents of the sentence at the surface level is the critical variable. Essentially, when the relative clause is on the subject of the matrix sentence, children consistently prefer the SOV order over the OSV order. When the relative clause is on the object of the matrix, the reverse is the case: they prefer the OSV order over the SOV order. This effect holds across comprehension, imitation, and production measures.

It is a curious fact that Japanese children generally have difficulty with the simple sentences when presented in the OSV order (discussed in the section). In fact, even when the object is emphasized through pointing, they have difficulty with OSV (Hakuta, 1978). Nevertheless, it is preferred when the object has a relative clause attached to it. While word order variation in Japanese is not common (i.e., it is not classified as a free word order language), it may serve a critical function in making relative clauses comprehensible. Now, looking at Table 1, it can be seen that for SOV languages and for VSO languages, a similar situation exists. In both language types, there is a mimic of the canonical NNV or VNN sequence in the relativized sentence when center-embedding occurs. My error data from Japanese in fact confirms that these sequences with NNV that mimic the canonical sentence caused the most difficulty in comprehension. Notice, however, that such is not the case for English and other SVO languages. While a somewhat difficult structure emerges in certain sentence types, such as "The cow that the dog likes likes cigars", there are no misleading canonical sequences, assuming certain properties of left-to-right sentence processing. Thus, the sentence "The salmon that chased the fisherman drank the beer" contains a potentially misinterpretable canonical-looking sequence, *the fisherman drank the beer.* However, this sequence is preceded by another canonical sequence, *the salmon that chased the fisherman*

(see de Villiers, Tager-Flusberg, Hakuta & Cohen [1979] for evidence that the re-lative pronoun is irrelevant for processing in English-speaking children). The above observation leads to a prediction about the universal distribution of word order variation as a characteristic of languages: *SOV and VSO languages must rely on some scrambling rule that allows word order variation, while SVO languages do not, other things being equal.*

Steele (1978) has classified languages with respect to whether they allow word order variation, and finds that in no SVO languages are alternative orders common, while they are very common in SOV and VSO languages (i.e., they occur in over half the languages surveyed). Thus, these data are consistent with the notion that SOV and OSV languages prefer word order variation as a device to minimize the possibility of erroneous, "canonical sentence looks" in the configuration of con-stituents.

Incidentally, Keenan and Comrie's (1977) well-known observation about the accessibility hierarchy of head nouns from relative clauses does not receive support from Japanese children, and I would like to use it to make a point about the re-lationship between psychological principles and linguistic universals. Keenan and Comrie predicted that the accessibility hierarchy may exist because of psychologi-cal complexity. One prediction would be that relative clauses where the head noun is the subject of the relativized clause would be easier to process than those with the head noun as object. This turns out to be true in English, as the authors point out. Thus, all other things being equal, "the boy that hit the truck" is easier than "the boy that the truck hit". However, since Japanese places the relative clause to the left of the head noun, the situation is more like a mirror image of English with respect to the position of subject, object, and verb with each other. The re-lative clause with the head noun as subject of the clause looks like the following in Japanese:

(a) [TRUCK-obj HIT] BOY-prt

where the object marker is a paricle, *-o,* and -prt is the appropriate particle that marks the role of the head noun within the matrix sentence. For relative clauses with the head noun acting as the object of the relativized clause, the correspon-ding sentence would be:

(b) [TRUCK-subj HIT] BOY-prt

where the subject-marker is *-ga.* Japanese children find (b) easier to understand than (a), which is the opposite of the predictions. Presumably, this is because (b) corresponds more closely to the canonical sentence configuration in Japanese. Ge-neralizing to other languages, one may state a conclusion: *In languages where the head noun is on the left of the relative clause, subject focus will be easier than object focus, whereas in languages where the head noun is on the right of the re-lative clause, object focus will be easier, all other things being equal.* This suggests that the surface configuration is an important variable and overrides whatever psychological variable it may be that is causing the language universal as stated by Keenan and Comrie. The point here is not that Keenan and Comrie are wrong. Rather, it is that configurational properties of sentences are important, and that the source of the important universal must be searched for in some more abstract set of psychological principles. The universal remains unexplained.

2. Children are highly sensitive to the pattern of correlation between word order and case-markings (in languages with case-markings).

I would like to suggest that case marked languages might be meaningfully divided into those where word order is free (e.g., Turkish) and those where word order is in most instances rigid, such as Japanese. The former variety of languages we will call *word order/inflection orthogonal,* since word order will not predict which in-flections will appear, nor vice versa; the latter variety of languages we will call *word order/inflection correlational,* since (presumably to some measurable degree) word order is predictive of inflections, and vice versa. Slobin (in press) has des-cribed part of his data on children's acquisition of Turkish, and his data are com-parable to mine (Hakuta, in press) for Japanese, since both languages are SOV. Turkish children have no difficulty in comprehending sentences in any order; par-ticles in Turkish are highly regular (an acquaintance once told me that morpho-logy was invented to describe Turkish, or vice versa), and children apparently find it delightfully easy to learn. Japanese children on the other hand have tremendous difficulty with simple sentences that vary from the SOV order, with even 6-year olds not in complete control of OSV sentences.

