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Comments on Skinner's Grammar

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The strong tradition of "school room" grammars may have had a negative influence on the reception given a functional analysis of verbal behavior, both within and without the field of behavior analysis. Some of the failings of those traditional grammars, and their largely prescriptive nature were outlined through reference to other critics, and conflicting views. Skinner's own treatment of grammatical issues was presented, emphasizing his view of a functional unit and his use of the autoclitic and intraverbal functions to describe alternatives to a formal or structural analysis. Finally, the relevance of stimulus control variables to some recurring questions about verbal behavior and, specifically grammar, were mentioned.

It is often alleged that Chomsky's (1959) review of Skinner's *Verbal Behavior* was responsible for its lack of popularity among students of language. The field of behavior analysis was also inactive in translating Skinner's reformulations into research or application. While serious applications of the basic methodology and analytical approach advanced rapidly in the ensuing 30 years, the experimental analysis of verbal behavior was slow to gain adherents. One reason for the sluggish response within the field may be the seemingly radical approach that Skinner adopted toward traditional, and very familiar, analysis in terms used to teach "correct grammar." That Skinner made little use of such familiar terms as nouns, verbs and adjectives was probably a source of concern. Grammatical issues are not prominent in Skinner's earliest presentations of his approach, for example in the Columbia University seminar (Hefferline, 1947). The William James Lectures at Harvard, the following year added the first mention of the autoclitic but issues relating to grammar appear scattered. Chapters 12, 13, and 14 in *Verbal Behavior* appear to be the only explicit references to grammar. It does seem evident that among Skinner's targeted audiences the fields of literary criticism, philosophy of science, and logic ranked ahead of grammar and grammarians. That he was aware of grammatical issues was clear, for many are discussed in the previous presentations and a number of traditional issues, such as the classification of languages, are alluded to in *Verbal Behavior*. The introduction of the *autoclitic*, a principally grammatical function, was early seen as controversial. In MacCorquodale's (1970) view autoclitic processes were "abstruse and difficult" and this may have been responsible for some subsequent disinterest in Skinner's treatment of grammar.

However, the fact that traditional grammar was seen, and taught, as a preemptive logic was of more importance to the non-behavior analyst and behavior analyst alike. A quotation from Fodor and Katz (1964) in the introduction to their book tends to underscore this tradition and the regard in which grammar was, and is to some extent still, held.

> As a description of the sentential structures of a language, a grammar is thus a scientific theory....First a grammar is a system of statements employing theoretical concepts to formulate regularities in the phenomena under study; for example, the familiar notions *noun phrase, transitive verb, indirect object*, and so on, are employed to formulate generalizations about English sentences in precisely the same way as such notions as *pressure, charge, magnetic*, are employed to formulate physical laws. (p. 153)

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SOME LEAKY GRAMMARS

Not everyone, however, has been so convinced. Edward Sapir (1921) is often quoted as saying that all grammars were "leaky." Laird (1957) has described many of the "leaks" in conventional grammars, especially English. From his treatment and that of others, it would be difficult to find any of the rules of our "school grammars" which were invariant in describing speech or language. Interestingly, John Lyons (1977) appreciated Chomsky's approach as an attempt to salvage, if not the field of linguistics, at least the portion dealing with grammatical structure.

Some of the issues can be seen just in conflicting definitions of sentence, word and phrase. Of these "sentence" is probably the most vulnerable. A partial definition, given in many school rooms, of "Starts with a capitol letter and ends with appropriate punctuation," is clearly an arbitrary convention of current writing practices. Definitions that seek to define a sentence in terms of subject and predicate must resort to the admission of *ellipsis* (classroom grammar: *understood*) when one or both are partially or completely absent as is often true of colloquial speech and not a few written sentences. A modern collegiate dictionary (Merriam-Webster, Webster's Ninth New Collegiate Dictionary, 1989) tries to satisfy most of the contenders. After noting earlier uses of the term (opinion and maxim) and one used for judicial criminal proceedings it offers the following:

> 4: a grammatically self-contained speech unit consisting of a word or a syntactically related group of words that expresses an assertion, a question, a command, a wish, or an exclamation, that in writing usu. begins with a capital letter and concludes with appropriate end punctuation, and that in speaking is phonetically distinguished by various patterns of stress, pitch and pauses. (p. 762)

The last phrase in the above quote would apparently have to be modified to fit atonal languages such as Japanese while other aspects of the definition are clearly related to writing practices such as punctuation, which in the case of Latin and languages using Latin script, did not occur in any form until approximately AD 400 (Laird, 1957).

Place (1981) was particularly concerned with Skinner's neglect of the word-sentence distinctions of more traditional analysis. It is, however, to Chomsky (1959) that we can look for confirmation that Linguistics had long failed to settle on an effective unit. Skinner's definition of a unit was either not recognized as such or was clearly antithetical to that of the linguist. It is, however, Skinner's view of unit, or units that appears most radical compared to traditional treatments, and most clearly points to his disuse of traditional grammars.

What goes unrecognized by even educated lay persons is that the many terms utilized in the more familiar grammatical analysis of language were most appropriate to a single family of languages, and not always compatible within that. A chief complaint of students of English has been that parts of speech definitions derived from Latin were indiscriminately applied to English (Jespersen, 1922).

