Sign language phonology: The Monosegmental Hypothesis (A synopsis)

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[All references to my own work can be going to the #number next to the references which refer to items under 'Publications: https://harry-van-der-hulst.uconn.edu/'. Other references cited here are provided in the text below. Many other relevant references, among others to related work by others, can be found in my publications.]

The most significant early discovery that contributed significantly to saying that sign languages have *duality of patterning* was the claim that signs can be divided into *meaningless* building blocks, such as handshapes, locations (near or on the body) and movements (of the hand). This was the important discovery of William Stokoe in 1960 and also of La Mont West in that same year. Stokoe called these units *cheremes* (and the study of them *cherology*) because he wanted to avoid looking at the perceptible side of sign languages through the lens of spoken language. But soon, his terms were replaced by 'phoneme' and 'phonology'. Stokoe made a crucial typological statement by observing that his basic units in signs are simultaneous, while the basic units in spoken language, phonemes, occur in linear succession. See van der Hulst (2022 [#171]) for a history of the origins and development of sign phonology and van der Hulst and Sandler (to appear [#187]) for a history is sign linguistics.

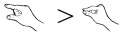
A later development was the insight that signs actually do include a linear kind of phonological organization, given that the starting and ending point of signs can be referred to in morphological, especially inflectional, operations that, for example, can realize pronouns on either edge. I-GIVE-YOU (a book) as opposed to YOU-GIVE-ME (a book) attaches a pointing sign to either the beginning or end of the movement that represents the transfer of the book, depending on the two meanings. Following work by Scott Liddell in the early 1980s), it was proposed by Wendy Sandler in 1987), and others, that the basic building blocks mentioned associate to an LML skeleton (location-movement-location) and soon enough this template was called a *syllable template*.

In van der Hulst (1993 [#51]) I have argued that the analogy between units like handshapes, locations and movement and phonemes in spoken languages was unfortunate if by 'phoneme' we mean more than just 'basic contrastive unit'. Let us first consider that phonemes in spoken languages stopped being basic units when distinctive features came to be acknowledged. This development was also seen in sign phonology work when it was proposed that Stokoe's basic units can also be analyzed in sets of distinctive features; These two parallel developments of recognizing distinctive features point us towards a more appropriate analogy, given that we add one further development in feature theories for spoken languages. See van der Hulst and van der Kooij (2021 [#169]) for a review of these proposals and for a specific proposal that follows van der Hulst (1993 [#51]) and that is based on Els van der Kooij - *Phonological categories in Sign Language of the Netherlands*. LOT Publications.

In work on features since the mid-1980's it was proposed that the internal structure of phonemes is not an unstructured list of features, but rather that phoneme-internally features group into simultaneous so-called *feature classes*, such as Laryngeal, Place and Manner. With this proposal in mind, it should now be clear that the basic units that Stokoe had proposed are analogous to these feature classes which then immediately explains that his units are simultaneous, just like the feature classes in phonemes. Following Stokoe's work, it was shown that *monomorphic* signs

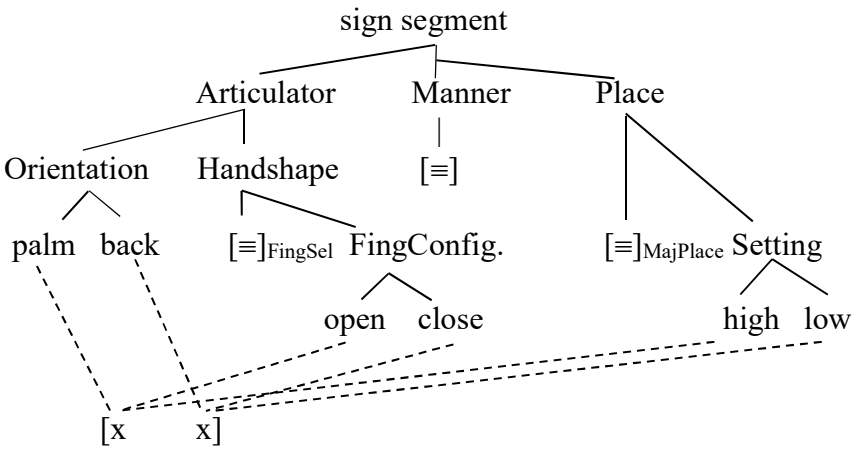
typically contain a single feature specification for each of the three basic units, which parallels the fact that phonemes in spoken languages have the same 'simplicity' (of usually having one specification for laryngeal, place and manner). While for both types of languages this claim needs to be adjusted (given certain types of complex segments), the conclusion that now follows is that *monomorphic signs are monosegmental* in that they have the formal structure of a set of simultaneous class nodes, just like phonemes in spoken languages. This is the claim advocated in van der Hulst (1993 [#51]). This conclusion was also reached in work by Rachel Channon.

