SIGN LANGUAGE RESEARCH AND LINGUISTIC THEORY

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ABSTRACT

Linguistic theory has traditionally defined language in terms of speech and has, as a result, labelled sign languages as non-linguistic systems. Recent advances in sign language linguistic research, however, indicate that modern linguistic theory must include sign language research and theory. This paper examines the historical bias linguistic theory has maintained towards sign languages and refutes the classification of sign languages as contrived artificial systems by surveying current linguistic research into American Sign Language. The growing body of American Sign Language research demonstrates that a signed language can have all the structural levels of spoken language despite its visual-spatial mode. This research also indicates that signed languages are an important source of linguistic data that can help further develop a cognitive linguistic theory.

RESUME

Recherche Concernant La Langue Gestuelle Et La Théorie Linguistique

Les linguistes ont traditionellement défini la langue par référence à la parole et ils ont conséquemment classifié la langue gestuelle parmis les systèmes de communication non-linguistiques. Pourtant, plusieures découvertes récentes indiquent que la langue gestuelle ne peut être ignorée en théorie linguistique. L'auteur examine premièrement les préjugés maintenus en théorie linguistique envers la langue gestuelle. Suivant une analyse du language gestuel américain, il rejette la classification de la langue gestuelle en tant que système de communication artificiel, puisque cette analyse démontre que les langues gestuelles peuvent posséder tout les niveaux et les propriétés structurelles de la langue parlée, en dépit de leur mode visuel. Les recherches concernant le language gestuel américain indiquent d'autan plus que les langues gestuelles forment une source importante de données qui pourraient contribuer au développement de la théorie linguistique cognitive.

INTRODUCTION

In his work <u>Sign Language Structure: An outline of the visual communication systems of the American deaf</u> (1960, revised 1978), William Stokoe presented the first linguistic description of American Sign Language. Since that publication, the number of linguists studying sign languages has increased dramatically, and the analysis of sign language, particularly American Sign Language, has become more sophisticated. Despite the growing amount of evidence that points to a definition of American Sign Language as a language (Klima and Bellugi 1979; Liddell 1980; Siple 1978; Wilbur 1980), there are still linguists who assert that sign languages are more properly labelled as "systems" which do not exhibit the characteristics and properties of language (Crystal and Craig 1978). The definition of sign languages as systems arises out of traditional linguistic theory which has featured at its core the relationship between sound and language. Given such an emphasis, it is not surprising that the similarities between spoken and signed languages were, for many years, overlooked or refuted. As a result, linguists have ignored a rich source of linguistic data that might lead to a greater understanding of language in general, irrespective of its modality. This paper will examine current linguistic analyses of American Sign Language in an attempt to refute the notion that it is more properly labelled a system. In addition, it will consider some of the contributions that can be made to modern linguistic theory through the study of sign languages.

TRADITIONAL LINGUISTIC THEORY AND SPEECH

Modern linguistic theory has long been tied to the notion that language is expressed solely in terms of speech. This view, fostered by linguists not attuned to the special visual-spatial relationships of sign languages, has led, as Markowicz (1977) points out, to the perpetration of several myths regarding sign languages: 1) reality, for the sign language user, is word based; 2) sign language is concrete; 3) signs are glorified gestures; 4) sign languages have no syntax; and 5) sign language is ideographic. These myths are, in part, the result of a lack of any systematic study of the linguistic properties of sign languages, and the notion that language can only be expressed through speech. The first notable linguist to discuss the interrelatedness of speech and language was Sapir. He states:

> The essence of language consists in the assigning of
> conventional, voluntary articulated sounds, or of

their equivalents, to the diverse elements of experience (Sapir 1921: 11).

In a somewhat stronger statement, Bloomfield supports Sapir: "In human speech, different sounds have different meanings. To study this co-ordination of certain sounds with certain meanings is to study language" (1933: 27). Bloomfield specifically addresses sign languages (grouping them with telegraphy) in a series of statements:

> It seems that these gesture languages ("lower-class Neapolitan, Trappist, Plains Indians, deaf-mute") are merely developments of ordinary gesture and that any and all complicated or not immediately intelligible gestures are based on the convention of ordinary speech (1933: 39).