What was more critical, according to Jespersen, was that even for Latin, "...Grammar was not a set of facts observed but of rules to be observed....In other words grammar was *prescriptive* rather than *descriptive*." (This last becomes important in considering such standards as *well formedness*.) The confusion between a grammar as a set of rules for describing a language's structure ("a set of facts observed") versus rules to be observed in writing or speaking was often underscored by the adoption of some very clearly arbitrary "rules" in English such as those forbidding double negatives (cf. Jespersen, 1922) and the ending of a phrase or sentence with a "pre-position" (Laird, 1957). Double negatives, for one, were found freely in Old English and Chauncer's Middle English as well. The practice is still prevalent in colloquial English on both sides of the Atlantic. Crystal (1971) attributed the rule concerning prepositions to John Drydan ("the father of literary criticism"), as late as the 17th century. Such prescriptive standards often do not repre-

sent majority behavior or usage, but have often been imposed by a very select minority (Laird, 1957). The arbitrary nature of other rules and categories are frequently hidden by the educational environment in what may be the earliest confusion between "rule governed" and "contingency shaped" behavior.

Some failures of traditional grammar became most obvious when applied to language communities outside the Indo-European tradition (Robbins, 1967). In our century B. L. Whorf (Whorf, 1956) took particular aim at both the verb-noun and subject-predicate distinctions as well as word-sentence partitions. He cited Nootka and Hopi as languages that were poorly served by such distinctions. He said of Nootka (a language of Vancouver Island) that "...all words seem to us to be verbs..." and "...the sentence without subject or predicate is the only type. Nootka has no parts of speech; the simplest utterance is a sentence, treating of some event or event-complex..." He is particularly strong in opposing the Indo-European notion of predication as a universal phenomenon citing the lack of such 'Aristotelian' logic in the Amerindian languages he had observed. In Kluckhohn and Leighton's (1974) *The Navaho* they say the grammar of Navaho:

> is primarily a matter of the verb....There are few true Navaho nouns, though the list does include some of the commonest and most basic words in the language. Most words which English speakers are apt to term nouns are really nominalized verbs. Some nouns, in fact, can be conjugated after the fashion of neutral verbs. Adjectives are almost entirely the third-person forms of neuter verbs that denote quality, state, or condition. In the formal sense Navaho has no adjectives. (p. 261)

They also point out that in duration some Navaho nouns have only a relative advantage over terms identified as verbs. A number of other terms often proposed as universal are challenged when applied to Navaho and other Amerindian languages.

One of the indications of the seriousness provoked by Whorf's comments is found in John B. Carroll's own introduction to his anthology of Whorf's essays in *Language, Thought and Reality* (Whorf, 1956) that it:

> should not be allowed to distract attention from the importance of language universals...phenomena found in all languages would be of as much interest as language differences. Is it true that all languages have subject predicate construction in sentences? Do all languages have some sort of noun-verb contrast? What features of verb-tense system are common to all languages? (p. 30)

It seems obvious that Whorf himself concluded a negative answer to all such questions.

Whorf's comments were not at all isolated. In many cases the terms *verb, noun, tense* and so on are poorly fitted to what actually goes on in different language communities. For instance Kluckhohn and Leighton (1974) indicate that Navaho's verb *tenses* would more easily be regarded as *aspects* in English grammar notation; tense referring to time: past, present or future; aspects to duration, intensity, etc. Even "aspect" as usually described doesn't fit the many variations of the verb in Navaho, however. In fact, almost any of our "parts of speech" have only an approximate correspondence to the Navaho. In general, the "meta-language" of Western grammar does not fare well in describing the practices of other verbal communities. Brain (1987) quoting Li and Thompson (1981) concludes that since a division between verbs and adjectives does not exist in Chinese the only truly universal parts of speech are nouns. As seen above in the quotation from Kluckhohn and Leighton (1974) even *noun* may be inadequate in describing similar, but clearly non-identical, terms of other languages.

Even among the Indo-European languages there is far from universal agreement on the proper assignment of the various categories that we call parts of speech. The application of Latin case rules to a largely caseless English was an early source of complaint and according to Robbins (1967), occasioned over 100 attempts to create a unique English grammar. Linguists have isolated several central features of the language that fail to conform to the definitions they were given. To describe a noun as "a person, place or thing" as is commonly done immediately excludes such common English nouns as

truth or *beauty*. The attempt to identify the verb as denoting action is similarly flawed. To quote again from Whorf (1956):

> why then is fist a noun? It is also a temporary event. Why are lightning, spark, wave, eddy, pulsation, flame, storm, phase, cycle, spasm, noise, emotion, nouns?....In the Hopi language, lightning, wave, flame, meteor, puff of smoke, pulsation, are verb-events of necessarily brief duration and cannot be anything but verbs. (p. 215)

Add to this the fact that verbs can be freely nominalized in English by adding an article as *that run is my last* or more simply *run of the mill*; by following the verb with a form of *to be as in Drink is for fools*. There is also the English gerund, which takes a normal verb form, adds *-ing* and usually an article to produce a "verbal noun" such as in *the running of the hounds* or in plural form as *the carryings on* or even *the late carryings on*, etc. Terms like *warning* seem also to illustrate this change. In a like manner a participle is the modification of a normal verb to form an adjective as in a *laughing face*.

