

SECOND THOUGHTS ON SARAH'S FIRST SIGNS

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It has become increasingly popular in recent years to investigate the ability of non-human primates to learn human languages; the most persistent and successful such attempts have involved teaching chimpanzees certain sub-classes of English. Early studies¹ were unsuccessfully devoted to encouraging a rather temperamental infant, Viki, to speak the language, but subsequent anatomical investigations showed that such failures would be the rule: the pharyngolaryngeal structures required for human speech were found to be absent in Viki and ilk. Taking their cue from the methodological limitations disclosed by those earlier attempts, the Gardners² taught their chimpanzee, Washoe, American Hand Sign Language, in which she was able to "spontaneously" produce several well-formed English expressions. Most recently, Premack's³ Sarah has surpassed these achievements in a linguistic system in which arbitrarily marked plastic pieces stand for words: Sarah is reported to have mastered certain rudiments of English grammar, to answer and formulate questions, to distinguish use and mention, to properly manipulate quantifiers in a wide range of expressions, and to handle certain logical operations. What the limits of such performances are is regarded at present by most researchers as an open question.

Though all of these investigations are of intrinsic interest, their results have been taken to imply consequences of a far wider theoretical scope. Every newly reported advance in English competence by non-human primates has been taken as evidence threatening the thesis that humans are programmed from birth with quite specific, structured aspects of natural language, among which are an active-passive distinction, a transformational grammar, linguistic categories such as concrete noun, verb taking an abstract subject, and so on. Philosophers, sensing dispute in this issue, were not long in contributing their own confusions; recently, Professors Margaret Atherton and Robert Schwartz⁴ produced a critical survey of these alleged relations between linguistic innateness and the use of human language by non-humans. Their view of such claims is straightforwardly skeptical: not only are extant formulations of connections between linguistic species-specificity and innateness false or implausible,

they argue, but also every version of the innatist theory proper is too metaphorical to render any claim about a connection between specificity and innateness intelligible.

None of the arguments they present in support of these criticisms, I wish to argue in this essay, are conclusive in the sense they desire: each will be reviewed and in turn shown to refine, rather than refute possible connections between linguistic innateness and specificity.

The first formula linking linguistic innateness and species-specificity that Atherton and Schwartz consider holds that competence must be present at birth, for the experience of the linguistically competent organism radically underdetermines observed performance, and little else can be invoked to explain the facts of language acquisition. Such a formulation achieves clarity at the expense of veracity, Atherton and Schwartz rejoin, for surely no humans speak at birth. Moreover, the veracity of the formula, they assert, cannot be saved by revising it to hold that humans acquire the content of language through some process like maturation; for "if it is false that humans come into the world equipped with a natural language, it is equally plainly false they will develop one without a rich experience of a linguistic sort." Thus the connection between the linguistic species-specificity and innatism cannot be cogently articulated if such a tie implies that humans are linguistically competent at birth.⁵

Whatever shortcomings this criticism may possess, it must surely be conceded that any theory, whether innatist or not, which implied that humans were capable of speech at birth would just be silly. But beyond this, it is hardly so clear that no account of maturation could articulate the desired details of an adequate formulation of possible connection between linguistic innateness and species-specificity. For Atherton's and Schwartz's view could not appeal to a generally accepted account of maturation: we can imagine human skills which do require time for maturation, yet clearly possess an innate element. Studies on infants have shown, for example, that directed grasping for material objects not contiguous with the body occurs spontaneously from birth, though competence is achieved only through much practice. Furthermore, apart from this difficulty, it surely does not follow, contrary to what Atherton and Schwartz claim, that if it is false that humans come into the world equipped with a natural language, then it is false that they will develop one without a rich linguistic experience. Thus, their objection to the "maturation" characterization simply fails.

