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## Abstract

Transformational grammar has elevated linguistic description from the statistical statement of regularities to a theory of a part of human knowledge, though the latter has been developed primarily by philosophers & psychologists rather than linguists. Linguistics itself is in great disarray at the moment, because it lacks shared conceptual assumptions about what a grammar is for. The notion of 'psychogrammar' is introduced; it is defined as the 'psychologically internalized representation of linguistic structure.' The question is that of when children acquire such a psychogrammar. A common view of language learning suggests that children acquire it relatively late; but it is hypothesized here that a psychogrammar exists before the age of 5, because it is needed to mediate between the emerging systems of speech production & perception. If it does not wither away by the age of 12, it is because it is functionally similar to the state seen in Marxist terms: it becomes entrenched in the mind & is the 'bureaucracy of linguistic life.' Psychogrammar is not the same as the systems of speech behavior (production & perception). Psychogrammar distinguishes between linguistic knowledge & behavior; with other systems it explains a variety of facts about linguistic intentions. In an adult, psychogrammar is redundant; it is the child who needs it in order to bring the systems of speech perception & production into alignment. It is also necessary in recording & simplifying material stored in memory. By the time the psychogrammar & the behavioral systems have decoupled (by age 15), learning a 2nd language becomes a different process.

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## PSYCHOLOGICALLY REAL GRAMMAR EMERGES BECAUSE OF ITS ROLE IN LANGUAGE ACQUISITION

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The revolution in linguistics in 1957 appeared to be a revolution about the theoretical form of grammar; the succeeding decade was filled with arguments against the descriptively inadequate taxonomic models and in favor of such distinctions as the one between deep and surface structure. The preoccupation with proselytization of the descriptive virtues of transformational grammar obscured a separate aspect of the revolution: the proposal that a grammar is a potential model of linguistic knowledge and cannot be bound by any specific set of discovery procedures. This represented a decisive break with the empiricist and behaviorist doctrines that had dominated linguistics for 25 years. It was of profound importance since it elevated linguistic description from the statistical statement of regularities in finite texts and corpora, to a theory of a part of human knowledge. Yet, this aspect of generative grammar was attended to primarily by philosophers and psychologists. Linguists immersed themselves in the technical (and comforting) questions concerning specific formal mechanisms, and ignored questions about the purpose of linguistic investigation. In this way, an intellectual generation of linguistic technicians has been spawned and trained: they understand what to argue about in linguistic description, but do not understand why it is important to argue correctly.<sup>1</sup>

It is no revelation to an audience of linguists that the field is in great disarray at the moment. There are as many revisions of transformational grammar as there are self-proclaimed theorists.

Some researchers even question whether the domain of grammar is itself a discrete part of language structure. Arguments and theories slip past each other because of the lack of shared conceptual assumptions about what a grammar is for: we are paralyzed by the frenzied virtuosity of our scholastic momentum, which generates a counter-argument for every technical proposal.

I think that the philosophical arguments against the despair of fictionalist and encyclopaedic views of grammar are overwhelming, and I am among those who have defended the rationalist and interactionist position. In the present discussion I shall focus on the psychological role that a grammar plays in language learning, remind you of some direct evidence that children and adults represent linguistic knowledge separate from language behavior, and propose a model for the notion of a 'critical' period for second language learning. The essentials of my argument parallel a marxist-structuralist interpretation of the persistence of the state after the conditions that formed it are removed. That interpretation runs like this:

- (1) A. The state emerges as the vehicle to regulate conflict between classes as they emerge in economic behavior.
- B. If class conflicts are removed or the classes are separated, the state should wither away.
- C. If it does not, it can be because of the entrenchment of the bureaucracy that has developed--the regulatory functions of the state persist even when they are no longer needed.

I wish to apply this kind of argument of the notion of a 'psychogrammar'. A psychogrammar is (by hypothesis and definition) the psychologically internalized representation of linguistic structure. In this sense a psychogrammar can be distinguished from a grammar. A grammar describes what a language is. The psychogrammar describes an internalized representation of the grammar that is a model of neither speech perception nor production, but a representation, in part, of what those skills imply. It may turn out that the psychogrammar is strongly equivalent with current grammars: I set up the concept for this discussion to avoid claiming 'psychological reality' for any particular linguistic grammar. Rather, I wish to explore the implications of the claim that some psychogrammar exists.