As a result of the grammatical vagaries of even familiar European languages, attempts to preserve the traditional parts of speech have led to some proposed modifications. Instead of strict adherence to the traditional word classes some linguists speak of *gradience* where, for example, the "adjectiveness" of a word might be graded on several bases. An example would be whether an *adjective* occurs after forms of *to be* or after articles and before nouns, after *very*, before *-ly* to form adverbs, etc. (Crystal, 1987, p. 92). This is clearly an attempt to retain the notion of word classes (noun, verb, adjective, etc.) while recognizing some of the inherent difficulties of doing so. What may be of some interest to behavior analysis is that most so-called "rules of grammar and syntax" not only have numerous exceptions, but might be best termed probabilistic in indicating the various functions of traditional "parts of speech." In the same context as his explanation of gradience Crystal asks the question "What part of speech is *round*?" and then exemplifies *round*, in turn, as an adjective, a preposition (went *round* the corner), verb (the yacht will *round* the buoy), adverb and noun (this last as in *it's your round*, etc.).

SKINNER'S GRAMMAR

Skinner (1957) spends some time early (pp. 19-20) in discussing the various and usual uses of the term *word*. As he illustrates these are varied. He makes it clear that none of these are relevant to his present analysis. He does conclude elsewhere that *word* has some functional significance, but not in his sense of a functional analysis. While Chomsky (1959) accused Skinner of not providing a proper unit to replace traditional terms that he admits are wanting, his comment really only serves to underscore the absence of a consistent unit among linguists.

Functional unity, for Skinner, is a key term for describing the units of discourse. Any units that emerge are idiosyncratic, not just to the community of speakers, but often to the individual. Any of the traditional units, including morphemes, words "...phrases, idioms, clauses, sentences... may have functional unity as a verbal operant..." To this he adds that the verbal operant is "exclusively a unit of behavior in the individual speaker..." This is not a notion compatible with a formal, or structural analysis that seems to require a more standardized unit, one not subject to the vagaries of individual histories. Skinner frequently refers to *standard phrases* as well, to indicate response units common to a community of speaker/listeners.

Here is a reminder of Skinner's view of unit size, as it relates to echoic behavior (p. 61): "The child may emit responses as large as syllables, words or even sentences as unitary echoic operants..." As with the term *functional unity*, his units of verbal behavior which transcend word, or other similar boundaries, there seems no simple blending of these concepts with more traditional views. The notion that so far as form is concerned there may be many overlapping units, many functionally independent (also see p. 21) while, dissimilar forms may be readily substituted because of the functional equivalence. One last ref-

erence before examining Skinner's approach to grammar proper, is to recall the notion of multiple causation of Chapter 9, and his use of various prompts (echoic, but especially formal and intraverbal), when considering what after Chomsky (1957, 1965) became known as "productive" speech and language.

In *Verbal Behavior*, Skinner begins (p. 331) his discussion of grammar largely with the announcement that "Purely formal analysis of grammar and syntax...are of little interest here where no *form* of verbal behavior is significant apart from its controlling variables." This reiterates his assertion that such subdivisions or units of verbal behavior are not relevant to a functional account. This is, of course, a simple extension of the notion that behavior is not identified by its form but by its functional relation to other variables.

He further characterizes his approach by reference to Chapter 12's discussion of autoclitic functions which "...described, qualify or otherwise comment on verbal behavior and thus clarify or alter its effects upon the listener." Skinner seems to have fashioned the term *autoclitic* from the term *clitic* as used by linguists and in turn taken from the Greek term for *leaning*. *Clitic*, according to Crystal (1985) refers to "a form...which cannot stand on its own as a normal utterance..." The article *the* is given as an example. Skinner clearly indicates that "tags," and other grammatical "devices," such as word order, may have *autoclitic* functions. Tags, for Skinner, obviously include, in English, articles, endings that change the usual verb form to noun and vice versa, adjective endings, prepositions, conjunctions and the whole array of terms, (with the exception of pronouns), that linguists classify as belonging to "closed classes."

For Skinner, and in languages other than English, tags would commonly include also those infixes, pre- and post-fixes, which indicate case inflection (accusative, nominative, genitive, dative, etc.) and therefore subject-object predication. In English, Skinner appeals to the "relational autoclitic of order," rather than tags, as in Latin, or other heavily inflected languages. The English plural and possessive *-s* is also discussed as autoclitic in function. (He does not mention so-called prepositions in conjunction with word order which have supplanted inflectional affixes of Old English predication.) Of course, and perhaps wisely, Skinner does not dwell much on the mechanics of these traditional grammatical entities. He does borrow freely from the current views (circa 1957 and before) of descriptive linguists. Again, we may thank Chomsky's (1959) review for this insight.

