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# The uniformity and diversity of language: Evidence from sign language

Wendy Sandler

*Department of English Language and Literature, The University of Haifa, 31905 Haifa, Israel*

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ABSTRACT

Evidence from sign language strongly supports three positions: (1) language is a coherent system with universal properties; (2) sign languages diverge from spoken languages in some aspects of their structure; and (3) domain-external factors can be identified that account for some crucial aspects of language structure – uniform and diverse – in both modalities. Assuming that any of these positions excludes the others defeats the purpose of the enterprise.



## 1. Introduction

The diversity/universality debate is well served by Evans and Levinson's (2009) example of sign language, as is the issue of domain-specificity. Sign languages represent a parallel human linguistic system, and as such they exemplify most strikingly the diversity of language and the organizational plasticity of the human mind and body in its service. At the same time, sign languages manifest certain definitive shared properties with spoken languages that are not trivial, and we dare not overlook them in the quest for a deeper understanding of human language. Sign languages can also provide clues to the earliest stages in the emergence of language, as they are the only languages that emerge de novo in our own era. They offer us a rare opportunity to identify those linguistic elements that are there at the outset – in the first systematic interactions among people in a social group – and help to identify effects of culture on language form. Taken together, evidence from sign language strongly supports three positions: (1) language is a coherent system with universal properties; (2) sign languages as a group diverge from spoken languages in some aspects of their structure; and (3) domain-external factors can be identified that account for some crucial aspects of language structure– uniform as well as diverse – in both modalities. Assuming that any of these positions excludes the others defeats the purpose of the enterprise.

The formal approach to language analysis that developed largely in the context of the universal grammar hypothesis (Chomsky, 1986) has yielded some of the most detailed descriptions and analyses of sign languages, and has indeed found a pool of impressive convergences between languages in the two modalities (Meier, 2002; Sandler and Lillo-Martin, 2006). But this very approach has uncovered divergences from uniformity in linguistic structure that are not predicted by the same school of thought. In fact, at each level of linguistic structure, while the spotlight is shown on universal properties, a look outside its glow will detect traits that are specific to sign languages in general and absent in spoken languages, and vice versa.

A distinction is observed here between universal properties or tendencies of language form on the one hand and UG on the other, specifically, the version of the UG paradigm that stipulatively restricts explanation of a range of purported universals to the existence of a domain-specific language 'organ'. This version is at odds with Hauser et al. (2002), which is usually interpreted as attributing only recursion to UG, and which welcomes interdisciplinary explanation of all other

E-mail address: wsandler@research.haifa.ac.il.

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language properties. Nevertheless, the earlier commentaries in BBS show that a domain-specific-language-organ UG is still fervently adhered to by many linguists, and it is that version that is referred to here as 'UG' and contested.

It will be argued here from a sign language perspective that accounting for diversity in human language requires a broad research paradigm, as E&L so cogently argue in their ground-breaking article – one that includes, together with rigorous linguistic analysis, investigation of the roles of the physical transmission system, of more general cognitive processes, and of culture. But I will argue that uniformity is striking as well, and that understanding it requires an equally broad scientific perspective. Evidence offered here is from sign language syntax and phonology, and from the characteristics of a newly emerging sign language.

## 2. Uniformity and diversity in syntax

Considering the centrality of recursion in the present debate, it is noteworthy that at least American Sign Language (ASL) has been shown to have it. This was first demonstrated by syntactic tests showing that subordinate clauses behave differently than coordinated clauses in ASL Padden (1988). One test distinguishing the two is applied to sentences with two clauses. At the end of such sentences, a pronominal copy of the subject often occurs, a sort of pronominal tag. In such sentences, coreference of the pronominal copy (an indexical, pointing sign) is interpreted differently, depending on whether the second clause is embedded or coordinated. If coordinated, the copy is coreferent with the subject of the second clause ('I hit him and he told his mother, he/*I'); if embedded, it is coreferent with the subject of the matrix clause ('My mother has been urging my brother to come and stay here, she/*he'). These differences in coreference relations motivate distinct structures for subordinate and coordinate clauses, in turn supporting the claim that ASL embeds sentences within sentences. The analysis also underscores the cross-linguistic generality of robust and distinctive properties of syntax: hierarchical structure and long-distance relations (Chomsky, 1957).