Nevertheless, assuming the failure of the "maturation"

explication to articulate a plausible tie between linguistic innateness and species-specificity, Atherton and Schwartz proceed to review and reject yet a second characterization of that connection. According to this view, they claim, the relation between specificity and innateness is akin to imprinting in animals: the organism's experience triggers an innately programmed species-specific behavioral response. But though on this view experience does play a role in shaping what is acquired in behavioral development and thus avoids the commitment of the "maturation" formulation that every aspect of linguistic behavior must be present at birth, it does so only, they insist, in the sense of "filling in some pre-existing set." More precisely, characteristic of imprinted behavior is its incorrigibility: once acquired, no matter how inappropriate the object, the behavior is fixed. But this degree of incorrigibility, they rightly continue, is not characteristic of linguistic behavior. Thus, the "imprinting" explication of the alleged relation between linguistic species-specificity and innateness also fails.⁶

Though in favor of this objection it must surely be granted that the way in which children acquire language is in some sense quite flexible, the argument has taken the duckling for the duckpond. For no one would imagine human linguistic behavior to possess the degree of inflexibility in some sense involved in, say, the behavior of young mallards. But surely one can hold that some features of imprinted behavior, if that is the appropriate articulation of the tie between the innatist thesis and species-specificity, admit of degrees. For example, while the "parental object" which greylag geese follow is rigidly fixed by imprinting early in their lives, the paths through which these birds move to follow the "parent" are apparently infinitely variable. Indeed, perhaps some purchase on the relation between the species-specificity and innateness of language might thus be extracted from the imprinting analogy by allowing the fixed part of imprinted behavior to stand for a particular natural language the child learns, while allowing variations in the means by which the organism relates to the imprinted object to correspond to the novelty and creativity in the production of expressions the child manifests within that natural language. What the criticism of the "imprinting" analogy establishes, then, is not that language acquisition is not like imprinting in any interesting sense, but rather, and trivially, that linguistic behavior merely is in some sense not as inflexible as part of the imprinted behavior of some species.

In spite of failing to exhaust the imprinting model of its possible promise, Atherton and Schwartz proceed

to reject yet a third characterization of the way in which linguistic innatism and species-specificity might be connected. People have, they claim, argued that the slowness with which chimpanzees acquire human language suggests that these creatures require something very different from what human children need in linguistic experience to achieve competence. But though this formulation avoids the problematic commitment to the "rigidity" of linguistic behavior characteristic of the "imprinting" explication, the fact that chimpanzees acquire language more slowly than humans does not "entail,"⁷ Atherton and Schwartz rightly insist, that humans do not learn language or that language acquisition is like imprinting. So long as we take a balanced view of language acquisition, they maintain, it would be false to say that no learning is involved in such behavior. But this means, they then conclude, that if innatism is to be an intelligible account of language development it must be seen as "part and parcel of some learning theory."⁸ So construed, however, the innatist thesis is no longer language-specific, and hence cannot provide rational grounds for establishing a tie between linguistic innateness and species-specificity.

Even if one concedes with this objection that the difficulty with which chimps acquire human language does not entail a link between the species-specificity and innateness of language, it simply does not follow that any plausible formulation of the innatist hypothesis is just part of some learning theory, contrary to what Atherton and Schwartz maintain. For it does not follow from the claim that learning is somehow involved in part in language acquisition that there is no innate element in such development. Thus their objection to the "facility" characterization of possible relations between linguistic species-specificity and innateness fails to strike its intended target.