The closed classes are seen in linguistics as significant because each class has only a limited number of terms as opposed to open classes, such as nouns or verbs, where the limiting case would only be the possible states of nature. With the exception again of pronouns, such closed class terms have another feature that distinguish them from other classes: they reflect no one-to-one relation with any real world, either actions or things or properties. As with various "meaningless" inflectional affixes they are typically regarded as a sort of glue, but whose exact functions have been difficult to describe, as we will see. They can be selectively omitted without great loss in clarity, are apparently learned somewhat late in childhood and may be largely missing from such language families as Chinese where word order is more strictly observed. To describe these Hockett (1958) had used the term *functors*. Brown and Fraser (1963) make much of their absence in early childhood imitation and Brown (1973) in so-called productive utterances.

Here is Skinner's (1957) chief reference to tags as autoclitics :

> In English the kinds of stimuli called things or objects usually evoke responses with tags appropriate to nouns, whereas the kinds of stimuli called actions[1] usually evoke responses with tags which indicate verbs. This is by no means inevitable....It is only because words referring to action conventionally carry distinctions of tense, person, and so on that we call the responses verbs and nouns respectively. The

[1]It should be noted from our previous discussion of word classes that verbs are not uniquely related to actions or nouns to "things."

> speaker responds to a common property of the situation and gives it a tag....If the first response has been tagged a noun, a fragmentary intraverbal pattern will supply the appropriate tag for, say, the verb to follow. (p. 337)

This is simply an extension of Chapter 12's autoclitic functions which "...described, qualify or otherwise comment on verbal behavior and thus clarify or alter its effects upon the listener." For his "relational autoclitic of order" Skinner drew Chomsky's (1959) fire as an essentially gratuitous entry. However, elsewhere (p. 332f) Skinner draws some five plausible correspondences in actual verbal and nonverbal events and our adherence to order. Here is a partially paraphrased rendering:

1. Different responses as a product of speech sound ordering. At the level of the phoneme: *tip* and *pit*. At the level of the morpheme: *outlook* and *lookout*. "Apart from the spectra of single speech sounds, the only dimension of verbal behavior is temporal, and order is...an important property."

2. "...ordered to correspond to the order of relevant stimuli."

3. Intraverbal ordering as in the recitation of a poem but also less strict sequences.

4. Order reflecting relative strength of responses in repertoire of speaker. "Other things being equal, the strong response occurs first."

5. Rhetorical order: effect on listener. "Him I despise," emphatic, etc.

In addition, on page 337, he cites *standard practice* (in English) where objects are given priority over actions as a contributing factor in generating some aspects of word order peculiar to English. Most of the above examples are clearly extra-sentential or at least non-linguistic in the usual sense, the exception being ordering based on object and action which might imply some sort of word class membership, in this case the subject-predicate with the accompanying noun-verb distinction.

Skinner's treatment of autoclitic ordering makes a plausible attempt to relate these to common environmental circumstances of human behavior, usually missing in a formal analysis. In this Skinner has anticipated a later evolved analysis based on Brown's (1973) *agent-patient-beneficiary-experiencer* distinctions or *animancy-inanimancy* discriminations and similar (cf. Lempert, 1984). Regardless of the variables ultimately responsible for ordering in composition the qualifications proposed by Skinner clearly evades a gratuitous circularity implied in Chomsky's remarks.

It is informative to contrast Skinner's few remarks about word order to a more traditional treatment. In English the most common word order is said to be subject-verb-object (SVO) or noun-verb-noun (NVN). Latin and Sanskrit were notable for their relative freedom from word order due the frequency of inflectional word changes called variously *inflections, flexions,* or *accidence,* especially those to indicate case (dative, accusitive, nominative, genitive, etc.). With the exception of personal pronouns (*he-him-his, she-hers, they-them-theirs,* etc.), English has few such case inflections to indicate subject from object as is common in many other languages and apparently relies more heavily upon the distribution of terms within a phrase or sentence. It is possible to include certain uses of prepositions (*to the woman it was given,* etc.).

One of the problems in referring to word order, whether by subject-verb-object or noun-verb-noun is that it is not independent of the definition of the requisite noun and verb or subject, verb and object distinctions discussed above. Thus, as usually defined, word order is in part a somewhat circular, not entirely independent designation from the word class definitions of noun and verb, etc., and these, as we have also seen, have their problems. In some languages, such as Chinese, word order is much more absolute than in any of the European languages. Inflection is apparently so rare that its possible to find scholarly papers written about the suspected use of inflection in such languages. Phrases such as "Boy father give present girl father." are apparently common.

Skinner's view of the productive nature of verbal behavior may in part be illustrated by a hypothetical example which he proposes:

> Suppose a speaker is primarily concerned with the "fact" that "Sam rented a leaky boat." The "raw" responses are *rent, boat, leak,* and *Sam.* The important relations may be carried in broken English by autoclitic ordering and grouping: *Sam rent boat-boat leak.* If we add the tag *-ed* to *rent* and *leak,* as a minimal tact indicating "past time," and the articles *a* and *the* to serve a subtle function in qualifying *boat*-in answer, say, to the anticipated query, *What boat?*-we get: *Sam rented a boat. The boat leaked.* (p. 347)

The autoclitics, except for ordering, Skinner explains earlier on the same page, may be left out under various forms of duress and in the early stages of learning a language. Many pidgin and Creole languages (he mentions "broken English") can be so described. He does not specifically indicate that children's early speech would be so characterized but there is a clear resemblance to what was later termed "telegraphic speech" by Brown and Fraser (1963) in the above example.

