CHAPTER 30

MORPHOLOGICAL THEORY AND SIGN LANGUAGES

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30.1 INTRODUCTION

IN a study comparing American Sign Language (ASL)¹ to English, Bellugi and Fischer (1972) found that it takes twice as long to articulate isolated signs as it takes to articulate isolated words, nevertheless a given proposition can be articulated in either language in the same amount of time. How can that be?

ASL makes up the time difference in at least two ways: via the rate of signing and the number and duration of pauses (Grosjean 1979) and via simultaneous delivery of multiple bits of information (Wilbur 2000), called layering. The first way involves phonetic matters outside the domain of morphology. Layering, on the other hand, is crucial to morphology.

Layering is interpreted via 'vertical processing'—processing various input types presented simultaneously. This contrasts with 'horizontal temporal processing'—processing temporally sequential inputs. Sign languages are superior to spoken languages at vertical production because they have multiple articulators and use the phonology in meaningful ways. They are superior at vertical processing because this is a task where vision is superior to audition (Brentari 2002). The types of vertical production that sign languages exhibit do not interrupt the base form of words or involve discontinuous morphemes, making them easier to process than non-concatenative processes in spoken languages (Emmorey 2007). We might expect layering, then, to be common in sign languages, and research over the past two decades confirms that expectation (Aronoff, Meir, and Sandler 2005; Vermeerbergen, Leeson, and Crasborn 2007).

¹ I give the rubrics for sign languages in English: Deutsche Gebärdensprache, for example, is referred to as GermanSL. The one exception is American Sign Language where the standard acronym is used: ASL.

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This chapter begins with the robust contributions of sign phonology to morphology, due largely to modality. I next point out two theoretical issues in sign language morphology, one not found in and one more extreme than in spoken language morphology. Next I outline horizontal and vertical morphological processes. Finally, I turn to the morphosyntactic process of verb agreement.

30.2 Exploitation of phonology in morphology

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An overview of relevant phonological basics will allow us to understand the robust contributions of phonology to the lexicon and to signs created in conversation.

30.2.1 Sign phonology basics

Sign languages have five articulatory parameters: handshape, location, movement, orientation, and non-manuals (Stokoe 1960). Handshape means the configuration that digits assume. Some handshapes are easy to make (these unmarked handshapes occur frequently in all sign languages), others trickier, and others difficult (these occur only in a few languages and then rarely). While handshapes can carry meaning (as discussed immediately below), a sign can be identified well enough by other parameters, particularly movement (Poizner, Bellugi, and Lutes-Driscoll 1981), so that if one uses an unmarked handshape throughout a whole sentence, the sentence can still largely be understood. For example, in a BritishSL story, Richard Carter uses the flat hand with the fingers not spread (the B-handshape) to make utterances signed by an owl (Sutton-Spence and Napoli 2009).²

Location means the place where the articulating hand(s) is located. If a sign transposes the hand(s), it will have a starting and an ending location. Locations can be places on the body (typically from the top of the head down to the hip and along the non-moving arm/ hand), as well as neutral space. Neutral space is the area directly in front of the signer.

Movement means the movement of the hand(s). Primary movement (via shoulder and/or elbow articulation) forms a path. Secondary movement (e.g. finger wiggling) has no path.

Orientation concerns the direction the palm faces. Important also is facing: the direction that the leading hand part is pointing toward as the hand moves (Liddell and Johnson 1989; Meier 2002).

Non-manual articulations are made by head, parts of the face, shoulders, torso. Most non-manuals (unlike the other parameters) are not specified in the lexical entry of a sign, but add separate information (lexical or functional). Typically non-manual articulations accompany manual ones (unless they are gestures, like a frown, as in spoken languages). However, some signs have separate manual and non-manual counterparts (Dively 2001).

² Here I mentioned the 'B-handshape'; linguists conventionally label handshapes with letters of the Roman alphabet or with numbers. A partial list of handshapes found in ASL appears in this Wiktionary entry: http://en.wiktionary.org/wiki/Appendix:Sign_language_handshapes.

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FIGURE 30.1. ASL sign THIN

Signs can be one- or two-handed. The hand used for one-handed signs is the dominant hand: '1H'. The nondominant is '2H'.

In two-handed signs either 2H is immobile, or both hands move. If 2H is immobile, 1H typically contacts or moves close to 2H, which, typically, has an unmarked handshape (Battison 1978). If both hands move, it is usually with reflexive symmetry across the sagittal plane, sometimes with alternation (180 degrees out of phase) or glide (one hand higher or moved forward), but longitudinal or transverse reflexive symmetry is possible. Rotational and, rarely, translational symmetry also occur (Napoli and Wu 2003).

In Figure 30.1, we see the ASL sign THIN, which is 1H, with G-handshape, starting location in front of the forehead and ending location in front of midchest, movement straight down, palm and extended fingers oriented toward the signer, and lips tightly rounded.³

30.2.2 Phonological parameters and meaning

Phonological parameters (and their component features) in sign languages can be meaningless elements, just as in spoken languages (Sandler 2012, and see references within). However, a parameter can also carry sense. This is common of the non-manuals. It is also common of the manuals, but in more restricted ways: via ion-morphs and iconicity.

30.2.2.1 *The non-manuals*

I begin with mouth actions (Boyes Braem and Sutton-Spence 2001), which are often part of a whole-face gesture showing affect, such as dismay or happiness. Other times they are an obligatory part of the sign (as in THIN in Figure 30.1).

One can (and many do) mouth the spoken word while manually signing it. However, mouthing can also be of a word distinct from the manual sign, creating a kind of compound unique to sign languages in which the components are simultaneous. With ETEN⁴ 'eat' in NetherlandsSL one can mouth *brood* 'bread', yielding 'bread-eating';⁵ MOUSE in BritishSL can be accompanied by the mouthing *baby*, to mean 'baby mouse' (Crasborn et al. 2008: 48).

³ All figures are reprinted from www.lifeprint.com with the kind permission of Bill Vicars.

⁴ Examples are in the form presented in the cited literature.

⁵ This is my translation. The source had 'eat bread', which could be mistaken as phrasal.

Other mouth actions modify a sign's sense, typically regarding manner or degree (Liddell 1980; Meir and Sandler 2008): in some languages (including ASL and BritishSL) protruded lips can indicate ease in an action and puffed cheeks can indicate large size on a referent (Sutton-Spence and Woll 1999). Like other phonological features, mouth actions can spread across neighboring signs: in NetherlandsSL VALS GRAP 'mean joke' exhibits tongue protrusion with VALS that spreads throughout the noun phrase (Crasborn et al. 2008: 58).