The striking difference between signed and spoken languages at the phonological level is thus rather different from what Stokoe claimed. While in both modalities, class nodes are simultaneous sets of features that characterize segments, it would appear that *sequences* of such segments, while typical of spoken languages, are virtually absent in monomorphic signs, and even in most polymorphic signs, although sequential sign segments do occur in compounds, being linear combinations of two independent signs.

The conclusion that in sign languages non-compound signs are monosegmental may strike one as implausible. Spoken languages do have morphemes that are monosegmental, some roots (*eau* in French for 'water') and more often affixes (plural /s/ in English). But that option is very limited given the limited number of phonemes, even when the same phonemes can be used for different morphemes (such /s/ for plural, third person singular and genitive in English). How then is it possible that sign language can 'get away' with a monosegmental structure of perhaps all their morphemes? To explain this, I have suggested that the phonetic 'spaces' that are available in the sign modality for creating different handshapes, locations and movements allow for many more distinctions than are possible in the phonetic spaces for spoken languages. A very specific potential for a rich array of phonetic options in signs involves, paradoxically perhaps, the possibility for *linearity*. While the handshape in signs is invariant with respect to the choice of *selected fingers* (i.e., fingers that are extended or foregrounded), the relationship between fingers (making a closing or opening movement) and the bending of fingers can vary; these distinctions are called *hand-internal movements*. The linearity here is that the handshape must then be specified with a linear order or the feature for 'aperture', i.e. [open] > [close] or [close] > [open]. An example is the ASL sign for BOY:  with an open to closing handshape at the forehead location. (The closing or opening hand-internal movement can be repeated or not repeated in some signs.) Another important source for a wide array of phonetic choices (that can be used contrastively) involves another kind of movement. Signs tend to have one specification for the place of articulation (like 'chest', 'forehead', 'arm') but within this 'major' place, the hand can move from one sublocation to the other (which Sandler 1976 calls *settings*), which creates what is called a *path movement*. Van der Hulst (1993 [#51]) refers to the path movement as 'the manner of articulation' because the movement results from how the hand as the active articulator interacts with the place of articulation. Compared to what we call manner of articulation in spoken segments, the manner of articulation of signs involves a path of the hand that allows many distinguishing properties, such as following a straight shape or a curved shape, or having a circular or zigzag shape. These distinctions are analyzed as *secondary movement* features. Manner in spoken languages does not allow for secondary movements given that the movement of the articulator, e.g., the tongue, to the place of articulation (e.g., the alveolar ridge) is simply too small. There are to be sure manner distinctions (i.e., stop vs. fricative), but the array of manner distinctions in signs is much greater due to the magnitude of path movements; see van der Hulst and van der Kooij (2021) for a more detailed review of the greater array of potentially contrastive use of phonetic distinctions in the signing modality.

To accommodate the linearity of hand-internal movements and path movements, van der Hulst (1993 [#51]) proposes a phonological model for signs that includes two linear positions ('x'), to which the various features that need to be linearized are associated. (This structure omits nodes for non-manual properties and two-handed signs; see van der Hulst (1996 [#71]); the Manner node contains features that account for, among others, secondary movement properties):

(1)



In a sense, the x-skeleton can be regarded as a kind of segment-internal 'syllable structure' if we say that the essence of syllable structure is to linearize phonological units. The fact that there is only one skeleton explains why, when signs have multiple dynamic aspects, the beginning and end phase of each is synchronized, as has been recognized in work by David Perlmutter.

The important contribution of Stokoe and La Mont West was to show that sign languages have a *dual articulation*, at least in the sense that there are *meaningless* building blocks that enter into the phonological structure of signs. As mentioned, the building blocks, a set of handshapes, locations and movements (as well as their features), indeed occur in many signs as meaningless units. However, early on sign researchers pointed out that in many signs one or more building blocks seem to have a 'meaning'. For example, in the ASL sign *to eat*, the location where the hand moves to is the mouth, while the movement looks like bringing something toward the mouth, with the handshape holding whatever it is that will be eaten. Does this imply that the location unit |mouth| has the meaning MOUTH? Another often-mentioned example concerns signs that refer to a mental activity, such as thinking, learning, believing, knowing, etc. which are all made with the hand at or near the forehead location. Does this mean that the location |forehead| has the meaning MIND?