> Apparent exceptions (to this dictum that "speech and the manner of speech are our most effective method of signalling") such as elaborate systems of gesture, deaf-and-dumb language, signalling codes, the use of writing, telegraphy, and so on, turn out, upon inspection, to be merely derivatives of language (1933: 144).

Hockett (1963), in an attempt to discover the universal characteristics of all human languages, proposes a set of design features which delineate human languages from animal communication systems. The entire list of design features need not be examined in depth, but four of his features explicitly link linguistic communication to vocal-auditory processes:

1. Vocal-auditory channel: The information transmission channel for all linguistic communications is vocal-auditory, from mouth to ear.

2. Broadcast transmission and directional reception: All linguistic signals are transmitted broadcast in all directions at once, as opposed to "tight-beam" or directional transmission.

3. Rapid fading: All linguistic signals are evanescent.

4. Complete feedback: The transmitter at the same time receives the message he or she transmits.

(Hockett 1963)

More recently, Chafe (1970) has also linked language to sound but in much stronger terms. He defines language as a "system which mediates, in a highly complex way, between the universe of meaning and the universe of sound" (1970: 15). For Chafe, this connection is irrefutable: "If we look at language in its

broadest perspective, then, there seems no need to debate its nature as a link between meaning and sounds" (1970: 16). Given this long tradition of language as manifest in sounds, it becomes clear why initial explorations into the structure and functions of sign languages has been greeted with suspicion, or, even worse, simply ignored.

American Sign Language

In their article "Contrived Sign Language", Crystal and Craig (1978) attempt to offer a more rigorous examination of manual communication systems using a modified version of Hockett's (1963) design features. While much of their analysis deals with a broad spectrum of communication systems, quite a bit of attention is given to the properties of American Sign Language (ASL). In reaction to the growing number of linguists (Klima and Bellugi 1979; Liddell 1980; Stokoe 1978) who claim that sign languages are properly labelled "languages", in every linguistic sense, Crystal and Craig state:

> We do feel confident in stating that the assumption that signing behaviours in general are capable of description in linguistic terms is wrong, and that it would be preferable to talk instead in some more neutral way (1978: 161).

The term that these authors choose for signing behaviours is "system". Using a theoretical base that starts with a "comparative study which postulates an arbitrary set of language properties, or design features" (1978: 145), Crystal and Craig posit 12 characteristics of language which do not permit a meaningful classification of sign language:

1. Productivity. An infinite number of meaningful units can be generated.

2. Finiteness. The rules governing the construction of these units are finite and learnable.

3. Range. The vocabulary is capable of indefinite extension.

4. Reciprocity. The majority of the units are conventionally understood by the whole of some community.

5. Acceptability. Some units will be considered unintelligible by all members of the community.

6. Constituency. Some units can be analyzed into meaningfully contrastive formal units.

7. Hierarchy. There will be at least one level of formal organization between the level of the largest formally definable unit of meaningful sequence and that of the minimal meaningful unit.

8. Idiom. The meaning of larger units is not necessarily analyzable as the sum of the meanings of the smaller units out of which it is constructed.

9. Duality. Each meaningful unit is identifiable with reference to a set of minimal distinctive but meaningless elements.

10. Systemicness. The minimal meaningful units are organized into systems.

11. Autonomy. If a set of minimal units constitute a system, there will be a theoretical inter-dependence between the units, such that every unit is capable of being defined in terms of some other unit.

12. Disambiguation. There are ambiguous formal sequences some of which are capable of having the ambiguity resolved through the use of transformational processes.

(Crystal and Craig 1978: 156-157)

Of these 12 criteria, the authors state that American Sign Language research provides no support for autonomy, reciprocity, hierarchy, and disambiguation, and that there is questionable support for finiteness, range, acceptability, duality, and systemicness. In order to address Crystal and Craig's statements, it is necessary to review the literature on American Sign Language's phonology, morphology, and syntax. Although American Sign Language is expressed in a visual mode, research has shown that this unique language can be classified according to Crystal and Craig's criteria.