In general, mouth actions convey lexical information, and other non-manual articulations convey syntactic, discourse, or pragmatic information (DanishSL, Engberg-Pedersen 1990; ASL, Aarons et al. 1992; for a cross-linguistic overview, Pfau and Quer 2010), including negation (in GreekSL, GermanSL, and others; Klima and Bellugi 1979; Sutton-Spence and Woll 1999; Antzakas and Woll 2001; Herrmann and Steinbach 2013) and question marking (Wilbur 2000). So, while nose wrinkling (in ASL and other sign languages) can intensify an adjective, particularly a pejorative one, this might be a facial gesture. A true exception involves HungarianSL: mouthings of spoken words add inflection, typically person, number, possession, and case (Rácz-Engelhardt 2013). (And see comments on EstonianSL reduplication in §30.4.) Also, recent work on Kata Kolok, a village sign language of Indonesia, shows mouth actions that indicate verb aspect and polarity (deVos 2014). Judging by the illustrations given, I believe the mouth action coincides with another non-manual articulation, with the possible exception of the evidential marker (a stiffened upper lip). If this is so, it would confirm other recent research showing that mouth shape gets involved in functional information, but only in conjunction with other non-manuals (Benitez-Quiroz et al. 2014).

This cross-language division between mouth actions and other non-manuals is interesting; it is not a general truth across spoken languages that certain types of phonological segments are involved in derivation while others are involved in inflection. Since the mouth has far greater articulatory range and detail than other non-manuals, perhaps physiology plays a role.

30.2.2.2 *Ion-morphs*

Signs can fall into families linked by sense and phonology, in which up to three of the manual parameters are the same, but at least one differs (Frishberg and Gough 2000). In order to understand this, we first need to discuss how handshape relates to the alphabet.

So long as a sign language has a manual alphabet, a sign can be fingerspelled. The frequency of fingerspelled items varies from high (NewZealandSL, McKee and Kennedy 2006), to moderate (ASL, MacFarlane and Morford 2003; Padden and Gunsauls 2003), to nonexistent (TaiwanSL, Fischer 2008: 12) and by region and age (BritishSL, Sutton-Spence, Woll and Allsop 1990; AustralianSL, Schembri and Johnston 2007).

Often a fingerspelled sign becomes lexicalized (dynamics/ timing changes, Wilcox 1992; coarticulation occurs, Battison 1978; Brentari and Padden 2001; Jerde, Soechting, and Flanders 2003; Keane, Brentari, and Riggle 2013). The factors affecting the likelihood of lexicalization are phonological (Cormier, Schembri, and Woll 2003). Sometimes a lexicalized fingerspelling remains distinguishable from native signs in morphophonological behavior (Padden 1998); at other times it becomes indistinguishable (TurkishSL, Kubuş 2008).

With one-handed alphabets (but not two-handed alphabets, Adam 2012: 849), often the handshape of a sign will be the letter of the manual alphabet that corresponds to the first letter of the written word in the ambient spoken language; 'milk' in MexicanSL

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uses the L-handshape since the word for 'milk' is *leche*. 'Initialization' is used heavily by some languages (MexicanSL, Faurot et al. 1999) and hardly at all by others (GreekSL, Kourbetis and Hoffmeister 2002). It is common in ASL name signs (Supalla 1992; Lucas, Bayley, and Valli 2003; Stephens 2012). Sometimes initialized signs can have a handshape change, where the second handshape corresponds to some other letter of the written word (LINGUISTICS in ASL has L>S; BULLSHIT has B>S, Mirus, Fisher, and Napoli 2012). Additionally, we find acronyms: in ASL the I-L-handshape is used for the sign I-LOVE-YOU, where we see 'I' and 'L' with a superimposed 'Y'.

Initialization plays another role in sign morphology. In ASL the signs CLASS, FAMILY, TEAM, GROUP, SOCIETY, and more are made with the same manual parameters except the handshape varies from C to F, T, G, or S, and so on. The set of movement, location, and orientation parameters in that lexical family convey the sense 'group'; they are an *ion-morph*, a partially complete morpheme which needs to attract another parameter (here handshape) in order to be complete; the handshape indicates the particular group (Fernald and Napoli 2000). Figure 30.2a shows all parameters for CLASS, while Figure 30.2b shows the handshape parameter for FAMILY, TEAM, and GROUP at the outset of articulating these signs.

Ion-morphs can get their general sense from just a single parameter; in ASL the side of the forehead is associated with cognition: THINK, KNOW, IMAGINE, IDEA, DREAM, MAKE-UP, etc. For this extended family, the ion-morph consists of a fixed location, while movement, handshape, and orientation vary.



FIGURE 30.2A. ASL sign CLASS



FIGURE 30.2B. handshapes for ASL signs FAMILY, TEAM, GROUP

The side of the forehead can carry other senses, too. In ASL the family of kinship signs uses a contrast of location for gender; forehead indicates male and side of the jaw indicates female. Perhaps the sense of female associated with the side of the jaw is the reason why MODEST, MENSTRUATION, and SLUT are made there.

Likewise, features of the movement parameter can carry sense; in ASL the so-called 7 path shape is often used for place names, forming a large lexical family.

While the discussion above draws mostly from ASL data, similar phenomena appear in AustralianSL (Johnston and Schembri 1999), BritishSL (Brennan 1990), DanishSL (Engberg-Pedersen 1993), ItalianSL (Pietrandrea 2002), IsraeliSL (Fuks and Tobin 2008), NetherlandsSL (Kooij 2002), and SwedishSL (Wallin 1996).

Ion-morphs have similarities to two phenomena in spoken languages. First, phonaesthemes are common throughout IndoEuropean (Firth 1930) and Austronesian (Blust 2003) languages. For example, in IndoEuropean languages initial [st] is associated with hindered movement, physical (*stay, stop, stumble*) or mental/emotional (*stupid, strict, staid*); but not obligatorily (*step, streak, strew*). Likewise, in ASL the open-8-handshape is the fixed parameter of an ion-morph associated with the general sense of feelings: TOUCH, CONTACT, FEEL, as well as SENSITIVE, PITY, THRILLED, by metaphorical extension from the physical to the psychological (Taub 2001: 130ff.); but not obligatorily (COMPUTER, EARLY).