But sign language reveals diversity in syntax as well, which may find explanation in physical differences between the two modalities of a kind that UG is not designed to detect. An example is in a type of verb categorization characteristic of sign languages and a sign language specific syntactic reflex of it.

In many sign languages, one class of verbs shows morphological agreement for arguments corresponding to subject and object (Padden, 1988). The remarkable aspect of this system is that only one verb category shows agreement, the category of verbs of transfer, such as GIVE or SEND (Meir, 2002). In these verbs, the hands move from a locus in space associated with the subject argument to a locus associated with the object. A second category of verbs, called plain verbs, does not mark agreement. Instead of inflecting the verb to agree with locations associated with subjects and objects, plain verbs are typically articulated at some location on the signer's body, e.g., near the mouth for EAT, or near the eye(s) for SEE. In the lexical form of these verbs, the body of the signer represents the subject of the action, and no agreement with the sentential subject is marked; instead independent indexical pronominal signs pick out referents (Meir et al., 2007).

This categorization of verbs into agreeing and plain verbs (and a third category, spatial verbs, not dealt with here) is observed in a large number of sign languages, although they may differ in grammatical detail within this categorization (Aronoff et al., 2005), while no known spoken languages have such a categorization. The system has expressly grammatical properties, but if we search for an explanation in UG we will not find it. If we complement the domain-specific linguistic analysis by examining ways in which the body in space is used as a grammatical reference point (Meir et al., 2007; Padden et al., in press), we stand a better chance.

Related to the diversity found in sign language verb agreement systems is a more formal syntactic pattern originally attributed to spoken languages that allow omitted pronouns, called null arguments. In such languages, *Arrived* is a full, grammatical sentence, though lacking an overt subject. While individual spoken languages that allow null arguments have been argued to fall primarily into one of two categories – either syntax-oriented (like Italian, Rizzi, 1986) or discourse-oriented (like Chinese, Huang, 1984) – American Sign Language belongs to both. More to the point, in the sign language case only, the determining factor for the type of null argument allowed and its licensing properties is whether the verb is an agreeing verb or a plain verb (Lillo-Martin, 1991). Here we have clearly grammatical properties that are determined by the role of the human body itself in linguistic organization.

We see, then, both agreeing and non-agreeing verbs, a categorization peculiar to sign languages, and two different types of null arguments, one for each verb type. Sign languages take advantage of the body, a physical entity, in organizing verbs into categories, an effect that penetrates the syntax. Standard generative analysis neither predicts nor accounts for this pattern, and the language domain-specific stipulation of UG makes that paradigm blind to it.

## 3. Uniformity and diversity in phonology

Stokoe's (1960) monograph revealed that signs are not holistic gestures, but are comprised of a finite set of discrete, meaningless combinatorial elements – that they possess the basic design feature of human language called duality of patterning (Hockett, 1960). Stokoe's work brought sign languages into the circle of languages worthy of investigation, and gave rise more specifically to the field of sign language phonology.

Similarities at the phonological level across physical modalities provide a compelling argument in favor of language as a coherent system. Quite remarkably, sign languages have contrastive phonological features (Stokoe, 1960), morpheme structure constraints (Battison, 1978), sequential-segmental and autosegmental feature organization (Liddell, 1984;

Sandler, 1989), allophones (Wilbur, 1978), hierarchically organized feature classes (Sandler, 1989, 1993a), and syllables (Liddell and Johnson, 1989; Sandler, 1989; Brentari, 1990; Perlmutter, 1992; Wilbur, 1993), as well as other levels of prosodic structure (Sandler, to appear). All of these properties may be seen as universal characteristics of language, and sign language research has contributed to establishing them as such. Each, however, is qualitatively different from its spoken language counterpart, demonstrating contra certain modularity hypotheses (Fodor, 1983) that a coherent system is not necessarily a modularly encapsulated, domain-specific one (Sandler, 1993a).

The syllable is a good case in point. As in spoken language, this linguistic element in sign language is a rhythmic unit characterized by a single perceptually salient core or peak element (typically the vowel in spoken language). It is nonisomorphic with morphemes or words, and has phonetic/phonological constraints on its form. As with any other linguistic element, the syllable also plays an active role in rules or constraints in the patterning of a language.