What is it that gives the children so much difficulty? For one thing, OSV orders are not very common occurrences in speech except when the object is being high-lighted. However, it would seem that, had children simply incorporated the par-ticles as cues to the grammatical structure, the OSV order should be equally easy as SOV. Then, is it the case that children simply pay attention to word order? Statistically speaking, as in children learning English (a heavily word order-depen-dent language), Japanese children can go quite far by simply paying attention to the order. If they interpreted the first noun of the sentence as the subject, they will comprehend most sentences correctly.

It turns out that Japanese children do not pay attention solely to word order either. This can be demonstrated experimentally by taking advantage of the passive con-struction in Japanese. The passive can also appear in either the SOV or OSV order. Consider the following sentences:

Active/SOV	AGENT-ga	PATIENT-o BIT-active
Active/SOV	PATIENT-o	AGENT-ga BIT-active
Passive/SOV	PATIENT-ga	AGENT-ni BIT-passive
Passive/OSV	AGENT-ni	PATIENT-ga BIT-passive

The particle *-ga* marks the subject of both actives and passives, while *-o* and *-ni* mark the object for the two voices repectively. If children were paying attention solely to word order, then they should find the Passive/OSV equally easy as the Active/SOV. They do not. On the other hand, if they paid attention solely to particles, then they should find SOV and OSV orders of the active and passive sentences equivalent in difficulty. That is not the case either. In fact, what appears to be the case is that Japanese children create an expectation where they predict particles to appear in particular locations within sentences. Specifically, they seem to have a generalized scheme that "If the first noun of the sentences is marked by *-ga,* then it is the agent". For example, they erroneously interpret sentences such as the Passive/SOV in which the first noun is marked by *-ga* and take it to be the agent of the

action, when in fact it is the patient. They have homed in on the correlation between particles and the word order. Thus, as in English speaking children who systematically reverse the interpretation of passive sentences (Bever, 1970), we find that children learning Japanese apparently go through a period when they systematically reverse the interpretation of Passive/SOV sentences, since the first noun of this construction is marked by the particle -ga.

Thus, the emerging picture is as follows: children learning word order/inflection orthogonal languages naturally come to learn the importance of particles from the very beginning. Children learning word order/inflection correlational languages create an expectation to find this correlation, and neither the word order nor the inflection alone are sufficient conditions for sentence interpretation. This conclusion finds support in reports by Slobin (in press) for Serbo-Croatian, Segalowitz and Galang (1978) for Tagalog, and Roeper (1973) for dative and accusative inflections in German. It should be stressed that there is no a priori reason to have expected children to have created such a stringent condition for sentences, suggesting that the extent of correlation between word order and inflections is a dimension to which children are equipped to pay attention.

If word order/inflection correlation is an important part of the psychological make-up of the child, then it is likely that this dimension might be reflected in the way language universals can be stated. Unfortunately, no data on this dimenison is available, nor am I aware of any objective way at present to state the extent of correlation between these two parameters. It suggests, however, a dimension that might be kept in mind by linguists in the classification of languages.

Conclusion

The paper began with a meta-review of the field of psycholinguistics since the 1950's. Following a feverish romance with transformational grammar in 1960's, the psychologists have recently come to reject not just the particular versions of linguistic theory; there is a tendency for psycholinguists to disavow the entire relationship with the discipline of linguistics itself. It is not uncommon for interdisciplinary endeavors to result in mutual dismemberment, often due to emotional rather than rational factors.

Where does the linguistically-oriented psychologist now turn? I suggested that there are currently being developed new linguistic models that promise to make psychologists more comfortable. But models do change, and consumers of linguistics (myself included) often feel that by the time one has finally managed to learn the notations and system of a particular theory, it is outdated. George Miller (Note 1), serving recently in the role of a discussant in a symposium on developmental psycholinguistics, gave the following advice to the psychologist interest in pursuing linguistic models: "Hang loose, and be patient".

The study of language universals is particularly appealing in that the statements about cross-linguistic generalizations tend to resist paradigm changes within linguistics. Using examples from my own research (for egotistical reasons), I argued that the varibales defined by such study might serve the field as what might be

regarded as a theoretical midwife along which psychological processing of language might be viewed. In the course of doing so, I hope to have shown that the psychologist's study of cross-linguistic language processing can also suggest areas of inquiry for the linguist, and that the street runs in both directions in this iterative endeavor.

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