Assuming, nevertheless, the failure of the "facility" characterization to link specificity and innateness, Atherton and Schwartz's argument then takes a new and much stronger tack. However an adequate theory of the relation between linguistic species-specificity and innateness might be formulated, they rightly argue, no intelligible connection between the two can be articulated unless the innatist theory itself is intelligible. But no such formulation, they try to show, exists. For the only extant version of the innatist thesis holds that innate mental structures provide a "form" of language whose presence is felt as a restriction on the types of languages that can be learned with ease. Such a claim, they counter, is not even testable, and furthermore is

shown false by the fact that humans obviously do learn artificial languages such as codes, ciphers, logical calculi, and so on. Thus, if on the innatist view the relation between the innate and learned elements of language acquisition implies that humans cannot learn artificial languages, the innatist theory itself is false, and hence cannot plausibly provide rational grounds for rendering the connection between species-specificity and linguistic innateness intelligible.⁹

Now whatever difficulties this criticism might possess, it is clear that any account of language acquisition on which the human use of artificial languages was impossible, would be too demanding to seriously entertain. Beyond this, however, the "acquirability" criticism is cogent only if every innatist theory implies the impossibility of human mastery of artificial symbolic systems. Yet the ease of mastery of languages can surely admit of degrees. If so, all the innatist has to hold to make his claim both interesting and testable is that there is a detectable difference between the ease with which humans learn natural languages having some independently identified universal form and the ease with which they learn artificial systems lacking that form. Thus the objection to the "acquirability" version of the innatist thesis is too narrow to impugn nativism in general.

Assuming, then, the failure of the "acquirability" version of the innatist view, Atherton and Schwartz consider a less demanding formulation which holds that the roles the learned and innate elements play in language acquisition are to be described in terms of "hypotheses" which the language learner "tests" against experience. Learning a language is seen as "acquiring a set of hypotheses" about the appropriate grammar for the linguistic "evidence" the language learner encounters. Since the experience which the learner has underdetermines his choice of "hypotheses," Atherton and Schwartz correctly conclude, there must be some innate contribution to linguistic development. Such a view, though free of the restrictions implied by the "acquirability" version of the innatist theory, they maintain, is, having obviously derived from the jargon of studies in inductive logic, metaphorical, and hence, cogent only if the metaphor can be clearly articulated in empirical terms. But all attempts to date, they claim, to articulate this metaphor, even though it seems to contain something essentially correct, possess their own difficulties. For, stripped of the baggage the metaphor carries from the jargon of inductive logic, all that the innatist can be asserting, they insist, is that something involved

in learning a language is innate. But this does not distinguish learning in general from learning a language in particular, and hence cannot provide grounds for articulating any interesting connection between linguistic species-specificity and innateness.¹⁰

This criticism poses, in contrast to its predecessors, a serious difficulty for the assertion that there is some cogent tie between linguistic species-specificity and innateness. For it rightly and fairly demands that if this connection is to be intelligible, the innatist must produce: (1) an empirically testable model of the language-specific elements involved in language acquisition; and (2) an account of the evidential connection between species-specificity and innateness of language in terms of this model. Though Atherton and Schwartz claim that no such account will be found, I am considerably less pessimistic: in the remainder of this essay I would like to describe a model I think satisfies their demands.

The model.¹¹ Linguists have traditionally recognized three elements individually necessary and jointly sufficient for the production and understanding of language: a syntactic component, consisting of the grammatical form of that which is produced or understood; a semantic component, consisting of the meaning of those expressions; and a phonological component, consisting of the physically identifiable features of their spoken form. Accordingly, it will be assumed in this model that an adequate theory of linguistic behavior aims at producing ordered triples, called linguistic descriptions of sentences whose entries are, respectively, the syntactic, semantic, and phonological components of those sentences. For the sake of convention and parsimony, the elements of the phonological and semantic components will be taken to be functional images of elements of the syntactic components. The syntactic component will be regarded as essentially a set of rules which specify the infinite class of formal structures assumed to underlie the sentences of the language. Such structures will be taken to consist of strings of minimally syntactically functioning elements [formatives] specifying the syntactic properties of sentences. To each such string one or more descriptions, called structural descriptions, indicating the syntactic relations of the elements of the string to each other and to the sentence will be assigned.