The *rent, boat, leak* example cited above brought an objection from Chomsky (1959) who used one of his many footnotes (#45) to cite studies indicating that pauses were more frequent following the "large categories-noun, verb, adjectives" indicating greater uncertainty. Chomsky apparently saw the above episode as illustrating a continuing process of such mini-editing, even in the mature speaker. It seems obvious that this was not Skinner's view as he makes frequent use of intraverbal operants and the functional unity of many terms.

For example, one of the more interesting aspects of Skinner's treatment of tags as autoclitic behavior is the exception he takes to this analysis under the sub heading of Relational Autoclitic Behavior. In this he identifies a functional unity as:

> a unitary contingency of reinforcement.... Frequently the part (of verbal behavior) does not correspond to a lexical or grammatical unit. Although *boy* and *hat* may upon...occasions be simple tacts, it does not follow that *the boy's hat* is therefore a compound expression. It may have a simple functional unity. In the response *The book on the table* the phrase *on the table* may have the same simple dynamic control exerted by a property of the environment exemplified by the response *red* in *the red book.* (p. 335)

Thus the search for stimulus properties which occasion subsequent behavior, autoclitic stimuli as tags or intraverbals, might not yield uniform results, depending upon the history of the speaker or listener. In some ways his treatment of a functional unity resembles his earlier warning against interpreting most metaphorical statements as unique or creative: what might have been metaphors historically come to us as intraverbals which display a similar functional unity. From his discussion of metaphor:

> The response *leg* evoked by the leg of a table... rarely represents metaphorical extension. We cannot be sure that response is or is not an example of metaphorical extension...unless we know the history of the speaker. *Bright as a dollar* is more often than not a standard response functioning as a single verbal unit. (pp. 93-94)

Since, in fact, the intraverbal is an important concept in Skinner's depiction of grammatical behavior, the flexibility he assigns to such intraverbal behaviors is of special interest. On page 76 under The Intraverbal Unit he indicates that "The number of intraverbal relations in the repertoire of an adult speaker greatly exceeds the number of different forms of response...since a given form may have many functional connections..." Of seeming equal importance he further asserts that "...units of different size overlap...are composed of, or share parts with, others. Such an operant may be as small as a single speech sound...or using certain grammatical tags..."

Another interesting distinction between intraverbal and autoclitic use is seen in the example (p. 339, bottom) of an ungrammatical (lacking number agreement) *the wages of sin is death* and where "...the intraverbal connection between *sin* and *is* overcoming the more remote relation between *wages* and *are...*" This distinction might suggest that autoclitic operants are more like educated relations, thus rule governed, while an intraverbal would appear more contingency based.

SUMMARY OF SKINNER'S VIEW OF GRAMMAR

The major ways in which Skinner differs most greatly from other more traditional views of grammar and syntax might be summarized briefly as:

1. There are no fixed units such as word, sentence, phrase, etc. based on the *form* of the response. For this reason all units are idiosyncratic to the individual and factors of personal history (functional unity) or to the verbal community (standard responses).

2. Unit size in non-standard and often intraverbal (and other) units overlap. Thus *Come to supper* can consist of *come, to,* and *supper* but also *come to, to supper,* plus many minimal echoic units at the level of the syllable and phoneme. It never appeared to Skinner to presume to put a limit on what a child, or adult, was capable, as is said to be done by phrase structured grammars (Slobin, 1974).

3. Transitional verbal behavior for Skinner could be constructed of primitives, probably simple tacts, to which are autoclitically added tags or order. This, to Skinner, would likely be an earlier level of construction beyond the concatenation of simple sounds.

4. There are multiple sources of grammatical (and ungrammatical) utterances in composition, only one of which did he term *autoclitic*. Since units are not form based it should be impossible to tell from a record of responses what functional category any given utterance might signify. (A experimental analysis of the individual repertoire, however as we know, might be able to plausibly reconstruct some relations among parts.)

Otherwise Skinner can said to have reformulated rather than discarded traditional terms in favor of those which might be more susceptible to a functional analysis. Nor was he unique in wanting to discard the terms of a formal analysis afforded by parts of speech, etc. Others had done a good job of undermining confidence in such.