Second, literal roots and vowel melodies are common throughout Semitic languages (McCarthy 1984): a root with an underdetermined sense (such as 'having to do with reading') is identified by a given string of consonants, and details that allow a particular sense to emerge is supplied by a given string of vowels (the melody), where both are mapped onto a template that determines the arrangement of consonant and vowel sequences, to yield a well-formed word (meaning 'book', 'read', 'write', 'scholar'). Ionmorphs are similar, where the fixed parameter or set of parameters carry a general meaning, and the varying parameter or parameters allow us to zoom in on the particular sense of the whole sign. (Similar morphological constructs in Athabaskan languages are called satellites, Faltz 2000; Fernald 2000.)

30.2.2.3 Iconicity

If iconicity means a non-random connection between form and meaning, where the form brings to mind the meaning, sign languages exhibit it heavily. For example, GUM in ASL has an opening and closing of the jaw; the non-manual mimics the action of chewing gum with the actual articulators used in chewing gum. And, in general, word formation exploits the availability of two hands in iconic ways, encoding particular types of relationships, such as interaction, location, dimension, or composition (Lepic et al. 2016). For example, signs for 'meet' typically involve two hands moving toward each other because of the symmetrical semantic relationship, not just for phonological reasons; in fact, concepts that are 'inherently plural' typically involve both hands. But iconicity is also often metaphorical (ASL, Wilcox 2000, Taub 2001; BritishSL, Woll 1985; FrenchSL, Bouvet 1997; IsraeliSL, Meir 2010; ItalianSL, Cameracanna et al. 1994, Pizzuto et al. 1995, Russo, Giuranna, and Pizzuto 2001, Pietrandrea 2002; JapaneseSL, Ogawa 1999, Herlofsky 2003). Let me offer an example my eye picks out. In ASL the signs SUPPOSE, THINK, and KNOW form a family sharing location, movement, and orientation, but handshape varies by finger extension. 'Suppose' does not commit the signer to the proposition; the pinky extends. A thought shows more commitment; the index finger extends. Knowing commits the signer fully; all fingers extend. So size

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and number of the extended fingers (physical property) indicates assertion strength (abstract property).

Nevertheless, nonsigners guess correctly at only about 20 per cent of signs in isolation and cannot guess the meaning of a conversation (ASL, Klima and Bellugi 1979; PolishSL, Fabisiak 2010, cited in Łozińska and Rutkowski 2011: 227). But if they are told what a sign means, they can agree on the iconic basis (Bellugi and Klima 1976). So what is going on?

Wilcox (2007, pointing to De Jorio 1832/2000) distinguishes between manual gestures and expressive gestures (facial articulations and movement dynamics). He lays out a route from manual gesture to lexical signs to grammatical (or functional) signs and a separate route from expressive gestures to prosodic markers and, again, grammatical morphology. His suggestions account for a wide range of iconicity throughout the grammar of sign languages. But recognizing that iconicity depends largely on understanding the grammar of sign languages.

Sign languages have two types of signs: so-called 'frozen' ones (ordinary lexical items), which can be found in a dictionary and which are often being coined via initialization and ion-morphs, and so-called 'productive' ones (made-up-on-the-spot), which do not appear in dictionaries (Bellugi and Klima 1976; Russo 2004; among many).

Lexical signs often start out iconic; after all, if you make up a sign for something, why not 'draw' it in the air to the extent possible? For example, signs for 'elephant' regularly involve moving the hand from the nose outward—in AdamorobeSL one moves a bent-L-handshape from the nose downward in an ark (Nyst 2007: 128). Still, many aspects of an object or an action could be chosen as the 'iconic base', so it is not surprising that the lexicon varies among sign languages/cultures. Further, even initially transparent signs over time yield to tendencies of the grammar that make their phonological shape more arbitrary (Frishberg 1975).

Contrasted to these are 'productive signs' created to express an entire predicate or even a whole event. Thus they are polymorphemic, iconic, and particular to the sign-act situation (Supalla 1986; Brennan 1992, 2001). Concepts related to events, such as size, shape, location, source, theme, path, goal—all lend themselves to being represented in spatial language. These productive signs are called 'classifier constructions'. For the sentence 'My friend walks from the store to the park', one might sign MY FRIEND, then STORE and spatially index it, then PARK and spatially index it, then do the classifier construction seen in Figure 30.3. Here the 'classifier' handshape (discussed in the next paragraph) represents my friend, the initial location represents the store, the final location represents the park and the movement of the hand represents walking from one to the other (Liddell 2000, 2003).



FIGURE 30.3. ASL classifier construction for 'Z walks from X to Y'

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While Figure 30.3 is relatively simple, these constructions can be complex and are most readily understood through demonstration. To express 'A leaf falls and then lies on the ground', the 5-handshape might move downward in a side-to-side way and stop when it meets 2H, which has been waiting there with the forearm extended horizontally oriented palm-down with the flat-B-handshape; this is a description for ItalianSL (Russo 2004: 179-80) and, importantly, many other sign languages. The 1H handshape represents the leaf, while 2H represents the ground (Corazza 1990). The starting location symbolizes the tree; the ending location, the ground. The movement and orientation of 1H show the movement of the leaf and its position as it falls. Crucially, LEAF in ItalianSL is a two-handed sign where both hands have the L-handshape. None of LEAF's parameters appears in the classifier construction. So this is not an instance of the lexical sign moving through space. This sentence is a single sign with one set of phonological parameters. The handshapes are called classifiers because they could be representing some other entity with similar physical characteristics⁶ (however that label does not align well with its use in spoken languages; Schembri 2003). For example, one might sign 'A piece of paper falls and then lies on the table' the same way, since a piece of paper is thin and flat like a leaf, and a table has a flat surface like the ground. For this reason, generally one articulates the lexical signs for the participants in the action first—LEAF and GROUND, Or PAPER and TABLE—and then signs the classifier construction.

The classifier construction for the leaf event involves two entity 'classifiers' (Supalla 1986: 182–5); the iconic handshapes (1H's handshape 'looks like' the leaf and 2H's handshape 'looks like' the ground). Not all classifiers are themselves iconic, however. In ItalianSL the 4-handshape represents a variety of moving objects, including people, vehicles, and objects in rapid sequence. To express 'A car stops at a traffic light', 2H would articulate the sign for 'traffic light' while 1H would assume the 4-handshape and move toward 2H and then stop (Russo 2004: 181–2). The handshape of 1H is arbitrary, but the rest of the phonological parameters in 1H's articulation are iconic, symbolizing meaningful parts of the action. (Notice further that the two hands express different propositions simultaneously: 'here's a traffic light' and 'a car stops at it', see Napoli and Sutton-Spence 2010).