In Sign Language Structure (1960, revised 1978), Stokoe presents linguistic evidence that American Sign Language signs can be described with a set of phonemes. At the phonological level, four categories of phonemes have been described: handshape, palm orientation, movement, and location. Within each parameter is a set of primes. Although the question of how many primes exist within each parameter has not yet been resolved, it is generally understood that there are 18-19 handshapes, 24 movement primes, 12 location primes, and 6 palm orientation primes (Baker and Cokely 1980). These phonological parameters can be manipulated in a rule-ordered fashion. In the lexicon, signs must adhere to series of formational rules. For example,

American Sign Language has a symmetry condition which requires that two-handed signs made at the periphery of the signing space must have symmetrical handshapes, movements, positions, and orientations. In contrast to this condition, signs made at or near the visual centre of the signing space (the mouth) tend to have finer distinctions for all parameters than signs made at the periphery; marked handshapes (handshapes whose configurations are fine, i.e. /m/n/t/) tend to occur closer to the centre of the signing space, but signs made at the periphery tend to be made with unmarked handshapes (handshapes whose configurations are grosser, i.e. /b/5/y/). As well, American Sign Language phonology adheres to phonological processes that are found in spoken languages; for example, assimilation, dissimilation, deletion, and insertion are all found in American Sign Language phonology (Siple 1982: 316).

The morphology of American Sign Language has been studied by Klima and Bellugi (1979). Bellugi (1980) claims that the morphology of American Sign Language is different from spoken language only in that it is coded in a sophisticated visual-spatial format: "Rather than adding parts to signs that are like spoken language affixes, most inflections or modifications in ASL involve spatial and temporal patterns which are overlaid on the movement of the basic signs" (1980: 58). Sign language researchers have demonstrated a far more complicated morphology than was initially considered. The Laboratory for Language and Cognitive studies at the Salk Institute has investigated modulations in signs and how these changes reflect a sophisticated system of morphological processes. American Sign Language's morphology uses space in a rule-ordered, structured way to enable a great deal of information to be compressed into a single sign (Bellugi 1980: 58). Although current research into American Sign Language's morphology is by no means exhaustive, researchers have identified six inflectional processes and three derivational processes. The six inflectional processes are: referential indexing, reciprocity, grammatical number (including dual, trial, and multiple inflection), distributional aspect (including exhaustive, allocative, determinate, and allocative indeterminate inflections), temporal aspect and focus, and manner and degree. The derivational processes known to exist in American Sign Language are: derivation of nouns from verbs, derivations of predicates from nouns, and derivations for extended meanings. It is important to note that these morphological processes are defined in terms of a finite set of spatial-temporal movement dimensions -- they are not randomly assigned.

At the lexical level, American Sign Language creates new entries through a series of processes, but the most notable are compounding and borrowing. Compounding, the creation of a new lexical item from two existing forms, is a highly productive process in American Sign Language. It is from this process that

terms such as BOX-ZAP ('microwave oven') are created. As well, Battison (1978) provides a rigorous analysis of how fingerspelled English words are restructured according to the phonological and orphological conventions of American Sign Language thereby creating new lexical entries --- fingerspelled loan signs. Loan signs are systematically shaped by the phonological parameters (i.e. deletion of handshape letters to arrive at the maximum two allowed in American Sign Language double-handshape signs) and morphological parameters (i.e. "time-related" loan signs are marked in the same manner as other time signs). A third way of expanding the lexicon is by borrowing "initialized" signs from artificially contrived sign systems (i.e. Signing Exact English). In this type of borrowing, a sign is given a fingerspelled letter as its handshape but the other phonological parameters of its class of signs are maintained. For example, American Sign Language has a basic root sign for the word 'group', and by making this sign with the /t/ handshape, the sign 'team' is created.