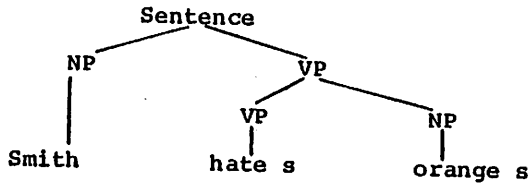
The class of syntactic components will be taken to consist of two major subparts which will be distinguished by the kinds of rules they respectively contain. The initial, or phrase-structure subcomponent will contain a finite set of rules which operate only on strings of

symbols. Each such phrase-structure rule will operate on a given string by replacing a single nonnull symbol in that string by a fixed nonnull string distinct from, and not containing, the initial, rewritten symbol. For example, a simple set of phrase structure rules might look like

- (1) Sentence \rightarrow Noun Phrase+Verb Phrase
- (2) Noun Phrase \rightarrow Smith
- (3) Noun Phrase \rightarrow orange+s
- (4) Verb Phrase \rightarrow Verb Phrase+Noun Phrase
- (5) Verb Phrase \rightarrow hate+s

Such rules permit the construction of derivations: finite sequences of strings of formatives, beginning with the initial sequence of the grammar #Sentence# [where # is the symbol for a sentence boundary]; each successive line will be formed by the application of one rule to one symbol in its immediate predecessor. One of the derivations produced by the above rules, for example, consists of the sequence [with boundaries omitted]: [Sentence, Noun Phrase+Verb Phrase, Smith+Verb Phrase, Smith+Verb+Noun Phrase, Smith+hate+s+Noun Phrase, Smith+hate+s+orange+s]. It will frequently be convenient to represent these derivations in the form of tree diagrams, or P-markers. With the above sentence and derivation, for example, the P-marker shown in Diagram I can be associated:

Diagram I.



P-markers formally capture the notions of "grammatical category," "part of speech," and "immediate constituent structure," for in the last line of each derivation each substring of symbols s is uniquely traceable back to some node X in such a fashion that "s is [a member of the category, or the immediate constituent] X." For example, in (I) Smith is a Noun Phrase; hate+s+orange+s is a Verb Phrase. Given these conventions, then, the range of the phrase structure subcomponent of the syntactic component is a finite set of P-markers, each describing the constituency relations among the words that compose the sentences met in actual linguistic experience.

The rules of the second part of the syntactic component, the so-called transformational subpart, will be taken to operate on the P-markers produced by the phrase-

structure component and derive new P-markers. Accordingly two kinds of P-markers will be distinguished in terms of the rules with which they are derived: Those whose derivations involve only phrase-structure rules, and those which are derivable only with the help of one or more transformational rules. The former structural descriptions will be called underlying P-markers, and the latter, derived P-markers.

In the idiom of this model, then, two notions can be distinguished: observable features of a sentence, and unobservable features of a sentence. An unobservable feature of a sentence S is any feature of S which is implied by a description of S's underlying P-markers or their phonological or semantic images. Correspondingly, an observable feature of a sentence S will be defined as any feature of S which is implied by S's underlying P-markers or their phonological or semantic images.

In terms of these distinctions, then, the innatist argument can now be quite sharply formulated. First of all, it will be assumed that every non-innatist account of language acquisition must explain language learning solely in terms of the "explicit" features of a given language. More precisely, it will be assumed that non-innatist theories of acquisition hold that the operations involved in language learning must be analyzed strictly in terms of correlations between what is required in the understanding and production of sentences and information explicitly available in the phonetic or orthographic representations of those sentences. In terms of the above model, this means that one of the fundamental assumptions of any "associative" theory of linguistic behavior is that what is acquired in language learning may be regarded as at best analyzable into elements each of which have been associated with observable constituents of sentences in the language. If it could be shown that for certain semantic or syntactic elements in some sentences there are no observable features with which these essential elements could be associated, it would have been shown that the information available to a language learner is too impoverished for appropriate linguistic behavior to have been derived by associative operations alone.