The basic question is: when does the child acquire the psychogrammar? A common view of language learning suggests that the psychogrammar is acquired at a relatively late age--around five years. On this interpretation, the younger child has no 'need' for a grammar. It communicates by using primitive, but effective,

habits of comprehension and talking. Since the adult environment is highly tolerant of mistakes and ungrammatical utterances, a grammar is not required. Around age five years, the child cannot refrain from using its abstracting capacities to construct a psychogrammar that represents what is shared between speech production and perception. It is useful in refining our linguistic capacities and simplifying the storage of linguistic knowledge. On this view, psychogrammar is one of the responsibilities of growing up and one of the joys of maturity.<sup>2</sup>

It is the hypothesis of the present discussion that this view is exactly wrong. Rather, the reason that a psychogrammar exists is because of the vital role it plays during language acquisition, much of which occurs during the first five years of life. The psychogrammar is needed during that period to mediate between the systems of speech production and perception. It is the internal translator that regulates conflicting capacities which arise as each of the two systems of speech behavior develop separately; if one system gets ahead of the other, the psychogrammar can equilibrate their capacities. The parallel between this and the description of the evolution and persistence of the state should be clear.

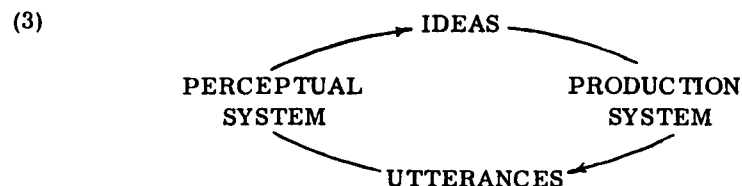
- (2) A. The psychogrammar emerges as the vehicle to regulate conflicts between the capacity of language systems as they emerge in speech behavior.
- B. If such conflicts are successfully equilibrated (as they are by age 12), then the psychogrammar should wither away.
- C. If it does not, it can be because of the entrenchment of the mental system of the psychogrammar that has developed--the regulatory functions of the psychogrammar persist even when they are no longer needed.

Accordingly, the psychogrammar is not a joy of adulthood, but a burden, an adventitious relic left from a dozen years of language learning. Like the state, it does not disappear after its usefulness has passed, because it is so entrenched as a mental system: the psychogrammar is the bureaucracy of linguistic life. In the next few pages I outline the evidence demonstrating this, and attempt to explain why it should be.

#### Adult speech perception and production

The fundamental mental activity in using speech is to relate inchoate ideas with explicit utterances. The direction of this mapping characterizes the difference between speech production

and perception. The main question is whether the two systems are the same one, running in opposite directions, or whether they use different processes and are independently represented in behavior.



There are three kinds of considerations supporting the view that these two systems can operate independently of each other: the needs of the speaker are opposite to those of the listener; preliminary experiments suggest the systems use different kinds of behavioral processes; there are empirical examples of sentences that are unusable productively but not perceptually, and vice versa.

Consider first the conflicting needs of the speaker and listener. The listener optimally requires that the internal grammatical and semantic relations be explicitly marked in the surface sequence. This would make the perception of the sentence homonymous with the recognition of the surface elements--no further processing would be necessary. The needs of the speaker are the converse of explicitness: the optimal situation for the speaker would be one in which each utterance could consist of a single monosyllabic grunt, which the listener would always interpret correctly.

Actual utterances clearly strike a balance between these two extremes. It would be a mistake to draw direct conclusions about the nature of the psychogrammar from the behavioral balance between speech perception and production. However, the conflicting constraints on optimal utterances do suggest that the behavioral systems themselves could differ internally. This possibility is supported by the current empirically based theories of perception and production. The data on these systems are unfortunately meagre (less than a hundred published studies). However, the most salient difference between perception and production is that the major planning unit differs: for the speaker it is something close to the 'surface structure clause', while for the listener it is something close to the 'deep structure sentoid'. The reason for this is not obscure: the speaker's problem is to find a mapping of a given, unconscious idea (relatively close in form to a deep sentoid) onto a compact but comprehensible explicit surface sequence. The listener's problem is to discover the underlying sentoids intrinsic to each utterance.<sup>3</sup>

Thus, the different goals of speaker and listener lead to different organization of the mapping process. It follows from this difference

that psychological processes of production and perception must differ, at least in part. That is, it is not the case that for every process of speech production there corresponds an isolable process of speech perception that is its inverse. It remains to be seen how much the two systems differ: even our current rudimentary knowledge indicates that there are some differences. That is, the systems are independent, at least in part.

