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Introduction

Issues in sign linguistics: Phonetics, phonology and morpho-syntax*

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Abstract

In this introductory article we give a brief review of sign language research, particularly in phonetics, phonology and morpho-syntax. We focus on the development of insights into the structure of sign languages, as well as on the theoretical importance of sign language research for linguistics in general.

1. Introduction

The importance of the study of the linguistic structure of sign languages to the field of linguistics in general can hardly be overestimated. Sign languages are produced and perceived in a different physical modality – that is, the manual-visual modality – whereas spoken languages are in the oral-auditory modality. Until recently the emphasis in linguistic research has been on spoken languages and, in fact, on a rather limited number of these. The proposals that have been made about candidate universal properties of languages have therefore been based on a rather small subset of human languages. Recent research on languages other than English, especially on languages from language families other than the Indo-European family, have often challenged the postulated universals, suggesting modifications or complete reconsideration. This in itself illustrates the importance of the investigation

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The drawings in this article have been reproduced with permission from L. Koenen, T. Bloem and R Janssen. Gebarentaal. Nijgh and van Ditmar, Amsterdam 1993 (Fig. 1) and from T. Schermer et al. De Nederlandse Gebarentaal, Van Tricht Uitgeverij 1991 (Figs. 1, 2, 3).

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of languages other than the ones that have been used to formulate the hypotheses in the first place.

In this respect sign languages form a very important testing ground for candidate language universals, and for isolating those universals from the effects of the modality of production and perception. By studying the structure of sign languages, linguistic analysis moves beyond the modality-specific and potentially reveals those aspects of linguistic hypotheses that are not valid for (some) sign languages. Those aspects that seem to be invalid for *all* sign languages are expected to expose modality-specific properties of language. Establishing modality-specific properties (of both spoken and sign languages) is in itself an important objective. The description of universal cognitive modality-free properties of language is, however, at least as important an objective, and some might say that it is the essential goal of research into the linguistic ability of the human species. The way to this goal requires consideration of the broadest possible range of language types. In a previous issue of this journal, Sandler (1993) gives a clear demonstration of the relevance that the study of sign languages has for the construction of models of the language capacity, or, more broadly speaking, of human cognitive organization. We also refer to Fischer (1974, 1994), who makes many of the points of the relevance and interdependency of sign language studies and linguistic theory that we make here.

In this introduction we wish to provide the reader who may not be familiar with the field of sign language linguistics with a minimum of background that we think is necessary to appreciate the issues that are discussed in the articles that follow. In section 2 we start out with a short history of the field. Sections 3 and 4 present issues which are specifically related to phonetics/phonology and morpho-syntax, respectively.

Before we turn to this, we wish to make the following remark. Certain readers might wish to be convinced of the fact that sign languages are governed by abstract principles that are comparable to those that we find in spoken languages so that one might feel justified in regarding both communicative systems as instantiations of a single human capacity. To convince such readers, we would have to know what they take to be essential and defining properties of human (spoken) language. An editor of this journal demands that students of sign languages demonstrate (preferably in every publication that is meant to be read outside sign linguistic circles, but certainly in an introductory text like this one) the existence of *double articulation* in sign language as the source of the arbitrariness of the sign form. The point seems to be that until one can be sure that a double articulation exists one does not know whether analyses are phonetic, phonology or morphological. That sign languages have a dual articulation will be shown in section 3 with reference to the pioneering work of William Stokoe. It is fair to say that most sign linguists today feel that the point has been made so often that the time has come, perhaps, to assume that the field of linguistics has acknowledged the 'language' status of sign languages. That the issue cannot be taken for granted, however, is apparent from a recent contribution on the matter of dual patterning. Armstrong et al. (1995) promote a perspective on sign language structure that undermines the duality claim, arguing that the form of sign utterances is essentially fully motivated by 'semantics'.

2. Historical background

Sign languages started to attract the attention of linguists only a few decades ago. In the early 1950's Ben Tervoort from Amsterdam, The Netherlands, observed the communication of some young deaf children and recorded properties of that communication which indicated an independent linguistic system in a different modality. For example, he observed that signs had a constant form with a constant meaning and that these were not derived from the spoken language (Tervoort, in press).