The study of the syntax of American Sign Language has led to some striking findings. Basically American Sign Language is an SVO language, but it makes extensive use of non-manual behaviours to indicate what type of sentence is being used. Questions (both Yes/No and Wh.), assertions, relative clauses, and topicalizations are all signalled by non-manual behaviours involving the eyebrows, eye gaze, head movement, and body shift (Baker 1980). Because linguists were not initially attuned to the syntactic importance of these non-manual behaviours, they often assumed that American Sign Language had a relatively free word order, or that it had no syntactic constructions whatsoever. But Liddell (1980) points out that the basic word order of American Sign Language is SVO, and that this structure can be changed by topicalizing the subject, object or the verb phrase. For example, the English sentence "I like the girl" can be signed as:

GIRL, ME LIKE
'I like the girl'

But the object, "girl", must be signed with the accompanying non-manual behaviours particular to topicalized constructions (see Baker and Cokely 1980). Given that topicalization is an important syntactic construction in American Sign Language (Ingram 1977), it is clear why some linguists would mistakenly assume that this language has no syntax. But Liddell clearly shows that not all sentences are considered acceptable by native signers (1980: 77).

Returning to Crystal and Craig's (1978) language characteristics, the preceding discussion demonstrates that American Sign Language does, in fact, satisfy their criteria. The discussion of American Sign Language's phonology illustrates

that there is considerable research supporting finiteness, hierarchy, duality and autonomy in sign language. Moreover, research into American Sign Language's lexicon and syntax demonstrates range, acceptability, reciprocity, and disambiguation. It is important to note that, despite its modality, American Sign Language has characteristics similar to spoken languages, but that some of its levels (i.e. morphology) are expressed in a modality-specific manner. The similarities of signed and spoken language are not limited to their description, but are also demonstrated in a discussion of language processing.

SIGN LANGUAGE AND CONTEMPORARY LINGUISTICS

Contemporary linguistic theory has turned from a structural description of the features of language to an emphasis on the underlying cognitive features. Linguistic theories, such as those posited by Chomsky (1957), Fillmore (1968), and Chafe (1970), attempt to discover the universal principles of language, not through the analysis of speech acts (surface structure), but in terms of the more fundamental underlying cognitive representations (deep structures). It is in this area of linguistic theory that sign language research may have its greatest impact.

Despite the differences in modality between signed and spoken languages there is an increasing amount of evidence to suggest that both are processed in cognitively similar ways (Siple 1982). Psycholinguistic research on the memory processes of Deaf people show that their processing errors are analogous to those of hearing people. Short-term memory experiments show that Deaf adults make formational errors in recall that are similar to the phonological errors made by hearing people (Bellugi, Klima, and Siple 1975). Long-term memory experiments (Siple, Fischer, and Bellugi 1977) report that Deaf people encode signs semantically, a finding which is consistent with analogous experiments conducted on hearing people. Studies of the discrete sublexical structure of sign morphemes also show that intrusion errors made by Deaf subjects parallel those made by hearing subjects (see Klima and Bellugi 1979). In a review of linguistic and psycholinguistic data concerning the sublexical structure and processing of sign language, Siple concludes:

> Linguistic description of the discrete elements and rules of American Sign Language governing their combination is analogous to that for spoken language. Modality affects the articulation of the language but not the abstract, systematic linguistic structure (1982: 323).

This statement counters the arguments made by theorists (i.e. O'Connor and Hermelin, in Siple 1982) who claim that the visual processing system is unfit for processing linguistic information.

The strongest evidence to date for the claim that American Sign Language is processed as a language comes from a study done by Bellugi, Poizner, and Klima (1983). Three deaf signers with damage in the left hemispheres of their brains were tested according to their linguistic and visual-spatial abilities. The processing of language has been generally considered a function of the left hemisphere of the brain, and the processing of visual-spatial relations considered a function of the right hemisphere. This study found that the subjects were linguistically impaired but that their spatial abilities remained relatively intact. Despite the fact that American Sign Language is a visual language, Deaf people still lateralize language in the left hemisphere of the brain. Bellugi, Poizner, and Klima note that "hearing and speech are not necessary for the development of left hemispheric specialization for language" (1983: 170). The evidence for an underlying linguistic cognitive structure that is modality-free has an important impact on the search for linguistic universals, particularly for theories that are cognitively based. Stokoe states:

> If important linguistic processes operate to make the surface appear quite unlike what is theorized to be the deep or abstract structure of language, then one might suppose that the language faculty lies so deep within (silent as well as motionless) human cognition that its expression may be indifferently vocal or gestural. (1978: 375).