It will now be argued, accordingly, through a series of examples, that the observable features of sentences do not, and could not adequately specify all syntactic and semantic information necessary for the production and understanding of sentences. In terms of the above model, this task is equivalent to showing that the phrase-structure part of the class of syntactic components of linguistic descriptions and their semantic and phonological images are inadequate to capture what is involved

in understanding or producing sentences of some natural language. For the sake of brevity in these examples let us call a restriction of a realization of the above model to its phrase-structure subpart and its corresponding semantic and phonological images, a context-free phrase-structure grammar, or CFPSG, for short.

Now first of all, it can easily be shown that CFPSG's cannot capture ordinary English conjunctions. Consider, for example

- (1) Leibnitz and Locke argued through the night.

To handle (1) a CFPSG will have to contain rules like

- (2) $NP \rightarrow NP \text{ (and) } NP$

where "NP stands for the linguistic category "noun phrase." Though rules like (2) can generate conjunctions of any length, they cannot articulate structural descriptions of all conjunctions correctly; for example, consider

- (3) Leibnitz, Locke, and Lakoff argued through the night.

In (3), the three proper nouns in the subject are parallel, i.e., the correct structural description of (3) should contain a branch which looks like

- (4)
- ```

 |
 NP
 / | \
Leibnitz Locke Lakoff

```

But if (2) is the only rule handling conjunctions, the only configurations assignable to the subject of (3) will look like

- (5)
- ```

      |
      NP
     /  \
Leibnitz NP
         / | \
Locke (and) Lakoff
  
```

or

- (6)
- ```

 |
 NP
 / \
 NP |
 / | \ Leibnitz, Locke, and Lakoff
Leibnitz, Locke, and Lakoff

```

which respectively correspond to the sentences

- (7) Leibnitz argued through the night and Locke and Lakoff argued through the night.
- (7') Leibnitz and Locke argued through the night and Lakoff argued through the night.

But obviously (7) and (7') are not renderings of (3). The correct structural description of (3) could be obtained if the following rule were available

- (8) NP→NP, NP, (and) NP.

Unfortunately, there is no limit to the number of noun phrases that can be conjoined in such constructions and hence a CFPSPG adequate to English would have to contain an infinite number of rules to generate them with the right structural descriptions. But by definition, no CFPSPG can contain more than a finite number of rewriting rules.

There is yet a second difficulty for constructing a CFPSPG for English. In certain constructions, repetition of phrases occurring previously in a sentence are required. For example,

- (12) Ford fell down, and Nixon fell down, too.

is grammatical, but

- (13) Ford fell down, and Nixon visited China, too.

is not. With such "and ... too" constructions, the verb phrase of the second independent clause must match that of the first independent clause. Such "context-sensitive" repetitions, Chomsky has formally shown,<sup>12</sup> cannot be captured by any CFPSPG. If English has a PSG, then, it must in some sense be "context-sensitive." Accordingly, we may introduce the notion of a "context-sensitive phrase-structure grammar (CSPSG)." A CSPSG is a CFPSPG together with a collection of context-sensitive phrase-structure rules which in some manner allow one to replace a given nonnull symbol in a string with a phrase containing a possibly variable number of elements. As above, it will be assumed that only the words actually occurring in a given sentence and the names of linguistic categories can appear at the nodes of context-sensitive phrase-structure P-markers of that sentence; furthermore, it will be assumed as before that there is a one-one correspondence between the sentences of a language and the structural descriptions of that language.

To the above argument, then, a clever associationist (if there are any) might object that the examples considered so far are exceptional, and that a CFPSG together with a few additional context-sensitive rules to cover these exceptions could handle the language.