As seen in several quotations presented earlier, Skinner often found it useful to refer to certain terms by their class names: *verb, noun* and so on. He did not identify these exclusively with things versus objects as is indicated by the repetition of a previous quote:

Recall that from page 337 "In English the kinds of stimuli called things or objects usually evoke responses with tags appropriate to nouns..." adding "It is only because words referring to action conventionally carry distinctions of tense, person, and so on that we call the responses verbs and nouns respectively..." Here he indicates that the conventional inflections rather than word class membership per se are responsible for our ability to add the proper affix. To some this may sound circular. It nevertheless is close to some modern views. In a well cited article, Maratsos and Chalkey (1980) present a somewhat more complicated, but similar view. Some twenty-three years after the advent of *Verbal Behavior*, theirs is the following comment:

> Our tendency to say that hearing *Today John glixes*, we know it is a verb...In a sense this is backward. It is because *glix* can enter into all of these correlated semantic-sequential patterns that we call it a verb. (p. 133)

However, these and similar speculations are still the subject of considerable controversy and seem, to the present, to be incapable of resolution. As with Maratsos and Chalkey (1980) the method of inquiry often derives indirectly from Chomsky's (1957, 1965) contrastive method of comparing sentences for the intuitively known or self-evident quality of "well formedness." According to Lyons (1977, p. 37), the 'Bloomfieldians' had put several limits on the uses of similar intuitive judgments of "correctness," which Chomsky (1957) made a centerpiece of his system. The practice apparently carried over to the Psycholinguists which followed him in this, if not his promotion of innate grammaticality. Frequent use in the much cited Maratsos and Chalkey (1980) article is made of con-

trasts between terms such as *unsympathetic, unhappy, unintelligent* versus **unnice, *unsad, *unrediculus*.[2] Elsewhere they say "...many verbs do not take transitive direct objects freely. One cannot say, **he will speak the problem* or **he will think the problem* even though one can say *he will discuss the problem* or *he will consider the problem...*" What is confusing about this and similar treatments is the uncareful way in which terms or statements are rendered unacceptable, when they may be merely not fashionable. According to Simon Potter (1971), usage alone determines which of several forms are spoken and "...people sometimes vacillate between two forms.... Northern children still say *unpossible*...it was the only form in the King James Bible, having been silently changed to *impossible* in later editions..." In trying to state the use of the *un-* affix as a rule, Maratsos and Chalkey state it as " '*un-* may be prefixed to a term...if the term is an adjective, and if the term is known to take *un-*'." They freely admit that such a rule seems "...hardly like a general knowledge at all..."

One of the problems, which seems endemic to grammar in general, is the definition of what constitutes a rule. A rule of orthography such as "*i* before *e* except after *c*" would be an example of a type of rule that has counterparts in grammar; an educated, memorized and prescriptive rule which clearly illustrates the traditional *thought preceding* or *fomenting action*. There is the other quest for rules which are algorithmic, in the sense of computer algorithms or algebraic equations.

There are, however, reasons to believe that word classes may have *some* functional validity, and these might lead to a true experimental analysis. The major citation in their favor is the application of regular tense inflections, mostly to verb type words, regular plural endings, almost exclusively to nouns, and similar phenomena. These consistencies have been, in fact, the major support of traditional parts of speech in the face of many other objections. The regularities in adult speech alone, however, could be seen as no more requiring explanation than the anomalous (irregular) forms were it not for children's tendency to *overregularization* (cf. Whitehurst, 1982). Overregularization is the frequently reported extension of regular verb endings to irregular verb forms or the similar "incorrect" use of plurals. There seems to be fair agreement to the characterization by Esper (1973) of Ervin's (1964) observations when he says:

> Ervin had found that in children tense inflection begins with the more frequently used irregular verbs; then when there has been a beginning of the acquisition of regular forms, these tend to be generalized to the previously used irregular verbs. Similar overgeneralizations were in the use of plurals. (p. 169)

One line of discussion concerns why children stop overregularizing or why adults don't. The issues raised by these phenomena continue to be the subject of much discussion and research by more traditionally guided psycholinguists (cf. Marcus, Pinker, Ullman, Hollander, Rosen & Xu, 1992). Similar attention has been given to the issue of the "word order." Some of these are traceable to Brown's (1973) attempts to formally characterize children's early speech in terms based on various forms of predication: *agent, beneficiary, patient*, etc. There have been an explosion of terms and attempts at redefinition of old terms largely within the bounds of the traditional distinctions. Some terms, *cue, cue validity, salience*, etc. (MacWhinney & Bates, 1989) have been introduced that appear to suggest another type of analysis; one that would be treated under the heading of *stimulus control* in Behavior Analysis. The methodology is another matter, however, and is still heavily dependent on averages.

Some research paradigms from these quarters show ingenuity, and deserve to be emulated when they address well defined questions. If Skinner is correct that grammatical behavior is not a singular process, but reflects in each case different conditioning histories then solutions based on

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[2] The asterisk (*) is used by traditional linguists in several ways, one of which is to ordain, in John Lyons' (1978) words, phrases that are "unacceptable" and which the authors Maratsos and Chalkey render as "cannot say" (in English), seemingly more restrictive yet.

averages, or aggregated individuals will not hold much promise. Unfortunately, research techniques surveyed seem still geared to group comparisons, large samples with little intensive or extensive use of independent variables. It is probably no surprise that neither inter- nor intra- subject replication is sought or found. Individual differences are noted but such experiments as are conducted seem to rely on averages. Some of the data that was gathered on children at early stages of speech development (cf. Bowerman, 1978; Brown, 1973; and earlier; Bloom, 1970; Braine, 1963a) is interesting, but the context supplied is often limited, and then only in the form of a "rich interpretation" of the child's utterances by the parent (Brown, 1973) or the overriding early theoretical cant of the investigator (as Brown, 1973 seems to suggest for both Brain and Bloom).