Another type is the 'handling' classifier. One might express moving a bucket by using a handshape that reflects how one carries it. The hand could close into a fist, palm down, to indicate that the bucket was grasped by a handle, then move from one spatially indexed location to another. Alternatively, the hands could face each other, cupping the air with thumbs extended to indicate that the bucket was grasped by its sides, and then move. One- and two-handed classifiers are found in many sign languages. ThaiSL has 45 one-handed classifiers, 36 two-handed classifiers where both hands assume the same handshape, and 45 two-handed classifiers where the hands assume different handshapes (Tumtavitikul, Niwataphant, and Dill 2009).

Classifier constructions can lay the foundation for lexical signs. Padden et al. (2013) show that for hand-held tools (combs, hammers, toothbrushes) different languages exhibit preferential patterning for either the handling classifier or, instead, an instrument classifier (where the handshape represents the tool) as a base for the lexical item. Al-Sayyid

⁶ A list of classifiers in ASL is given here: http://www.lifeprint.com/asl101/pages-signs/classifiers/ classifiers-frame.htm

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BedouinSL and ASL prefer instrument, while New ZealandSL prefers handling. Thus sign languages differ in their overall preferences for how they classify words, as spoken languages do (consider count vs. mass nouns, for instance), and they show us new (visual) criteria for classifications.

Most sign languages use classifier constructions heavily and in similar ways, but not all. AdamorobeSL has (little to) no entity classifiers (Nyst 2007). Cogill-Koetz (2000a, 2000b) argues that classifier constructions are not linguistic but, rather, belong to a system of visual representation that is part of human communication. Schembri, Jones, and Burnham (2005) study AustralianSL, TaiwaneseSL, and the gestures of nonsigners, and show that handshape may be morphological, while location and movement may be gestural, suggesting that classifier constructions are a blend between language and gesture. Benedicto and Brentari (2004), however, argue that classifiers in ASL are distinguished phonologically and syntactically according to the syntactic valency of the predicate.

The various kinds of iconicity described here fall outside the common presumption that there is an arbitrary relationship between form and meaning, which has been with us since the work of Ferdinand de Saussure (1916), but has been argued to go back as far as Aristotle (Richards 1932). When we look outside the IndoEuropean language family, however, we find that iconicity includes not just onomatopoeia, and somewhat episodic and exotic associations between particular phonemes and senses (Hinton, Nichols, and Ohala 2006; Haynie, Bowern, and LaPalombara 2014); they also include robust patterns of soundmeaning associations that tap into the 'sensory, motor and affective experiences as well as aspects of the spatio-temporal unfolding of an event' (Vigliocco Perniss and Vinson 2014: 3). We also see these patterns in Japanese, Korean, Southeast Asian languages, sub-Saharan African languages, Australian Aboriginal languages, South American indigenous languages, and Balto-Finnic languages (for references and discussion, Perniss, Thompson, and Vigliocco 2010). In fact, it has been argued that direct quotations are iconic (Davidson 2014), as are reduplications (Fischer 2011), so all languages use iconicity (Michelucci, Fischer, and Ljungberg 2011). Still, iconicity is pervasive in sign languages, greatly facilitated by the visual possibilities that come from being able to see the large and versatile movements of manual and non-manual articulators. The difference is one of degree (Meir 2012).

30.3 THEORETICAL ISSUES IN MORPHOLOGY

Scholars of sign language morphology confront many of the same issues scholars of spoken language morphology confront (as §30.2 and the following sections show). Still, there are new issues that face them, and familiar issues that are particularly extreme. I have left one of these for §30.5: agreement.

30.3.1 New issue: Complexity vs. simplicity

Unlike spoken languages, sign languages tend to have many morphological commonalities. Those commonalities are of two contrasting types. On the one hand, sign language morphology appears complex, given verb inflection (see §30.5) and classifier constructions

(see §30.2). On the other hand, sign language morphology appears simple in that there is little affixation (see §30.4) and the affixes that do appear seem to have evolved from lexical items via grammaticization (Campbell and Janda 2001), are derivational, and differ from language to language. As Aronoff, Meir, and Sandler (2005: 304) say, "Sign languages seem to present the impossible combination of Navajo-like and Tok-Pisin-like languages, a typological puzzle." Their account of this apparent paradox lies in the modality and history of sign languages. The modality allows for layering and iconicity, yielding a rich morphology. But, like creoles, sign languages are young. The oldest sign language communities are under 300 years old, and many are fewer than 50 years old. Since affixes are the product of grammaticalization, it takes time for affixes to develop—young languages simply have not had enough time yet. Further, deaf children tend not to learn sign language from their parents (most of whom are hearing), but, instead, from inconsistent and impoverished input—just as first-generation children forming a creole in a pidgin environment do.

Attributing the common complexities of sign language morphology to modality is wellaccepted. However, attributing the common simplicities (the characteristics of affixation) to their youth is a new hypothesis. Earlier work argued that the paucity of affixation was due to modality; after all, each affix theoretically adds time, and, as noted at the outset of this chapter, time is of the essence in sign language morphology (Bellugi and Fischer 1972; Klima and Bellugi 1979; Meier 1993; Emmorey 1995; Meier and Willerman 1995; for an overview, see Sandler and Lillo-Martin 2006: Unit 5). Which is the most empirically adequate account of affixation? We return to this matter in §30.4.⁷

30.3.2 New issue: reactive effort

The articulators in sign languages are larger and heavier than the articulators in spoken languages. In studies of signs in which the two hands move in reflexive symmetry across the sagittal plane, both in phase and alternately, we find that movements that are likely to induce torque and, thus, make the torso twist or rock require reactive effort to hold the torso stable. Since there is a drive toward ease of articulation in sign languages just as there is in spoken languages (Napoli, Sanders, and Wright 2014), such signs appear with far less frequency across the lexicon than would be expected if they were randomly distributed (Sanders and Napoli 2016a, 2016b, where the first study is of three sign languages and the second study is of an additional twenty-four languages). Thus biomechanical factors influence the shape of the lexicon in sign languages. So far as we know, no similar claims have been made about spoken language lexicons.

30.3.3 Familiar issues: roots and lexical categories

The definition of 'root' in a sign language is problematic. For spoken languages, a monomorphemic nonaffix is a root (Selkirk 1982: 98). But monomorphemic signs are

⁷ Similar considerations come up in syntax. Sign languages all allow the word order SOV and all (so far) have been argued to have underlying order of SOV or SVO, as is the case for creoles. Napoli and Sutton-Spence (2014) consider a modality vs. a young-language account, and argue for the former.