But though there seems to be some prima facie merit to such a suggestion, it will now be argued that the exceptions are really too common, if not ubiquitous, to sustain such hopes. Consider the following example (here and wherever appropriate throughout the remainder of the essay, entries on the left will be regarded as grammatical; entries on the right will be taken to be grammatically deficient in a way intended to illustrate the immediate point under discussion):

- |      |                 |                       |
|------|-----------------|-----------------------|
| (14) | I am falling    | I are falling         |
|      | he is falling   | he am falling         |
|      | you are falling | you is falling        |
|      | Ford is falling | Ford are falling      |
|      | The skiers are  |                       |
|      | falling         | The skiers is falling |

Obviously, in these examples there is a dependency between object and certain features of the verb phrase [here, the auxiliary]. The clever associationist might therefore conjecture that these examples could be handled by rules that derive the verb phrase in a way which depends on the subject noun phrase. Crudely formulated such rules might look like

- (14a) S → NP+VP  
 NP → D+N  
 NP → DN<sub>s</sub> (where "s" is the plural)  
 sVP → S are V ing  
 N+VP → N is V ing

Such rules will at least allow the distinction required between singular and plural common nouns. A separate set of rules would be required to handle pronouns, however. And even further rules are needed, because various constructions can obviously be inserted between the NP's and VP's; in

- |      |                          |               |
|------|--------------------------|---------------|
| (15) | Ford is probably falling | " are falling |
|      | The man from the White   |               |
|      | House is falling         | " are falling |
|      | The man the reporter saw |               |
|      | is falling               | " are falling |

for example, each different kind of material inserted between subject and verb requires a distinct phrase-structure rule.

An analogous problem is illustrated by the case of questions:

- |      |                            |         |
|------|----------------------------|---------|
| (16) | Am I falling?              | are ... |
|      | Are you falling?           | am ...  |
|      | Is he falling?             | are ... |
|      | Are they falling?          | am ...  |
|      | Are the skiers<br>falling? | is ...  |
|      | Is Ford falling?           | are ... |

Here, the same sort of subject-verb dependency obtains as in (14), except that the relation is between the subject noun and the first element in the sentence. Since permutational rules are excluded from PSG's, there is no way to use rules like (14a) to derive both (14) and (16). Similarly, sentences containing negatives, negative questions, and commands have such "shared constraints" and a distinct phrase-structure rule would have to be introduced for each such genera and each distinct kind of intervening material within sentences in those genera.

Moreover, English and several other Indo-European languages contain what may be called "distant dependencies." Consider for example

- (17) They pulled Ford out of the drift what he struck.  
 They pulled Ford out of the drift that he struck.  
 They helped the man in the drift what he struck.  
 They helped the man in the drift that he struck.

Here, an element at one point in a sentence determines the nature of another at a considerable distance. Again, as above, a distinct kind of rule for each distinct kind of intervening material would be needed.

Similarly, consider

- (18) Ford got the impression that Mother Nature intended to leave.  
 Ford got the impression which Mother Nature intended to leave.  
 Ford got the impression which Mother Nature intended to leave him.  
 Ford got the impression that Mother Nature intended to leave him.

In these examples, "which" is acceptable only if the clause which follows it can be interpreted as a relative

clause rather than as a complement. If the sentence which follows is a relative clause, however, "that" is still acceptable, and in some cases, this produces some interesting ambiguities:

- (19) Ford left the impression that he hadn't intended to leave.

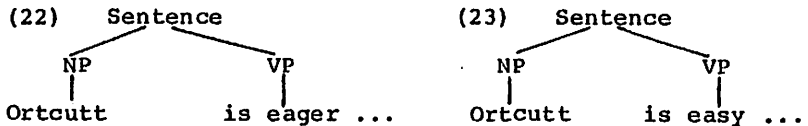
Often enough, it may not become clear that the clause following "impression" in (19) is relative until the end of the sentence. Thus if we add "a quarter" to the end of (19) we interpret the final clause as relative. And as above, for each such distinct kind of sentence, a distinct phrase-structure rule will be required.