William Stokoe went further in describing the linguistic structure of American Sign Language (ASL). He developed a system for describing signs at the level of form or, in other words, formulated phonological parameters for signs: the handshape, the movement and the place of articulation (Stokoe, 1960); see section 3 for further details. Together with Casterline and Cronenberg he produced a dictionary of American Sign Language, published in 1965. This work attracted the attention of researchers both in the US and in many other countries, and raised sign languages to the status of natural languages worthy of linguistic interest.

Work in the 1970's expanded the knowledge of ASL structure greatly (see Klima and Bellugi, 1979), and gradually other sign languages became the object of serious description and analysis as well. The then commonly held views that sign language was really a limited form of pantomime or that there was one universal sign language used by deaf people all over the world began to make way for consideration of these languages as fully fledged separate linguistic systems. This had an interactive effect on the deaf communities in various countries, who began to become aware of the status of their language and of their own status as a cultural group (Lucas and Valli, 1989).

A particularly important effect in Europe was that within deaf education, policy changed from the oral approach which had been dominant in this continent since the banning of the use of signs in 1880 to the policy of Total Communication, involving the use of all means of communication to promote the communicative abilities of deaf children. Here linguistic research contributed to making an important distinction, namely, between the natural sign languages of the deaf community and the artificial sign systems which were most frequently used in schools for the deaf under the new Total Communication policy. Signed systems are a combination of the spoken language of the hearing community and the sign language of the deaf community. Roughly, the syntactic and morphological structure of the spoken language is maintained in these contrived systems, and the sign language lexicon is inserted in that structure. Signed systems are used in the communication between hearing and deaf people. They are, in principle, not natural languages. The study of sign systems does not form the focus of interest in sign linguistics. Rather, most attention is given to the natural sign languages that are used within deaf communities. It is clear, however, that the use of Total Communcation systems has formed an important bridge between the oral approach and full recognition of sign languages as means of communication and education.

A considerable amount of work in this early period was at the level of lexicographic and basic grammatical description. This in turn led to the development of

practical tools (such as dictionaries) that were of immediate use to the educational system. Such practical and descriptive projects necessarily had to precede the more theoretically oriented work which was to follow. But even today much too little is known about a sufficiently large number of individual sign languages at the descriptive level to facilitate broad comparative research; we return to this point below.

As might be expected, the interest also spread from description of normal adult signing into other areas of linguistics such as language acquisition, sociolinguistics, and language pathology. These extensions showed quite clearly that most if not all angles on the study of spoken language apply just as well to the study of sign languages. The study of sign language aphasia and localization of the language component in the brain is an example (Poizner et al., 1987). For an overview of studies of sign language acquisition, see Newport and Meier (1987).

In the 1970's, 80's and early 90's the interest in sign linguistics increased rapidly and gradually a shift in emphasis revealed itself. Early work often had as a meta-goal the establishment of sign languages as worthy objects of linguistic research, so that much energy was spent on showing the parallels between descriptions of sign languages and spoken languages. The motivation, though it was probably often not conscious, was apparently to give sign languages a greater chance of being accepted as natural human languages by demonstrating that they had many properties that spoken languages are known to have. Gradually, however, some researchers began to pay more attention to those properties of sign languages that seem to differ significantly from those of spoken languages. Examples of this can be found in various recent studies that address the idea of syllabic organization in sign language. Many of these quite explicitly recognize different modes of organization (as a reflection of the different modalities), without denying certain abstract parallels; see e.g. Wilbur (1990, 1993), van der Hulst (1995), Sandler (1995) and various contributions to this issue (Corina, Brentari).

Addressing modality-specific aspects of signed and spoken languages as well as formulating more abstract principles of language structure in order to properly generalize over both modalities was often seen as a daring step, but also as a sign of maturity of the field, only possible once sign languages had been established as respectable linguistic system.

Meanwhile sign linguistics remained a specialized field, which, however, the linguistic community in general (although still rather naive about sign language) no longer classified as a specialization outside of linguistic inquiry. In addition to the specialized journals and conferences that have been in existence for nearly two decades, today one regularly finds sign language contributions in general linguistic events, and the debate around the issue of the contribution of sign linguistics to linguistic theory has become more open.