Some of the issues debated, however, seem to pose basic questions about stimulus control as it relates to grammar. What are the physical dimensions, or stimulus properties of regular verb forms, for example? And how does this relate to known relations and training procedures evolved during the past thirty years? To say that such features generalize, as Skinner is careful not to without qualification (cf. p. 127), would not be a very satisfactory solution. After thirty years the field of behavior analysis has a variety of both techniques and phenomena, though somewhat uncataloged, which should give the field now an advantage that Skinner could not possess. To mention a few by generic titles should give some notion of the range of options to a modern analysis. The phenomena now more critically known include *selective attention, additive combinations, inhibitory gradients, peak shift, contrast, errorless discrimination, stimulus equivalence, response class formation, transfer of stimulus control* and similar topics of research. The techniques available: *matching to sample, nonmatch* and *oddity, exclusion, stimulus fading* (criterion and non-criterion), *stimulus topography shaping, response shaping, schedules, delayed prompts,* etc. Some of these have arisen from applications or application research, as well as basic research. The classic terms generalization and concept formation, as known to logic and linguistics, are currently being addressed by experiments. New formulations have been proposed which see some phenomena as less continuous than formerly (cf. Bickle & Etzel, 1985), and some which view differently the nature of linkages between stimulus events in equivalence relations (cf. Fields, Adams, Verhave & Newman, 1990). Generalization, but only within discrete boundaries, was obtained convincingly for imitative behavior by Garcia, Baer and Firestone (1971) and very recently replicated with infants (Poulson, Andreatos, Kyparissos & Kymissis,1993) and young (autistic) children (Young, Poulson, Krantz & McClannahan, 1993).

Over 20 years ago, Guess, Sailor, Rutherford and Baer (1968) used operant conditioning procedures to produce a "generative" spoken use of the plural morpheme in a severely retarded girl. Later, Baer and Guess (1971) showed effective receptive training to superlative and comparative inflective suffixes and Sailor (1971) was able to train similar subjects to produce generalized training effects for the spoken allomorphs /-s/ and /-z/ to form plurals for nouns with, respectively, unvoiced and voiced endings. Relatively little has been reported from an experimental analysis standpoint since that time on questions relating to grammar. An analysis of word order by Braine (1963b) using a miniature language system is one of the more compatible research paradigms seen.

SUMMARY

The strong, perhaps preemptive, tradition of "school room" grammars may have had a negative influence on the reception given a functional analysis of verbal behavior, both within and without the field of behavior analysis. It has been proposed that a general unfamiliarity with both the failings of those traditional grammars, and their generally prescriptive nature, constituted at least some of the problem. Some of these were outlined through reference to other critics, and conflicting views.

Skinner's own treatment of grammatical issues was presented, utilizing his conception of a proper unit for behavioral analysis and his use of the autoclitic and intraverbal functions to describe alternatives to the formal or structural analysis of the same subject. It is possible that Skinner's original order of presentation may have also confused readers. Stemmer (1990) in an attempt to counter the criticism contained in Chomsky's (1959) review, puts forward solutions of his own to grammatical questions, which, while plausible, were not Skinner's views. It is hoped that the present rearrangement will rectify some of the problems encountered. Finally, the relevance of stimulus control variables to some recurring questions about verbal behavior and specifically grammar was mentioned.

REFERENCES

Baer, D. M., & Guess, D. (1971). Receptive training of adjectival inflections in mental retardates. *Journal of Applied Behavior Analysis, 4,* 129-139.

Bickle, W. K., & Etzel, B. C. (1985). The quantal nature of controlling stimulus-response relations as measured in tests of stimulus generalization. *Journal of the Experimental Analysis of Behavior, 44,* 245-270.

Bloom, L. (1970). *Language development: Form and function in emerging grammars.* Cambridge, Mass., M.I.T. Press.

Braine, M. D. S. (1963a). The ontogeny of English phrase structure: The first phase. *Language,* 1963, *39,* 1-13.

Braine, M. D. S. (1963b). On learning the grammatical order of words. *Psychological Review, 70,* 323-348.

Braine, M. D. S. (1987). What is learned in acquiring word classes-A step toward an acquisition theory in, B. MacWhinney (Ed.) *Mechanisms of language acquisition* (pp. 65-87), Hillsdale. NJ: Lawrence Erlbaum Associates.

Brown, R., & Fraser, C. (1963). The acquisition of syntax. In C. N. Cofer and B. Musgrave, (Eds.), *Verbal behavior and learning: Problems and processes* (pp. 158-201). New York: McGraw-Hill.

Brown, R. (1973). *A first language: The early stages.* Cambridge, MA: Harvard University Press.

Chomsky, N. (1957). *Syntactic structures.* The Hague: Mouton and Co.

Chomsky, N. (1959). *Verbal Behavior.* By B.F. Skinner. *Language, 35,* 26-58.

Chomsky, N. (1965). *Aspects of the theory of syntax.* Cambridge, MA: Cambridge University Press.

Crystal, D. (1971). *Linguistics.* Middlesex, Harmondsworth, England; Penguin Books Ltd..