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harder to come by. As we saw in §30.2, any one or more of the phonological parameters might be iconic in some way or might be connected to a sense via an arbitrary factor (such as initialization), blurring the distinction between phonology and morphology. Even a noun as simple as MAN can be seen to include the sense 'male' as separate from the rest of its meaning (by contrasting it to WOMAN); likewise color terms like BLUE can be seen to include the sense 'color' as separate from the rest of its meaning (by contrasting it with gREEN and others). Further, we will see in §§30.4 and 30.5 that unarguably complex signs tend to have the rhythmic and timing properties of all other signs, so we get no help from prosody. How, then, do we distinguish between simple and complex signs?

Few have addressed the issue head-on. An exception is Wilbur (2000: 192f), who claims there are two kinds of derivational processes, ones that apply at the root level and ones that apply at the word level. Word-level derivational processes affect path movement, while root-level derivational processes affect only local movement. This approach meets problems, however. Consider ASL FILTHY, which is derived from ASL DIRTY (Frishberg 1972): DIRTY has finger wiggling and FILTHY has a spritz (an abrupt opening of the fist). So this derivation affects only local movement and therefore this process is root-level. But the signs STUDY and CRAM are likewise related via the same process (from finger wiggling to a spritz), where STUDY is open to a polymorphemic analysis (2H being a classifier for an object being looked at and 1H showing the study action). So now that same process, which affects only local movement, is applying at the word level. Further, this method of distinguishing roots is not widely applicable, since derivational processes that affect only local movement are few and do not occur with most signs. My position is that the notion of root has yet to be proven pertinent. Instead, morphology makes reference to the two units of the ion-morph (which has similarities to Semitic roots, as noted earlier) and the 'simple sign' (a notion developed in §30.4), which has a visual unity dependent upon having only one set of phonological parameters and, probably, a characteristic duration. Nevertheless, sign language linguists use the term 'root', and I have done the same in my discussion of affixation and reduplication for ease of exposition.

Standards for identification of lexical categories can, likewise, be elusive (Meir 2012), as in spoken languages (Haspelmath 2010). No particular question is prominent in the sign language literature; rather, all categories are problematic. First, for the three major categories of V, N, and A, tried-and-true diagnostics (co-occurrence of a numeral with a sign for nouns; distinction between negative markers for verbs and adjectives versus nouns, and so on) that hold in one language (ASL, Padden 1988) do not hold for another (Indo-PakistaniSL, Zeshan 2000; GermanSL, Erlenkamp 2000). Second, identification of prepositions has not been a major concern in the linguistic literature, so far as I know, perhaps because their use is minimal, where the phonological parameters (particularly location and movement) of a classifier construction (Emmorey et al. 2005) or dynamic characteristics (speed, rhythm) of a lexical verb (Wilbur 2000) do the job undertaken by a PP or a case-marked NP in a spoken language. Additionally, iconicity can interfere in category identification: in classifier constructions agent, theme, goal, action, and other information roll up into a single sign (Zeshan 2002).

Schwager and Zeshan (2008) look at semantic, syntactic, and morphological behavior in three sign languages and conclude that lexicalization is culturally determined, that a large database is necessary to figure out which lexical categories get mapped onto which syntactic functions, and that morphological operations are more useful in recognizing categories in

languages that have a larger array of such operations to draw on (RussianSL and GermanSL, in contrast to Kata Kolok). But they suggest universal lexical category identification in sign languages will become possible as we study larger databases. In the spirit of their optimism, this chapter plunges ahead.

30.4 MORPHOLOGICAL PROCESSES

Given the discussion in §30.3, you might expect no horizontal temporal processes in sign languages; you would be wrong. Sign languages exhibit both horizontal and vertical morphology.

30.4.1 Horizontal temporal morphology

Affixation, compounding, and reduplication are horizontal in that they add phonological parameters over sequential time. The first two, however, turn out to adjust movement in ways that make the overall time it takes to articulate the sign no greater than the time it takes to articulate the root (in the case of affixation) or the first element (in the case of compounds). In this way they are like cliticization in IsraeliSL, where a complex word obeys well-formedness constraints on simple signs (Sandler 1999). In contrast, reduplication truly lengthens the duration of a sign.

30.4.1.1 Affixation

Affixation is uncommon in sign languages; a language might have no affixes (SwedishSL, Bergman 1983), a couple (IsraeliSL, Meir and Sandler 2008), or a handful (ASL, Sandler and Lillo-Martin 2006). All have been argued to be derivational, with the exception of certain verb agreement markers in GermanSL (Glück and Pfau 1999; but see Keller 1998, who argues these morphemes are pronouns).

Examination of the IsraeliSL negative suffix 'not-exist' allows us to delve into the issue of affixhood identification, as problematic for sign languages as for spoken languages (Haspelmath 2011). 'Not-exist' attaches to nouns or adjectives to derive adjectives (Meir 2004: 115): INTERESTING+NOT-EXIST 'uninteresting', IMPORTANT+NOT-EXIST 'unimportant, insignificant', WORTH+NOT-EXIST 'isn't worth it'. It is similar in form to the lexical sign NEG-EXIST, from which it probably derives.

Meir (2004) lists reasons why this morpheme is best analyzed as a suffix rather than an independent sign. First, whether it is one-handed or two-handed follows from whether the base sign is one-handed or two-handed, just as allomorphs of affixes in spoken languages depend upon the base form; but NEG-EXIST is two-handed. Second, the movement of the morpheme differs from the movement in NEG-EXIST in several ways, including that it is shorter in duration and has a shorter path; sometimes the base sign and suffix are produced with a single movement, a common reduction in word-formation processes (Liddell and Johnson 1989). Third, the sense is unpredictable, a characteristic of derivational morphology (but also compounding); SURPRISE+NOT-EXIST means 'doesn't interest me at all' rather than 'surpriseless', ENTHUSIASM+NOT-EXIST means 'doesn't care about it' rather than

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'without enthusiasm'.⁸ Fourth, signs with this morpheme are not accompanied by the negative headshake typical of negative sentences, including those with NEG-EXIST.