So, rather than avoiding sign language research, linguistic theorists should be looking for underlying cognitive representations through a comparison of spoken and signed languages. As an example, the next section will consider an application (somewhat truncated) of Chafe's semantic theory to American Sign Language.

Maxwell (1983) applies Chafe's model, found in Meaning and the Structure of Language (1970), to American Sign Language. Chafe's assertion that deep structure is not ordered and that linearization is the process that produces order in the surface structure is a particularly useful model for American Sign Language. American Sign Language has a greater degree of simultaneity than most spoken languages; the phonological and morphological elements of a word can be performed simultaneously, as opposed to spoken languages in which they must be performed sequentially. What is suggested is that the underlying representations are the same for both groups, hearing and Deaf, but that the surface structures are quite different. Chafe (1970) describes the process of converting configurations of combined

concepts (semantic structure) to surface structure as linearization. The ensuing process of symbolization then converts the linearized conceptual units into an arbitrary configuration of symbolic units. Chafe gives an example of this process in English:

semantic structure	linearization surface structure	symbolization phonetic structure
cat	cat plural	/kaets/

Maxwell gives a parallel example in American Sign Language:

cat	CAT plural	CAT CAT

Maxwell (1983: 180) also notes the high degree of deletion of old information in terms of Chafe's model. Often Deaf signers "delete" information such as pronouns from a sentence and by body shifting take the first-person narrative structure. For example, the sentence JOHN TELL MAN FINISH BOTHER," John told the man to stop bothering him", can be signed ME TELL MAN FINISH BOTHER, "I told the man to stop bothering me", if the speaker assumes the identity of John by body shifting. The receiver of the message is perfectly aware that it was John speaking, not the narrator, by the body shift. In themselves, spatially oriented processes like body shifting and indexing are semantically empty, but within the context of the story they indicate new and old information. Maxwell (1983) notes that the deletion is more "apparent than real".

Chafe's (1970) semantic theory focuses on the importance of underlying verb representations in the surface structure. Verb centrality, manifested in Chafe's theory as case structure, is an important aspect of American Sign Language. A singer of American Sign Language can use one verb, HIT, for many sentences:

    ME HIT HE   "I hit him"
    HE HIT ME   "He hit me"
    SHE HIT HE "She hit him"

The differences in these sentences are indicated by the direction and movement of the verb, but the hand configuration remains the same. Just as there is an underlying patient/agent distinction for the English sentences, the sentences require different motions for their surface structures. An analysis of the movements used for directional verbs (verbs which express case roles through movement) of American Sign Language might shed new light on Chafe's theory. Sign language research can lead to profitable insights for not only Chafe's theory but also for contemporary cognitive theory; the visual-spatial properties of

signed languages offer another route by which linguists can study the underlying principles of language.

CONCLUSION

The significance of trying to apply a cognitive linguistic theory to American Sign Language lies in the fact that there may be underlying linguistic universals in language. As Stokoe notes "it is now clearer than ever that any language research has to consider signed languages along with spoken languages" (1983: 266). Perhaps with the support of research in signed languages, theorists like Fillmore (1968) and Chafe (1970) would not have abandoned their cognitive theories so readily. The research done on the processing of signed languages points out that despite being perceived in a fashion totally separate from spoken languages, they are still processed as "language", not as limited codes. Once linguists determine which facets of language are modality-specific, then perhaps the shared characteristics of signed and spoken languages will lead to discoveries of "true" linguistic universals. At any rate, it is now clear that modern linguistic theory can no longer ignore sign language research as a possible path to the study of linguistic universals. Language can no longer be thought of only in terms of speech.

REFERENCES

Baker, Charlotte
    1980   Sentences in American Sign Language. _In_ Sign Language and the Deaf Community. Charlotte Baker and Robbin Battison, eds., pp. 77-86. Maryland: National Association of the Deaf.