Crystal, D. (1985). *A Dictionary of linguistics and phonetics,* Oxford, UK: Basil Blackwell, Ltd.

Crystal, D. (1987). *The Cambridge encyclopedia of language.* Cambridge, UK: Cambridge University Press.

Ervin, S. M. (1964). Imitation and structural change in children's language. In E. G. Lenneberg, (Ed.), *New directions in the study of language* (pp. 163-189). Cambridge, MA: MIT. Press.

Esper, E. A. (1973). *Analogy and association in linguistics and psychology.* Charlotte, NC: University of Georgia Press.

Fields, L., Adams, B. J., Verhave, T., & Newman, S. (1990). The effects of nodality on the formation of equivalence classes. *Journal of the Experimental Analysis of Behavior, 53,* 345-358.

Fodor, J. A., & Katz, J.J. (1964). *The structure of language: Readings in the philosophy of language.* Englewood Clifts, N.J. Prentice Hall.

Garcia, E., Baer, D. M., & Firestone, I. (1971).The development of generalized imitation within topographically determined boundries. *Journal of Applied Behavior Analysis, 4,* 101-112.

Guess D., Sailor, W. S., Rutherford, G., & Baer, D. M. (1968). An experimental analysis of linguistic development: the productive use of the plural morpheme. *Journal of Applied Behavior Analysis, 1,* 297-306.

Hefferline, R. (1947). Class notes made by R. Hefferline, Summer 1947, in a course at Columbia University, given by B.F. Skinner. Privately circulated.

Hockett, C. F. (1958). *A course in modern linguistics.* New York: Macmillan.

Jespersen, O. (1922). *Language, its nature, development and origin.* The Norton Library edition (1964), New York: W.W. Norton Co., Inc.

Kluckhohn, C., & Leighton, D. (1974). *The Navaho,* Revised Edition Cambridge, MA: Harvard University Press.

Laird, C. (1957). *The miracle of language.* Greenwich, Connecticut: Fawcett Publications.

Lempert, H. (1984). Topic as starting point for syntax. With commentary by Brian MacWhinney. *Monographs of the Society for Research in Child Developement, 49* (5, Serial No. 208).

Li, C. N., & Thompson, S. A. (1981). *Mandarin Chinese: A functional reference grammar.* Berkeley, CA: University of California Press.

Lyons, J. (1977). *Chomsky.* (2nd. Ed.) 2 Stanford Terrace, Hassocks, Sussex: The Harvester Press.

MacCorquodale, K. (1970). On Chomsky's review of Skinner's *Verbal Behavior. Journal of the Experimental Analysis of Behavior, 13,* 83-99.

MacWhinney, B., & Bates, E. (1989). *The crosslinguistic study of sentence processing.* Cambridge: Cambridge University Press.

Maratsos, M. P., & Chalkey, M. A. (1980). The internal language of children's syntax: The ontogenesis and representation of syntactic categories. In Keith Nelson (Ed.), *Children's Language (Vol.2)* (pp. 127-214), New York: Gardner Press.

Marcus, G. F., Pinker, S., Ullman, M., Hollander, M., Rosen, T. J., & Xu, F. (1992). Overregularization in language acquistion, with commentary by Harold Clahsen. *Monographs of the Society for Research in Child Development, 57* (4, Serial No. 228)

Place, U. T. (1981). Skinner's *Verbal behavior II,* what is wrong with it. *Behaviorism, 9,* 131-152.

Potter, S. (1971). Word creation. In C. Laird & R. M. Gorrell, (Eds.) *Reading about language.* New York: Harcourt, Brace Jovanovich, Inc.

Poulson, C. L., Andreatos, M., Kyparissos, N., & Kymissis, E. (1993, May). *Generalized imitation within three response classes in normally developing infants.* Paper read at the Association for Behavior Analysis 19th Annual Convention, Chigago, Ill.

Robbins, R. H. (1967). *A short history of linguistics.* London: Indiana University Press.

Sailor, W. (1971). Reinforcement and generalization of productive plural allomorphs in two retarded children. *Journal of Applied Behavior Analysis, 4,* 305-310.

Sapir, E. (1921). *Language: An introduction to the study of speech,* New York: Harcourt Brace.

Skinner, B. F. (1957). *Verbal behavior.* New York: Appleton-Century-Crofts, Inc.

Slobin, D. I. (1974). *Psycholinguistics.* Glenview, IL: Scott, Foresman and Company.

Stemmer, N. (1990). Skinner's *Verbal Behavior,* Chomsky's review, and mentalism. *Journal of the Experimental Analysis of Behavior, 54,* 307-315.

Whorf, B. L. (1956). *Language, thought, and reality: Selected writings of Benjamin Lee Whorf.* Edited with an introduction by John B. Carroll. New York: The Technology Press of M.I.T. and John Wiley and Sons, Inc.

Young, J. M., Poulson, C. L., Krantz, P.J., & McClannahan, L. E. (1993, May). *The development of generalized imitation in young children with autism within topographically determined bounderies.* Paper read at the Association for Behavior Analysis 19th Annual Convention, Chicago, IL.