But might these single signs be compounds, especially since compounding is common in sign languages (see \$30.4.1.2)? Meir argues these signs are suffixations because:

- the suffix attaches to a wide range of base forms, whereas compounding is more restricted;
- the base determines the number of hands in the suffix, whereas this is less common in compounds;
- the suffix determines the category of the final form, whereas in compounds in IsraeliSL the first element is the head.

Unfortunately, analogous arguments may not carry over to other sign languages.

While most proposals of sign affixes concern suffixes, Aronoff, Meir, and Sandler (2005) argue for the existence of 'sense' prefixes in IsraeliSL. The prefix is always one of five morphemes, meaning 'ear', 'eye', 'nose', 'head', 'mouth'. Again, the phonological form of the prefix is integrated into the base. The strongest evidence that the resultant forms involve prefixation is their paucity and the fact that the resultant words are always verbs; still a compound analysis exists that eliminates the need to add prefixation to the morphology of sign languages (Brennan 1990).

Repeatedly, affixes are integrated into the base via movement changes in the base, the affix, or both. The result is a single-syllable sign with the duration of a simple sign (although the result of 'sense' prefixation in IsraeliSL is an iamb; Aronoff, Meir, and Sandler 2005: 334). For example, ASL STUDENT is LEARN plus the agentive suffix (Aronoff, Meir, and Sandler 2005). The sign used to consist of a one-handed movement (from 2H-palm to the forehead) followed by a two-handed movement (downward in neutral space). These days, in the Philadelphia area, STUDENT consists of a single path movement (from 2H-palm (slightly up and then) downward),⁹ just as the fusion of an affix to a stem in spoken languages can maintain the rhythm/timing of the stem (as in English *business* vs. *laziness*, where the first is a trochee like *busy*, but the second is a dactyl contrasting with the trochee *lazy*).

30.4.1.2 Compounding

Compounding is common. Compounds typically have unpredictable meaning, and a movement that is the elimination of the movement parameter of both elements in favor of the transition movement from the location of one element to the location of the next (Klima and Bellugi 1979: 213). The resulting movement appears typical of a simple sign, with the same duration.

BritishSL exemplifies this nicely (Sutton-Spence and Woll 1999: 102). The rhythm of a compound sign is more like that of a simple sign than of a sequence of two signs since:

⁸ The translations given here are from the source article. I don't know whether they indicate that the complex sign is a verb rather than an adjective.

⁹ Further, the older version of the sign begins with 2H palm facing up and 1H palm facing down, and ends with both facing contralaterally. But in the newer version the palms are oriented contralaterally from the start. So the orientation of the affix spreads over the whole sign, as often happens in compounds (see §30.4.1.2).

- the hold at the end of the first element is lost;
- any repeated movement in the second element is lost;
- 2H of the second element is established and waiting at the time the first element starts;
- the duration of the first element is noticeably shorter than the second (regardless of which is the head);
- the transition between the two elements is rapid.

The BSL sign BELIEVE, for example, is THINK^TRUE ('^' indicates compound juncture), where the outward movement of THINK is eliminated in favor of a simple downward transition movement to the location of TRUE. THINK is a one-handed sign while TRUE is two-handed; in BELIEVE the 2H of TRUE is already in place as the whole compound initiates. So this compound has been lexicalized.

In Figure 30.4c we see the ASL lexicalized compound SISTER, which combines GIRL (Figure 30.4a) plus SAME (Figure 30.4b). The initial location and orientation of the compound is determined by the first element and the handshape is determined by the second. The movement is simply a transition from the location of the first element to the location of the second. The compound is two-handed like the second element.



FIGURE 30.4A. ASL sign GIRL

FIGURE 30.4B. ASL sign SAME



FIGURE 30.4C. ASL sign SISTER

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Like spoken languages, sign languages offer examples in which the order of the elements is fixed: BrazilianSL CASA^CRUZ 'house^cross', means 'church', but the opposite order is incomprehensible or means something bizarre, like a cross used as a house (Figueiredo-Silva and Sell 2009). (This is the expectation if NN compounds are leftheaded, although Figueiredo-Silva and Sell do not discuss headedness.) Complex compounds arise; HOMEM^CONSERTO^ELECTRICIDADE 'man^fix^electricity'/'electrician' exists beside HOMEM^CONSERTO 'mechanic'. As in two-element compounds, the movements of elements in complex compounds fuse.

Al-Sayyid BedouinSL demonstrates fixed-order as well as free order compounds (Meir et al. 2010): in elicitation both TURN^COOK and COOK^TURN were offered for 'stove/range top'. However, conventionalized compounds exhibit a fixed order.

The question of ordering of elements within a compound need not arise, however, since the presence of two manual articulators affords the possibility of simultaneous elements. In BrazilianSL 'honeymoon' is rendered by articulating SEXO 'sex' with one hand and VIAJAR 'travel' with the other (Ralfe 2012). The BritishSL compound MINICOM (a communication software) consists of 1H in the handshape of TELEPHONE and 2H in the handshape of TYPE (maintaining the finger wiggling of TYPE), 1H located above 2H in neutral space (Brennan 1990: 151). However, in ordinary conversation both hands tend to assume one or the other handshape (Sutton-Spence and Woll 1999: 103). Also, recall from §30.2 that a mouthing action allows compounds with simultaneous elements.

That last kind of change regarding handshape is typical: handshape and orientation features spread (anticipation or perseveration, Liddell and Johnson 1986) in sequential and simultaneous compounding. Given that movement changes as well, compounds, like affixation, undergo phonological changes that obscure iconicity in the contributing elements (ASL, Frishberg 1975; PolishSL, Łozińska and Rutkowski 2011), yielding an overall visual unity that makes them phonologically like simple signs (and see Sandler 1990 for a formalization of length limits on signs).

This fact is coherent with the production and processing needs of sign languages, mentioned in the introduction. Still, the fact that sequential compounds are numerous whereas affixes are few calls for explanation. As discussed earlier, Aronoff, Meir, and Sandler (2005) attribute lack of affixation to youth; grammaticization takes time. Compounds, however, are not the product of grammaticization, so they can occur in young languages. In fact, compounds appear to be the source of affixes in sign languages, so the fact that only derivational affixation has been attested follows from the fact that compounding is derivational, not inflectional (*pace* Glück and Pfau 1999). Sign compounding, then, lends support to the Split Morphology Hypothesis (Anderson 1977b). A final warning is in order, though: distinguishing between compounding and affixation is notoriously hard, since phonological fusion and semantic idiosyncrasy characterize both. Certainly, fixed order of root and affix is typical of affixation, and we do not expect one hand to articulate a root or stem while the other hand articulates an affix—so compounds differ here. But further work is needed.