It seems obvious that the driving force behind the fact that phonological building blocks are often associated with a meaning is iconicity, which fosters sign forms that somehow mimic visual aspects of the activity or thing that the sign refers to. Nevertheless, the same building blocks also occur in signs in which said meaning is absent. Many signs made at the forehead do not involve a meaning aspect MIND, such as the ASL signs for *father*, *cap*, *deer*, etc. This is not to say that when signs are first created (either consciously or subconsciously), they are totally arbitrary in their form/meaning relation. We can safely say that when signs are first 'made', almost all aspects of them are iconic. This fact is supported by research that invites signers to make new signs for concepts (even if a sign already exists); see important unpublished word by Els van der Kooij and Inge Zwisterlood. Over time, the iconicity can become opaque for various reasons which results in many signs being only partially iconically motivated. In such cases, the meaning of signs

cannot be compositionally derived from the meaning of all their parts. This suggest that meaning-bearing building blocks of signs are like *morphemes* in spoken languages that can be productively combined to form complex words, the meaning of which *is* compositionally based on the meanings of their parts, with the proviso that the meaning of compounds is vague. Also, in spoken languages, apparent complex words can contain so-called 'cranberry' morphemes, i.e., formal units that have no meaning, such as 'cran'. If we would analyze signs as morphologically complex because parts of them seem to bear meaning, we would have to accept that such signs typically also contain cranberry morphemes, i.e., formal parts that have no apparent meaning. This implies accepting that sign languages have a different kind of morphological structure, next to also having affixation (mostly of the non-concatenative kind) and compounding.

Whether or not the recognition of many signs having iconic properties calls duality of patterning into question, I suggest that it is helpful to recognize also another kind of duality. The formal, phonological building blocks in sign phonology are often associated with a 'semantic value' (based on iconicity, although not necessarily), but at the same time, they can also be used without it, arbitrarily so to speak. Models that acknowledged the duality of phonological building blocks in signs have been developed for example in Penny Boyes-Bream. If this is accepted, even though we can still accept the duality of patterning thesis, we can no longer say that it is a necessary criterion that elements in phonological representations are always meaningless. This recognition led William Stokoe in his later work for speak of 'semantic phonology'!

Let us finally address the finding in work by Wendy Sandler and her collaborators who analyze the signs in the emerging language called Al Sayyid Bedouin Sign language (ASBL), that no evidence for a compositional phonology in terms of distinctive features can be established. The phonetic form of the signs is highly variable, subject to interpersonal and cross-personal variation, and being highly iconic. They suggest that the phonetic form of signs is holistic and has not (yet) been subjected to a phonological analysis (by the signers) in terms of mental representations that use contrastive features as has long been proposed for 'mature' sign languages.

Before we conclude that human languages can apparently do without having a phonological level, we could perhaps also say that we must have a broader understanding of what phonology is supposed to cover. In van der Hulst (to appear [#183]) I make a case for recognizing that the task of phonology should not be limited to accounting for a compositional structure in terms of strictly formal, meaningless units. Realizing the important role of meaning-bearing, iconically motivated building blocks, we also have to explain how signers (or humans in general) are able to map mental conceptual representations (of things and activities) iconically onto a perceptible form. If we say that to explain this mapping falls within the domain of phonology, we need to broaden our idea of what phonological theories are about. Let us say that a complete theory of phonology comprises these two submodules:

(2) a. *Compositional (or symbolic) phonology*: deals with the compositional organization of signs in terms of meaningless units.
b. *Iconic phonology*: deals with the mapping from a semantic conceptual structure to phonological form.

We should not be surprised that iconic phonology precedes compositional/symbolic phonology in the emergence of a new language and when signs are newly formed, especially in the visual domain. When looking for a form to represent a concept, people naturally come up with an iconic gesture whenever possible. My point here is that phonology is about the perceptible form of

linguistic expressions. The bias toward compositional/symbolic phonology is the result of a long exclusive focus on spoken languages in which iconicity pays much less of a role than in sign languages, even though the role of iconicity in spoken languages has come to be recognized. The agenda for phonology is to develop theories about iconic mapping, based on early and important contributions by Penny Boyes-Braem, Sarah Taub and Karen Emmorey.

The overall 'lesson' of including the phonology of sign languages into the field of phonology is that we need a phonology theory that is a-modal. This view is central in van der Hulst 2000 [#97] and repeated in van der Hulst (2020: Chapter 11].