Finally, we can isolate in our everyday speech behavior examples of sentences that we can understand but could not say ourselves, and sentences we can say but could not understand if somebody else said them. This, too, is *prima facie* empirical evidence supporting the behavioral distinctness of the two systems. Sentences that others say that we do not understand are all too common, and need no examples. But, by the same token, sentences that we utter that others do not understand are equally common. While this in itself does not prove that the systems are independent entities, it does show that running the idea-utterance mapping in one direction is not behaviorally equivalent to running it in the opposite direction.

These three kinds of arguments, general, technical, and anecdotal, support the claim that the systems of speech perception and production are independent entities in the adult mind. We understand utterances using one system, and speak using the other. This raises the question of the motivation to postulate a psychogrammar as part of the mental representation of language. There are already two systems for pairing ideas and utterances which combine to provide bidirectional mappings. Why, then, do we postulate a psychogrammar as a separate mental entity?

#### The psychogrammar and speech behavioral systems

There are three sorts of considerations supporting the distinction between a psychogrammar and the systems of speech behavior: it renders the distinction between linguistic knowledge and behavior; it combines with other linguistic systems to explain a variety of facts about linguistic intentions; there are critical examples of sequences that are intuitively well-formed but unusable, and vice versa.

Consider first the role of the psychogrammar in defining linguistic knowledge. The distinction between linguistic knowledge and language behavior arises initially out of the logical possibility that there is a distinction between what we 'know' and what we 'do'. At first such a distinction may seem obscurantist, especially to the empiricist. However, the postulation of this distinction is by no means unique to a 'higher' abstract function like language. Rather, some of the most basic areas of psychological research find it necessary to postulate this distinction. For example, consider the T-illusion in which we

'know' that the horizontal and vertical lines are equal in length, but we can 'behave' as though the vertical line were longer (this extends both to the perceptual judgment and to the production of a drawing of the lines). Indeed, it is characteristic of illusions that they involve this kind of contrast, and it is for this very reason that the study of illusions has been central to psychology.

We may take the position, as does Piaget, that the distinction is between two kinds of knowledge ('operative' and 'figurative').<sup>4</sup> Or, like others, one could argue that the two ways of observing illusions are really due to two kinds of behavior (e.g. 'measuring' vs. 'estimating'). Whichever view one holds, the fact remains that the distinction is maintained, and that both ways of dealing with the stimulus are assumed to be psychologically real.

This in itself does not prove that there is such a distinction in the case of language. It does, however, establish a precedent in one of the most fundamental areas of psychological study: the postulated distinction is not unique to research in language. If one turns to this research one finds two kinds of empirical arguments supporting the claim that there are two kinds of representations of language--the behavioral systems governing speech behavior and the psychogrammatical representation of linguistic knowledge.

The first is a technical argument resting on the fact that assuming the existence of a psychogrammar allows us to explain a variety of facts about linguistic intuitions and aspects of language. It allows us to investigate and sometimes to answer which kinds of language universals are due to psychogrammatical constraints and which are due to other systems of speech behavior. Essentially, this argument is the claim that if one assumes a distinction between 'competence' and 'performance' (rendering the distinction between linguistic knowledge and language behavior), one can explain a variety of facts about language.

I think that the achievements of this approach have been prodigious and justify the distinction in themselves. I freely grant, however, that such an argument smacks of methodological sermonizing; the indirectness of the argument lacks full convincing power. A more direct argument for the distinction between a psychogrammar and speech behavior systems is the existence of empirical evidence that the two kinds of mental structures are independent. The crucial data are sequences which are intuitively well-formed but unusable, and sequences which are usable but intuitively ill-formed. These cases illustrate that behavioral usability and intuitive well-formedness do not overlap completely, showing that each is accounted for by (at least partially) independent mental representations.