30.4.1.3 Reduplication

Reduplication is common, and has a wide range of uses, as in spoken languages (Wilbur 1973).

Some signs have internal repetition. Generally, their form is root-root. In the sign for 'Rome' in ItalianSL, both hands have the H-handshape and the ulnar side of the extended fingers of 1H tap the radial side of the extended fingers of 2H twice. But reduplication can

result in two, three, or more articulations of the root (Fischer 1973), where two or more iterations are not contrastive (Channon 2002).

Reduplication for intensification can depend on utterance prosody, as in IsraeliSL (Nespor and Sandler 1999) and QuebecSL (Miller 1996). On the other hand, New ZealandSL exhibits reduplication for intensification that is not prosody dependent (Wallingford 2008).

Reduplication also occurs in aspectual modifications of changeable-state verbs and adjectives (Klima and Bellugi 1979), as in SwedishSL (Bergman and Dahl 1994: 402f). Movement dynamics in aspectual reduplication reflect information about the predicate (Wilbur 2009; Rathmann 2006). Durative/stative aspect in ASL involves continuous loops of movement (Sandler 1989: 157), whereas iterative and perseverative-punctual aspects in MicronesianSL have stops between movement repetitions (Anderson 1982). The number of hands moving also matters, as in the allocative aspect in ASL (Klima and Bellugi 1979).

In many sign (and spoken) languages, reduplication of a noun indicates plurality. Strategies for reduplication can depend on phonological factors (as in GermanSL, Pfau and Steinbach 2006; ItalianSL, Pizzuto and Corazza 1996; BritishSL, Sutton-Spence and Woll 1999: 105–6; and NetherlandsSL, Nijhof and Zwitserlood 1999; Harder 2003). In AustrianSL, some two-handed nouns can be pluralized by changing identical movement to alternating movement (Skant et al. 2002: 39–40). EstonianSL uses movement reduplication or hand reduplication to pluralize nouns (Miljan 2003: 220). In AustralianSL signers can reduplicate in multiple ways when pluralizing pointing pronouns, including using hand reduplication and repeating location (Johnston 2013: 130f.).

In these uses, reduplication is iconic; repetitions intensify or indicate multiplicity in a similar way to reduplication in spoken languages (Börstell 2011). This contrasts with noniconic movement changes, such as the dynamics of another intensifier in ASL: an initial hold, a tense quick motion, then an abrupt release (Frishberg 1972, cited in Wilcox 2007). This is not iconic; SLOW can be intensified this way.

Iconic reduplication can occur in languages which are otherwise without inflection, thus it has been argued to be ideophonic (Bergman and Dahl 1994, who compare a number of spoken languages to SwedishSL, but see also Pagy 2012 on BrazilianSL). Ideophonic morphology is found in many spoken languages, including Kammu (in South-East Asia) and African languages of the Gbe group, as well as Klao and Ewe (Fischer 2011).

Verbs can also undergo reduplication that changes spatial features, where these modifications reflect information about arguments (Wilbur 2009). If one did an action toward multiple individuals, one might repeat the sign, moving toward a different location each time. Multiple types of reduplications can be added to the same root. GIVE in ASL can have durative aspect (reduplicative circling), and that form can have the distributive sense added (durative circling is repeated at each spatial location that the giving is distributed across), and, finally, if one continued to give repeatedly to each individual, iterative aspect could be added (making the whole thing repeat a few times) (Wilbur 2009: fig. 23). Reciprocity can be indicated by 'backward' reduplication. In GermanSL to indicate that the two of us gave each other flowers, GIVE would be articulated with 1H moving forward while 2H moves backward (Pfau and Steinbach 2005, 2006).

Reduplication causes increased duration, so its occurrence goes against general morphological tendencies. One account would be to analyze the above instances as belonging to a visual communicative system other than language, since they involve 'drawing in the air' in

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a spatially meaningful way (as in 'backward' reduplication) or a multiplicative way, thus they are nonlinguistic.

On the other hand, there are a few instances of derivational reduplication. Activity verbs that have simple movements can undergo trilling (rapid, repeated movement) to yield gerundive nouns (Padden and Perlmutter 1987). Time expression nouns reduplicate to yield adjectives: WEEK > WEEKLY with a slightly circular movement, while YEAR > YEARLY with a repeated brush of 1H (Paul 2009: 229). While these are open to an iconic explanation, other derivations are not: in ASL many verbs with a single long movement use two short movements to derive a noun (SIT > CHAIR) (Supalla and Newport 1978; and compare with Italian V > N reduplication, as in *lecca lecca* 'lollipop' lit. 'lick lick'). Thus reduplication is an exceptional horizontal morphological process, at least in ASL. Still, like simple signs, reduplicated signs have only one set of phonological parameters that are merely repeated.

30.4.2 Vertical morphology

This chapter started with a note on vertical morphology. Here, we return to two uses of vertical morphology: incorporation and blends.

30.4.2.1 Incorporation

Many sign languages exhibit incorporation of numerals (GermanSL, Mathur and Rathmann 2010; ASL, Liddell 1996; JapaneseSL, Mathur and Rathmann 2010, Fischer, Hung, and Liu 2011, Ktejik 2013; TaiwaneseSL, Fischer, Hung, and Liu 2011; KenyanSL, Morgan 2013). 1H assumes the shape of a numeral while other parameters remain unchanged (but complications arise, as in Indo-PakistaniSL, in Zeshan 2000: 75). Typical candidates for numeral incorporation include quantifiable units of time, money, age, and grades in school (but see Liddell 2003: 35–7).

Numeral incorporation is idiosyncratic, with dialectal variation (Prillwitz and Leven 1985: 81) and boundaries on the numerals can vary among paradigms and across speakers (Liddell 1996: 218). It can be blocked by phonological characteristics of the particular numeral, for example secondary movement such as the shake in ASL 10 or the flick in ASL 11 (ASL, GermanSL, and JapaneseSL, Mathur and Rathmann 2010; KenyanSL, Morgan 2013).

Note that, generally speaking, incorporation is limited to numerals (though see Woodward and Desantis 1977, who argue that there is negative incorporation in ASL, inherited from FrenchSL).