The above examples at best show that a CSPSG is not likely to capture all distant dependencies in the sentences of English. Stronger arguments are therefore required to show that no such grammar can capture all information necessary for the production and understanding of sentences.

Consider, then,

- (20) Ortcutt is eager to kill  
 (21) Ortcutt is easy to kill

The underlying P-markers of (20) and (21) are, respectively

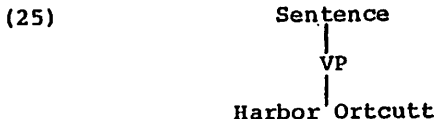


Thus there is no plausible grammatical difference between (20) and (21) that can be represented in terms of their underlying P-markers. But obviously, in (20) "Ortcutt" is the subject of "to kill" while in (21) "Ortcutt" is the object of "to kill." Thus a phrase-structure description of these two sentences does not contain information sufficient for their understanding or production. This implies, of course, that the observable features of (20) and (21) are too impoverished to distinguish the syntax of these sentences.

Similarly, consider

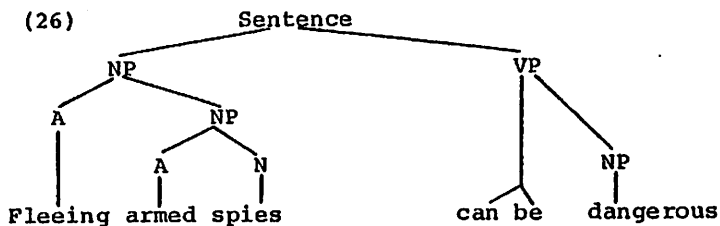
- (24) Harbor Ortcutt

whose only underlying P-marker is



Since understanding (24) requires that the language learner know that "you" is contained in adequate syntactic and semantic representation of that sentence, phrase-structure grammars once again fail to capture information necessary to the production and understanding of sentences.

Finally, consider the following sort of sentence, which is structurally ambiguous though it contains no ambiguous words



This is the only underlying P-marker which can be reasonably assigned to "fleeing armed spies can be dangerous," yet (26) clearly has two distinct meanings. Thus, once again, PSG's are an inadequate representation of natural language.

Examples like (21)-(26) show, then, that PSG's cannot capture information essential to the production and understanding of natural languages. From this it follows that associationist theories of language acquisition are inadequate, and, on the assumption that the only plausible theories other than the associationist are innatist, that innatist theories are the only viable explanations of such linguistic phenomena.

It might be objected to this view, however, that the associationist theories of language can account for such unobservable features as the suppressed "you" subject of imperatives because certain imperatives contain the word. In particular, it could be plausibly held that the language learner can and does correlate imperatives explicitly containing "you" with those not explicitly containing it.

But this proposal is extremely problematic. For not only do such sentences as

(27) You harbor Ortcutt

occur in the language learner's experience, but also such sentences as

- (28) Bernard harbors Ortcutt  
 (29) No one harbors Ortcutt

occur. Now if the associationist theories are to explain how the appropriate correlation between instances of suppressed and explicit occurrences of the imperative's subject are to be reached, the language learner's association must proceed from sentences like (27). But on the associationist account, there is nothing in the language learner's acquisitional "equipment" to prevent the learner from erroneously correlating (24) with (28) or (29). In contrast, the model posited by the innatist holds that there is a transformational relation between (24) and (27) which does not hold between (24) and (28) or between (24) and (29).

Similarly, the associationist might argue that cases like (20) and (21) are correlated, respectively, with sentences like

- (30) Ortcutt is eager for Ortcutt to kill  
 (31) It is easy for one to kill Ortcutt

But if the reasons for this pair of correlations as distinguished from some other is that (20) and (30) have the same meaning and (21) and (31) have the same meaning, then the associationist has to show how the language learner can recognize the "Ortcutt" is the object of "to kill" in (31), but the subject of "to kill" in (30). It is not sufficient to observe that in (31) "Ortcutt" follows "to kill" whereas in (30) "Ortcutt" precedes "to kill," since in the observable form of indefinitely many sentences the order of subject and object can be reversed. For example, in

- (32) The dagger was concealed by Ortcutt

the subject "Ortcutt" follows the verb. What the associationist requires, but does not have, is a general notion of subject of and object of which are formulated in terms of configurations of syntactic symbols in derived P-markers and the notions of transformations which connect these P-markers with the appropriate final derived P-markers.