The significance of sentences that are unusable but intuitively well-formed has long been recognized. A classic example of this is

a center-embedded sentence such as (4).

- (4) The dog the cat the cricket chirped at miowed at barked at.

Upon ratiocination one can appreciate the fact that such sentences are a combination of singly embedded ones like (5) and (6).

- (5) The dog the cat miowed at barked at me.  
(6) The cat the cricket chirped at miowed at the dog.

Thus (4) seems intuitively well-formed, but is obviously unusable. Furthermore, the fact that (4) is well-formed is demonstrated by the fact that a structurally identical sentence like (7) is completely usable.

- (7) The reporter everyone I met trusts had predicted Thieu's resignation.

Something about (4) (perhaps the homogeneity of the nounphrases and verbphrases) is impossible for the behavioral systems to manage. Such cases show that the domain of structural well-formedness can exceed that of behavioral usability.

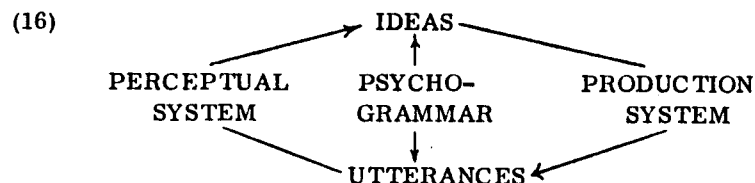
A separate set of cases shows that the domain of usability can exceed that of well-formedness. Consider the cases below, which are all taken from actual observations.

- (8) That's the first time anybody ever sang to me like that before.  
(9) I really liked flying in an airplane that I understand how it works.  
(10) Everyone forgot their coat.  
(11) Either you or I is crazy.

Each example is perfectly usable, perfectly utterable, and comprehensible. But each is also intuitively ill-formed. This intuition can be backed up by showing that there are structurally identical sequences, differing only in a critical word, that are completely unusable (or at least would not be used) e.g. (12)-(15). This demonstrates that the original intuition of structural oddness was correct, but that specific properties of (8)-(11) make them usable.

- (12) \*That's the second time anybody ever sang to me like that before.  
(13) \*I really liked flying in an airplane which I understand how it works.  
(14) \*Harry forgot their coat.  
(15) \*Both you and I is crazy.

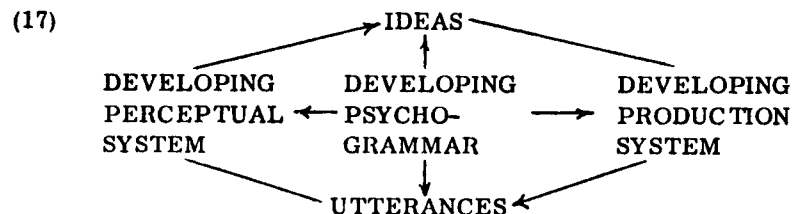
These three arguments--general, methodological, and empirical--support the claim that the psychogrammar and the systems of speech behavior are independent in the adult mind. That is, the schematic outline of the representation of language is like that in (16), not (3).



As adults, we have two separate ways of mapping ideas and utterances, through the psychogrammar, or through the conjunct of the systems of speech production and perceptions. Clearly the psychogrammar exists in the adult, and yet clearly it is redundant for language behavior. Why do we have it?

#### The psychogrammar in language learning

The answer lies in the language-learning child. A child is acquiring two fundamental language abilities, the ability to talk and the ability to understand--that is, the child is acquiring a system of speech production and perception. Since these systems are behaviorally independent in the adult, we might expect them to be learned independently in the child: on this view the role of the psychogrammar is to translate internally between the systems of production and perception, and thereby to build up a representation of what is implied by their conjoint operation. That is, the schema for the language-learning child is like that in (17), rather than (16).



There are three kinds of arguments supporting this view of language acquisition. The psychogrammar provides the behavioral systems with an otherwise unavailable specification of linguistic universals and behavior-free record of what has been learned so far; there is evidence suggesting that the systems of speech perception and production are learned separately, thus requiring the

psychogrammar to bring their capacities into alignment; anecdotal data suggest that young children are aware of the disparity between the way they talk and the way they think they ought to.