To conclude this section we will address a methodological issue that frequently comes up in sign language studies, e.g. recently in Uyechi (1994). Uyechi argues that research on the phonology of sign language must be done from scratch, that is, with no theoretical assumptions from spoken languages in terms of theoretical model, primitive units assumed, etc. Clearly there is an issue here since it is always possible that familiar concepts, thought to be very well-established in the

study of spoken languages, may be forced inappropriately upon the structure of sign languages. Although it is natural perhaps to defend apparent generalizations, uncritical transfer of concepts and terminology is of questionable methodological value.

Despite warnings for uncritical transfer, most researchers, including the authors of the articles in this issue, adopt the view that the theoretical models used for spoken languages usefully provide a scaffold for sign language analysis, accepting (and sometimes stressing) that this confrontation may lead to a re-analysis of the spoken language model. This point comes up in several articles including Liddell's on the use of space and various contributions on the notion of syllable structure (Brentari, Corina, Sandler).

This issue also raises the question of what might be expected to survive the test. Van der Hulst's contribution centers around the claim that we expect abstract principles of organization (those that even within the spoken modality are not confined to a single module of grammar) to generalize over both modalities. He refers to principles of structure such as binarity of branching and a head-dependent relation between structural sisters as possible candidates.

The articles included in this issue make clear contributions to the debate on the general and the specific of sign language descriptions. In the next two sections we will discuss issues in the area of the study relating to the 'form' of sign languages (phonetics and phonology) and to the morphological and syntactic organization, respectively. This organization reflects the duality of patterning that sign languages are claimed to have. The space we devote to each area is proportional to the number of phonology and non-phonology contributions in this issue.

3. Phonetics and phonology

The study of the form (i.e. phonetics and phonology) of both spoken languages and sign languages is perhaps the least likely area to reveal cross-modality correspondences because it would seem evident that modality differences between spoken and signed languages are rooted primarily in the physiological means of production (oral vs. manual) and of perception (auditory vs. visual). The phonetic dimensions involved are completely different and one might expect that this must lead to different phonological categories and organization. One might expect further that resulting differences in the phonological inventories and organization would engender different sorts of morphological and syntactic processes and generalizations.

In one sense such differences appear to be very real indeed. If sign languages are taken seriously, no modern textbook or article ought to state that there is a universal set of phonological features out of which specific languages make a choice – where this 'universal set' contains features such as [voice], [coronal], [nasal], and so on. If this set were the one made available by universal grammar, deaf children would be pretty much on their own when they have to figure out the abstract phonological structure of their language and the relation between this structure and its phonetic exponents.

The example is, we think, very instructive because it is so simple. It illustrates quite straightforwardly that by studying languages in a different modality we are immediately confronted with candidate 'universals of human language' that turn out to be valid for spoken languages only. Recognizing the appropriate status of such alleged universals should not, of course, eliminate our interest in them. As pointed out in section 2, sign linguistics is no longer obsessed with proving that sign languages are real languages. The modality-specific properties of sign languages and spoken languages (presumably properties that are largely determined by the channel that is used) form an area of study in themselves, just like the study of differences among spoken (and among sign) languages does.

To elaborate the example let us establish that there is, of course, an essential difference between proposing an actual list of distinctive features that is supposedly universal (an enterprise that is doomed to fail as long as phonologists attribute clearly modality-dependent entities to the list) and proposing, as a universal of human language, that forms having the status of morphemes (i.e. atoms of morphosyntactic structure) can be decomposed in building blocks that have no meaning, in other words pure building blocks of the form of language that we may refer to as features.

We have mentioned in section 2 that precisely this proposal (viz. that the *monomorphemic forms* in sign language can be decomposed in *meaningless features*) forms the heart of the groundbreaking work of William Stokoe (Stokoe, 1960), who argued that monomorphemic signs can be systematically decomposed into three types of building blocks; the terms between parentheses are the ones that Stokoe used:

(1) a. The shape of the hand(s) (dez)
    b. The place of the hand(s) vis-à-vis the body (tab)
    c. The movement of the hand(s) (sig)

Each of the parameters in (1) has a finite number of values, which can be taken to represent the features. ASL, as well as other sign languages, uses a finite set of handshapes that does not exhaust the set of handshapes that is physiologically possible. Not all languages use the same set. Likewise, there is a limited number of loci on and in front of the body where the hand(s) may be held or move. The hand(s) typically perform some movement rather than being held completely still and the set of possible movements appears, again, to be finite.