These arguments and examples go far to sharpen the innatist's theory and methodology. For if the assumption that associationism is the only plausible theory of language acquisition other than the innatist is correct, then in general the innatist may hold that that is innate

which cannot be accounted for on associationist principles. This formulation, cast in terms of the model outlined above, I believe is sufficiently language-specific and purged of inductivist metaphors to overcome the charge of vagueness forward by Atherton and Schwartz. And, so formulated, the innatist theory is empirically testable because the actual sentences of natural language are axiomatically tied to the model by derivations.

The remaining challenge, to produce a plausible connection between species-specificity and linguistic innateness in terms of this model can now be fairly directly met. Though it must surely be conceded, as Atherton and Schwartz insist, that there is no immediate logical dependence between linguistic innatism and the alleged species-specificity of language, it likewise must be conceded that this does not imply that there is not some evidential link between the two. For, ceteris paribus, the failure or success of non-humans to master human language provides evidential evaluation of the claim that there is a uniquely human language-specific faculty of the sort described in the above model. And if it is assumed that linguistic behavior is genetically determined, and that what is genetically determined is innate, then the failure or success, ceteris paribus, of creatures genetically distinct from Homo sapiens to master human language provides evidential grounds for assessing the claim that this allegedly species-specific faculty is innate.

The problem here, of course, is how to articulate the paribus condition. Though by no means trivial, the difficulty is considerably mitigated by the model and methodology outlined above. For at the very least, the model provides a means of identifying the language-specific, putatively innate elements in linguistic behavior, showing thereby just what variables are and are not part of that condition. So construed, the problem of assessing the import of the linguistic performance of non-humans thus reduces to the task of formulating and evaluating an adequate nonlinguistic interspecific learning theory. With the theoretical and methodological burden of such investigations thus shifted to non-linguistic concerns, we should in principle and time come to see the significance to the species of Sarah's first signs.

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## NOTES

<sup>1</sup>K. J. Hayes and C. H. Nissen, "Higher mental functions of a home-raised chimpanzee," in A. Schrier and F. Stollnitz, eds., Behavior of Non-human Primates, Academic Press, New York, pp. 106-10.

<sup>2</sup>B. T. Gardner and R. A. Gardner, "Two-way communication with an infant chimpanzee." in Schrier and Stollnitz, Behavior ..., pp. 117-84.

<sup>3</sup>D. Premack, "On the assessment of language competence in the chimpanzee." In Schrier and Stollnitz, Behavior ..., pp. 185-228.

<sup>4</sup>M. Atherton and R. Schwartz, "Linguistic innateness and its evidence." The Journal of Philosophy LXXI, No. 6 (March 28, 1974), pp. 155-68.

<sup>5</sup>Ibid., p. 157.

<sup>6</sup>Ibid., pp. 157-58.

<sup>7</sup>Ibid., p. 159.

<sup>8</sup>Ibid.

<sup>9</sup>Ibid., p. 160.

<sup>10</sup>Ibid., p. 163.

<sup>11</sup>My debt to the work of J. Katz should be evident. See in particular Jerrold J. Katz, The Philosophy of Language, Harper and Row, 1966; Jerrold J. Katz and P. Postal, An Integrated Theory of Linguistic Descriptions, M.I.T. Press, 1964.

<sup>12</sup>N. Chomsky, "On certain formal properties of grammars." Information and Control, Vol. 2, No. 2 (1959).