The first argument is primarily in the form of a formal justification of why the scheme outlined in (17) must be true of the language-learning child. The emerging psychogrammar serves two functions. First, it provides the emerging behavioral systems with an input vocabulary (e.g. 'noun, distinctive feature, tree structure') which gives the behavioral systems a common set of objects to work with. The richness of the initial vocabulary is an open, hopefully empirical, question. Whatever the answer, there must be some initial internal language common to the systems of perception and production. Otherwise, they might never map the same kind of structures for the same kind of idea-utterance pairs.

A second role for the emerging psychogrammar is to record and simplify the amount of memorized material. Very early in language learning each new utterance can be memorized; but as the number increases, the load on memory can be eased by the application of a grammatical organization (given that humans are predisposed to learn grammars at all). Accordingly, the grammar can become a repository for accumulated perceptual and production patterns applying its own organizational reductions to them.

It should be clear from these two proposed functions of the psychogrammar that I am suggesting that it develops in part because of its functional role in equilibrating the independently developing systems of speech perception and production. The heart of the problem is this. If a child learns to understand a new construction (however such 'learning' occurs) how does this become transported to the production system? Conversely, if the child tries out a new speech production process (based on the schemata acquired thus far) and decides it is successful, how does that new knowledge become transported to the perceptual system? It is the role of the psychogrammar to maintain the perceptual and production capacities similar to one another.

Crucial evidence on this point is the fact that the perceptual and production systems develop separately and with different capacities: thus we have initial evidence that what the child says and understands can differ during language acquisition. For example, at around age three the (English-speaking) child shifts its perceptual strategies so that the first noun in a clause is regularly interpreted as the actor. (Earlier in life it was any noun immediately before the first verb.) This shift in a perceptual process is not accompanied by any marked change in what the child utters--indeed, that particular strategy characterizes the speech production pattern of the much younger child.<sup>5</sup>

Considerably further study is needed to demonstrate that the perceptual and production capacities leap-frog one another during development. In particular, there are very few children who have been longitudinally followed with systematic investigation of both speech production and perception. Nevertheless, the preliminary evidence suggests that these systems do develop separately, thus requiring some internal mechanism to equilibrate them; by hypothesis that mechanism is the emerging psychogrammar.

The final argument supporting the schema in (17) is anecdotal evidence that children themselves are aware of the distinction between their own language behavior and what they 'ought' to say. Consider the following true anecdote. It shows that the child says an incorrect form (goed) that it recognizes to be 'wrong'.

- (18) Child: Mommy goed to the store.  
 Father: Mommy goed to the store?  
 Child: No, Daddy; I say it that way, not you!  
 Father: Mommy wanted to the store?  
 Child: No!  
 Father: Mommy went to the store.  
 Child: That's right, Mommy wen . . . Mommy goed to the store.

Since it cannot produce the right form (at this stage) and understands both correct and incorrect forms, where does the child 'represent' the distinction between the 'right' and the 'wrong' way to say it? A psychogrammar would be the repository of such knowledge. Such anecdotes are common enough to lend initial plausibility to this interpretation (the same child was involved in a similar discussion of the utterance 'mazagine'), but obviously require further study.

These three arguments support the claim that the psychogrammar exists as a mediator between the emerging systems of language behavior: it provides linguistic universals and records accumulated linguistic knowledge; it equilibrates the systems of speech perception and production as they leapfrog one another; and it accounts for the anecdotal evidence that even the young child is aware of the distinction between linguistic knowledge and behavior.

In brief, the psychogrammar serves the function of being the mental 'language' in which the speech perception system and the speech production system communicate: it provides a mental vehicle for translating a perceptual schema into a production capacity with the net inverse effect, and vice versa; when a new perceptual schema is learned, the psychogrammar essentially is a transducer which can translate from one domain of the child's capacity to another. In that sense, it regulates the conflicts between those two separable emerging

capacities. The psychogrammar is the bureaucratic manager of the child's acquisition of language abilities. By the time we are adults the systems of perception and production are in almost complete register: we no longer need the psychogrammar to serve the function of an internal mental language. But by that time it has become thoroughly entrenched as an independent representation of the mapping between ideas and utterances. Like the systems of perception and production, its internal structure leads to slightly differing mappings, although they are without consequences for adult behavior.