Later work extending Stokoe's insight has both enriched the set that he proposed as well as further decomposed the parameters that he suggested. Important contributions were made by Battison (1978), Mandel (1981), Friedman (1977), Boyes-Braem (1981) and the works brought together in Klima and Bellugi (1987), to mention just a few. The precise details of these contributions cannot be spelled out here and we must refer to Sandler and Corina (1993), Sandler (1995b) and Brentari (1995) for overviews of sign language phonology research.

The claim that the building blocks are meaningless units in principle has been generally accepted, although the matter has also been critically assessed (see Kegl

and Wilbur (1976) and Brennan (1990)). That they are meaningless entails that their form (and the form of the constellations they enter into) is not necessarily motivated or iconic. This, then, shows that sign languages have a double articulation. The atoms of structure function just like distinctive features in spoken language phonology in a system of opposition and contrast. Like in spoken languages we can study the wellformedness of signs in terms of possible combinations of atoms and we can establish rules and processes that apply with reference to (sets of) atoms. All phonological contributions to this issue bear witness of these points.

A point worth making here is that single phonological features, or combinations of features, that do not form a fully specified (i.e. pronounceable) form, can form morphemes by themselves. One can think of tonal features which may represent tense morphemes in tone languages, or nasality that may mark morphological categories in some South-American languages. Thus, claiming that e.g. the handshape is a meaningless building block of the monomorphemic signs in (1) below, does not entail that morphemes cannot consist of a handshape alone. Like morphemic tones, such morphemes must be realized in conjunction with other morphemes to be pronounceable. Morphemes that consist of a handshape alone in fact occur and they are called classifiers (cf. below).

To give the reader a grip on the dimensions in (1) we compare them to dimensions in spoken languages which, though very different from a physiological and phonetic point of view, play a role at the corresponding level of analysis. It is generally accepted that segments (to use a neutral term) in spoken languages can be decomposed into features, which are classified according to:

(2) a. The choice of articulator
    b. The place of articulation
    c. The manner of articulation
    ...

As in (1), each of these parameters has a limited set of values (usually referred to as phonetic or phonological features, depending on the level of analysis). Both (1) and (2) make direct reference to the production of signs and sounds, respectively. Stokoe showed that a number of different values for the dimensions or parameters in (1) play a distinctive role in ASL. Thus, he pointed to pairs of monomorphemic signs that differ minimally in handshape, place or movement.

The examples from SLN in Fig. 1 illustrate such minimal pairs. The examples VERKLIKKEN 'to tell tale', TANDARTS 'dentist', INSTITUUT 'institute' show that the handshape value can be distinctive. The three signs show the same value for place and (type of) movement. The examples ONSCHULDIG 'not-guilty', WONEN 'to live (somewhere) and LEREN 'to learn' illustrate the distinctive use of place.

These kinds of data bring the parameter values in (1) within the realm of phonology. The logic of phonological analysis is no different from that applied to spoken languages. If e.g. two handshapes appear to be never strictly contrastive, they are possible phonetic variants of a single phonological handshape value. And indeed, Stokoe isolated some examples of allophonic variation.