30.4.2.2 Blends

The meaning of a blend comes from a combination of the meanings of the input signs, as in compounding and incorporation. Blending differs from incorporation in that it does not have a complete sign fused into another sign. It differs from compounding in that it does not have one sign followed by another sign (often with spreading of features). There is one set of phonological parameters, where some come from one component sign and some from the other. They therefore have the timing of a single sign. Members of lexical families (discussed in §30.2.2.2) are open to an analysis as blends (Lepic 2015). However, blends are distinguished from lexical families by the fact that they are isolated examples; they give delight because of their cleverness. Lexical families, in contrast, are held together by a

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FIGURE 30.5. ASL sign MOTHERFUCKER

general sense encoded in certain phonological parameters, plus a variable sense encoded in other phonological parameters. That general sense (the ion-morph) is what holds the family together. In GermanSL blending occurs as a production error. The signs HOCHZEIT 'marriage' and HEIRAT 'wedding' are semantically connected, but articulatorily different. Both signs have 2H as the location. An attested blend in a slip-of-the-hand combines the Y-handshape and the path movement of 1H in HOCHZEIT with the orientation and the particular location of 2H in HEIRAT (Hohenberger, Happ, and Leuninger 2002: 123–6). Blends are common in creative language—jokes, poems (Sutton-Spence and Napoli 2009), and taboo terms (Mirus, Fisher, and Napoli 2012). ASL MOTHERFUCKER blends the location and movement of MOTHER with the handshape of the taboo finger gesture, seen in Figure 30.5.

Though their verticality would lead us to expect blends to be common in conversation, they are not. Perhaps their very cleverness conspires against their diffusion.

30.5 Morphosyntax

A huge part of what one might put into a morphosyntax section is already handled in \$30.2: classifier constructions. It was important to our understanding of iconicity to place it there, and that placement allowed \$30.3 to be succinct. Another morphosyntactic issue was handled in \$30.4: distributives and reciprocals—which use reduplication. Thus, here I discuss only verb agreement.

Many verbs treat the signer's body as subject; 'eat' in many languages brings the hand to the signer's mouth, regardless of who is eating. 'Subject' here, then, is not defined in syntactic (tree configuration) terms but as a lexical notion (Meir et al. 2007) inherent in any verb that takes an external argument (Williams 1984: 641). Other verbs may agree with the subject (rather than having the signer embody the subject) and, typically, with objects. Agreement happens vertically via spatial indexing: the signer indicates (manually or nonmanually) that certain spatial locations represent referents (Padden 1988; Meir 2002). In signing that 'she' on the left side of the signer was acting upon 'him' on the right side of the signer, 1H would move from left to right for FRAGEN 'ask' in GermanSL, SHOW in ASL,

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FIGURE 30.6. ASL sign show indicating 'I show you'

ANSWER in AustralianSL, and CHUUI SURU 'advise' in JapaneseSL (Mathur and Rathmann 2010: 73). Generally, agreement verbs involve a transfer of an object, whether physical (as with 'give' in many languages) or abstract (as with 'help' in many languages), but over time, as the formal mechanism of agreement becomes firmly established, more verbs tend to enter into the phenomenon and "the semantic basis for the category becomes more opaque" (Meir 2015: 119). Phonological factors of a sign may interfere with how agreement is realized (Mathur and Rathmann 2010: 74). In Figure 30.6 we see ASL SHOW, here moving from the signer to the addressee to indicate 'I show you'.

While there is considerable literature on agreement, the morphological nature of agreement has been challenged. Liddell (2000) argues that when we point to a referent to 'agree' with it, we are really identifying it with a gesture. In fact, sometimes we target a particular spot on an addressee (chest, chin, etc.) or on a present or conceptualized third person. This (among other reasons) leads him to claim that verbs are not, in fact, marked for agreement, but that we understand the verb's arguments via gestural communication; that is, the various entities that have been called 'subject' and 'object' in analyses of 'agreement' bear little to no resemblance to syntactic counterparts in spoken language. De Beuzeville, Johnston, and Schembri (2009) analyze fifty narratives in AustralianSL and show that 'agreement' is often not found when expected if the entity referred to is not present (cannot be pointed to), and, when found, it occurs with verbs that are more spatially iconic than with verbs for which the spatial parameters are abstract. This behavior supports Liddell's account.

On the other hand, Lillo-Martin and Meier (2011) argue that directionality of movement marks person. They show that the ways person marking interacts with syntax (word order, null arguments, behavior of auxiliaries, as in BrazilianSL) are expected if sign languages have agreement systems. However, they concede that the evidence argues for a first person distinct from non-first person, but not for a distinction between second and third person. Rathmann and Mathur (2002), looking at GermanSL, AustralianSL, RussianSL, JapaneseSL, and ASL, concur that non-first person marking must interact with gesture (and see Mathur and Rathmann 2010). This sets sign languages apart typologically from most spoken languages. Still, Cysouw (2005) did a survey of spoken language agreement systems, and found thirty-one languages which had only a first person/non-first person distinction in the singular and forty-two with only that distinction in the plural. Comp. by: Bendict Richard Stage : Proof ChapterID: 0004142145 Date:12/7/18 Time:10:20:35 Filepath:d/womat-filecopy/0004142145.3D Dictionary : 613

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30.6 CONCLUSION

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This chapter touches on the fact that sign language morphology adds new considerations to debates over category identification, inflection vs. derivation, the notions of ideophones and subject, and properties used in lexical classifications. Additionally, it indicates four major theoretical points.

First, sometimes meaningful phonetic information in signs can be considered iconic. Other associations of meaning with phonological parameters are not iconic, at least not synchronically. Both kinds of information allow for networks in the lexicon. If morphological theory is to account for such data, it must allow links between particular phonological parameters in different lexical items, thus ion-morphs must be part of morphological theory.

Second, related to the reality of ion-morphs is the possibility (probability?) that the notion 'root' plays (little to) no role in sign language morphology, so it should not be taken as a universal.

Third, certain phenomena are open to analysis as part of a system of visual representation that we otherwise need in communication, and may be gestural (see the works of Scott Liddell from 1998 on, particularly 2003), including agreement and classifier constructions (see Mathur and Rathmann 2010, in particular). If this approach is shown to be correct, the grammar of sign languages covers a more narrow range of phenomena than that of spoken languages. So modality determines at least partially the job of a language's morphology.

Fourth, the prevalence of simultaneity (verticality) over linearity (horizontal temporality) in sign language morphology in contrast to the opposite prevalence in spoken language shows that linguistic analysis must include the study of physical properties (visual vs. auditory) if we are to understand language typology. The effects of biomechanics on the lexicon underscore this point. This is not a call for a change in morphological theory, but rather for an augmentation of the material linguists consider as they do language analysis.

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