Baker, Charlotte and Dennis Cokely
    1980   American Sign Language: assorted titles. Maryland: T.J. Publishers.

Battison, Robbin
    1978   Lexical Borrowing in American Sign Language. Maryland: Linstok Press.

Bellugi, Ursula
    1980   How Signs Express Complex Meaning. _In_ Sign Language and the Deaf Community. Charlotte Baker and Robbin Battison, eds., pp. 53-74. Maryland: National Association of the Deaf.

Bellugi, Ursula, H. Poizner, and E.S. Klima
    1983   Brain Organization for Language: Clues from Sign Aphasia. Human Neurobiology 2: 155-170.

Bellugi, Ursula, E. Klima, and P. Siple
    1975   Remembering in Signs. Cognition 3: 93-125.

Bloomfield, L.
    1933   Language. New York: Henry Holt.

Chafe, W.L.
    1970   Meaning and the Structure of Language. Chicago: University of Chicago Press.

Chomsky, Noam
    1957   Syntactic Structures. The Hague: Mouton.

Crystal, David and Elma Craig
    1978   Contrive Sign Language. _In_ Sign Language of the Deaf. L.M. Schlesinger and Lila Namir, eds., pp. 141-168. New York: Academic Press.

Fillmore, C.J.
    1968   The Case for Case. _In_ Universals in Linguistic Theory. E. Bach and R.T. Harms, eds. New York: Holt, Rinehart, and Wilson.

Grosjean, F.
    1980   Psycholinguistic: Psycholinguistics of Sign
            Language. In Recent Perspectives on American Sign
            Language. Lane and Grosjean., eds., pp. 33-59. New
            Jersey: Lawrence Erlbaum Associates.

Hockett, C.F.
    1963   The Problems of Universals in Language.   In
            Universals of Language. J.H. Greenberg, ed. Mass:
            M.I.T. Press.

Ingram, Robert
    1978   Theme, Rheme, Topic, and Comment in the Syntax of
            American Sign Language. Sign Language Studies 20:
            193-218.

Klima, Edward and Ursula Bellugi
    1979   The Signs of Language.   Cambridge: Harvard
            University Press.

Liddell, Scott
    1980   American Sign Language Syntax. New York: Mouton.

Markowicz, Harry
    1977   American Sign Language: Fact or Fancy. Washington
            D.C.: Gallaudet College.

Maxwell, Madeline M.
    1983   Chafe's Generative Semantics and the Structure of
            American Sign Language. Sign Language Studies 39:
            169-185.

Sapir, Edward
    1921   Language: An Introduction to the Study of Speech.
            New York: Harcourt, Brace.

Siple, Patricia
    1982   Signed Language and Linguistic Theory.   In
            Exceptional Language and Linguistics. Lorraine Obler
            and Lise Menn, eds., pp. 313-338. New York:
            Academic Press.

    1978   Linguistic and Psychological Properties of American
            Sign Language: An Overview. In Understanding
            Language Through Sign Language Research. P. Siple
            ed., pp. 3-23. New York: Academic Press.

Siple, Patricia, S. Fischer, and U. Bellugi
    1977   Memory for Nonsemantic Attributes of American Sign
            Language Signs and English Words. Journal of Verbal
            Learning and Verbal Behaviour 16: 561-574.

Stokoe, William
    1978a   Sign Language Structure. Maryland: Linstok Press.

    1978b   Problems in Sign Language Research. In Sign Language
           of the Deaf. I.M. Schlesinger and Lila Namir, eds.,
           pp. 365-378. New York: Academic Press.

    1983   Sign Language, Linguistics, and Related Arts and
           Sciences. In Language in Sign. Jim Kyle and Bencie
           Wall, eds., pp. 263-268. London: Croom Helm.

Wilbur, Ronnie
    1980   The Linguistic Description of American Sign Language.
           In Recent Perspectives on American Sign Language.
           Lane and Grosjean, eds., pp. 7-31. New Jersey:
           Lawrence Erlbaum Associates.