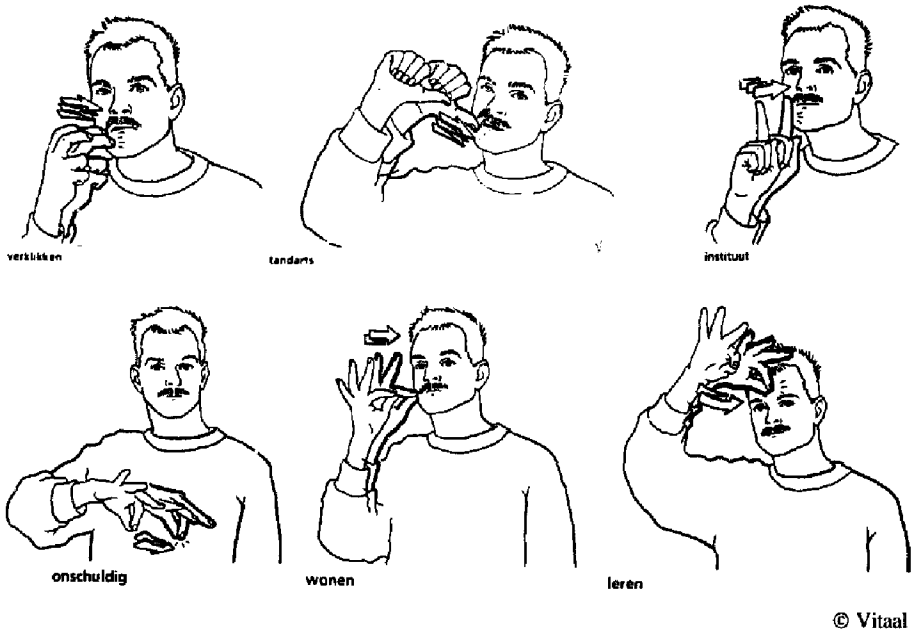

Fig. 1. Minimal pairs in SLN.

We point out here that a strict application of the minimal pair test is hampered by a certain shortage of minimal pairs for many of the parameter values that have been proposed in the sign language literature. To what extent it is justified to collapse different phonetic values into single phonological categories remains to be established. It does seem clear, however, that some feature inventories that have been proposed for sign languages contain too much phonetic differentation.

Stokoe compared the values of his parameters to 'phonemes', although he avoided the use of this particular spoken language term, coining the term 'chereme'. In our discussion so far we have worked our way to another view, namely that the values of the parameters in (1) are analogous to the values of the parameters in (2), i.e., the units we call phonological atoms or features. To establish this we do not base ourselves on the number of parameters or the number of their values, i.e. the actual list of features. With respect to the actual list, the two modalities differ quite obviously, which is why the lists of 'universal' features that we find in our phonological textbooks are clearly not universal. The correspondence we note leads us to a level of abstraction at which universals transcend the 'names' of features as well as their phonetic exponents. In this particular example, it seems likely that the universal abilities lie in being able to categorize phonetic scales into discrete categories, presumably in some systematic way.

If this is accepted, basic structural correspondences between signed and spoken languages emerge, something one might expect in the area of morphosyntactic structure, but perhaps not, as stated above, in the study of phonological form.

Stokoe (1960) stressed that the components in (1) are cotemporal. Because he compared the components to segment-sized units, he concluded that an important modality difference was that signed language have a largely cotemporal (or 'simultaneous') organization, whereas spoken languages are more linear. This point loses force, once we recognize that the parameters in (2), that form the analogues to those in (1), are just as cotemporal, although this then leads us to another modality difference: most morphemes in ASL (and other sign languages as well) have just one value for each of the parameters in (2). This implies that most morphemes in sign languages are monosegmental. We refer to van der Hulst (1995) for further discussion of this point.

Among the features that characterize signs, those that characterize movement occupy a rather special position. Movement is a dynamic notion and movements

have a starting and an end point. In Newkirk (1981) and Liddell and Johnson (1985, 1989), arguments have been provided for recognizing beginning and end points of movements as phonologically significant. Both phonological and morphological rules make reference to these points and this requires them to be represented in the structure of signs. One morphological argument involved the marking of subject and object on certain kinds of verbs; we discuss this in section 4.

Liddell and Johnson (1989) propose a skeleton consisting of two types of units, Holds and Movements to which features of handshape etc. associate. Sandler (1989) follows and modifies this model. In her model, handshape is represented on an autosegmental tier, thus being separated from the linear sequence of static (location) and dynamic (movement) segments. Independent behavior of that category with respect to locations and movements (which she compares to the way tones behave with respect to the string of vowels and consonants in tone languages) is cited as motivation. In addition, Sandler's model follows earlier suggestions that place of articulation is constant across morphemes; movement of the hand is limited to moving *within* a limited set of 'major places'. Like Handshape, she represents a place unit as being multiply linked to the linear segments. Schematically, this results in the following representation:

(3) handshape

```
 / | \
L M L
 \ | /
  place
```

Though it is not apparent from this simplified representation, the intent is that each location (L) is characterized by a point within the major place of articulation. These