#### Decoupling of systems and the critical period for second language learning

Before closing, I wish to point out the implication of this view of first-language learning for a 'critical period' in second language learning. Suppose that the developed systems of speech perception and production become functionally autonomous in the adult. That is, suppose the schema appropriate to the adult representation of language is that outlined in (16); on this view the psychogrammar and the behavioral systems have decoupled (by age 15 years). Learning a language after this point may well be possible, but it now will proceed in a manner fundamentally different from that at a younger age. The problem now is to map each of the distinct first-language behavioral systems onto the corresponding systems in the second language in partial independence of each other. This is not only likely to make the job of learning a language more difficult; it will certainly make it more disjointed.

There is little research on second language learning that would bear on this interpretation of second-language learning after age 15. We have found some evidence suggesting that the acquisition pattern of perceptual capacities is the same in 7-year-old children learning English as a second language as it is in 2- to 4-year-old children learning English as a first language. But the pattern differs dramatically in 15-20-year-old people learning English as a second language. It is not a disorderly development pattern at this age, but it is different.<sup>6</sup>

#### Conclusion

I have sketched an argument about the role of a psychogrammar which draws on a rationalist view about the nature of knowledge and behavior. The general view is that the mind is composed of partially distinct systems which interact with each other, relying in part on internal languages to translate from one capacity to another and to regulate differences in internal capacities that bear on the same class

of external behaviors.<sup>7</sup> A psychogrammar is an example of such an internal communication and regulating system. It regulates the relations between the emerging system of speech perception and the emerging system of speech production. Children need the psychogrammar for this purpose and they need to elaborate it as the other systems become more complex. Adults do not need it anymore, but we are stuck with it. It simply refuses to wither away.

#### NOTES

1. A discussion of these issues is found in J. Katz and T. Bever, 'The Fall and Rise of Empiricism.' This is to appear in: T. Bever, J. Katz, and D. T. Langendoen, An Integrated Theory of Linguistic Ability, T. Y. Croll Press (in press).

2. This point of view is implicit and explicit in a number of writers. To avoid blaming others I cite only myself: T. Bever, 'Associations to Stimulus-Response Theories of Language.' Verbal Behavior and General Behavior Theory, T. R. Dixon and D. L. Horton, eds., Prentice-Hall, Inc., 1968.

3. For reviews of the literature on speech perception and production see J. Fodor, T. Bever, and M. Garrett, The Psychology of Language, McGraw Hill, 1974, Chapters 6 and 7. See also T. Bever, J. Carroll, and R. Hurtig, 'Speech Production, Perception, and the Formalization of Linguistic Analogy.' This is to appear in T. Bever, J. Katz, and D. T. Langendoen, An Integrated Theory of Linguistic Ability, T. Y. Croll Press (in press).

4. See his The Mechanisms of Perception. London, Routledge and Kegan Paul, 1969.

5. See T. Bever, 'The Integrated Study of Language.' In: J. Morton, ed., Biological and Social Perspectives in Language, Logos Press, 1970, 158-206. These findings have been replicated by M. P. Maratsos, 'Children Who Get Worse at Understanding the Passive: A Replication of Bever.' Journal of Psycholinguistic Research, in press, and S. G. DeVillieus and P. A. DeVillieus, 'Development of the Use of Word Order in Comprehension.' Journal of Psycholinguistic Research, in press.

6. See T. Bever, P. Denton, E. Nam, and J. Shallo, 'Second Language Learning and Perception' (in preparation), for a discussion of this.

7. For discussions of this point of view see T. Bever, J. Katz, and D. T. Langendoen, An Integrated Theory of Linguistic Ability, T. Y. Croll Press (in press); T. Bever, 'The Psychology of Language and Structuralist Investigations of Nativism.' In: Gilbert Harman, ed., On Noam Chomsky: Critical Essays, Anchor Press, 1974, 146-164; and T. Bever, 'Some Theoretical and Empirical Issues that

Arise if We Insist on Distinguishing Language and Thought.' This is to appear in D. Aaronson and R. Rieber, eds., Proceedings of the New York Academy of Science Conference on Psycholinguistics, January, 1975.