By this definition, sign languages have syllables – another language universal. Research on the ASL syllable proposes that the salient core is the movement of the hand, and that there are constraints on the form that a syllable may take (Brentari, 1998; Sandler, 1999). The syllable is distinguishable from morphemes and words: some morphemes are disyllabic and some syllables are multimorphemic (Brentari, 1990).

The syllable unit participates in rules and constraints. Reduplicative rules select the final syllable to copy, regardless of morpheme structure (Sandler, 1989). Reduction of a disyllabic form such as a compound to the optimal monosyllabic template deletes some segments and retains others on the basis of sonority or visual salience: the reduced form favors a sonority curve that goes from least sonorous to most sonorous and back down to least sonorous (Sandler, 1993b). This is similar to the general tendency for spoken syllables with the segments *p*, *a*, *r*, for example, to favor *par*, *pra* or *arp*, but to eschew syllables like *rpa* or *apr*. All together, an impressive array of properties is shared between the two modalities regarding an element that a priori might seem grounded in the oral-aural nature of one of them.

But the ways in which sign language syllables (and phonology in general) differ from those of spoken languages are not trivial. Clusters of consonant-like or vowel-like elements never occur in sign languages, so that syllables typically correspond to a CVC-like form, where each 'C' is some location on or near the body and the intervening 'V' is a movement of the arm, the fingers, and/or the wrist. As with spoken language, each sign segment is comprised of a list of features (Liddell and Johnson, 1989; Sandler, 1989). But unlike spoken languages, in which the feature content of each segment in a morpheme is often very different from that of its neighbors, sign language segments typically differ by only one or two features within any morpheme, as shown in the representations of monosyllabic and monomorphemic words English *fit*, and ASL LOOK-AT below. The sign, illustrated below the representation in Fig. 1, is produced in the following way: the hand, in a 'V' shape, with the fingertips pointing in the direction of the movement, moves from a point close to the lower part of the head on the side of the body ipsilateral to the signing hand, to a point more distal with respect to that location. The tendency of certain feature classes to span a whole sign has motivated autosegmental representations of signs (not shown here; see Sandler and Lillo-Martin, 2006 for a full discussion).

| [f] | [I] | [t] |
|---|---|---|
| +cons | -cons | +cons |
| -son | +son | -son |
| +cont | +cont | -cont |
| -voiced | +voiced | -voiced |
| +labial | +high | +coronal |
| | -back | +anterior |

| x | x | x |
|---|---|---|
| Location (C) | Movement (V) | Location (C) |
| *index*, *middle* | *index*, *middle* | *index*, *middle* |
| *open* | *open* | *open* |
| *fingertip* | *fingertip* | *fingertip* |
| *head* | *head* | *head* |
| *ipsilateral* | *ipsilateral* | *ipsilateral* |
| *low* | *low* | *low* |
| proximal | | distal |

Signs are overwhelmingly monosyllabic, even if they consist of several morphemes, so that a verb inflected for subject and object agreement as well as temporal aspect often still consists of a single syllable, with the features of the inflectional morphemes **simultaneously** layered onto the segments of the 'CVC' syllable (Sandler, 1990). Adding an [arc] feature to the

**Fig. 1.** The ASL sign LOOK-AT, reprinted with permission from Ursula Bellugi.

Movement segment (and reduplicating the whole sign) encodes a durational morpheme; adding a location feature to the final Location segment encodes object agreement.

While it arguably includes segments, features, syllables, and other universal organizing properties, sign language phonology and morpho-phonology are different from those of spoken language. As shown above, spoken language phonological structure exhibits a good deal more variation in the content of neighboring segments than does that of sign language. In addition, spoken languages typically (though not exclusively) sequence morphemes concatenatively, as opposed to the more simultaneous layering typical of sign language morphemes. As for the syllable, while it is clear that both modalities require a meaningless temporal unit whose structure is defined in terms of perceptual salience, the structure of the syllable is very different, and the term 'sonority' in sign language can only be understood analogically.

The question is, to what do we attribute those properties that are universal at a general level but quite different in detail – to 'a domain-specific phonological mechanism' (Berent, 2009) or to independent perceptual requirements of the visual and auditory systems? Given the differences, attributing to UG the existence of a syllable unit and sonority in each system is an oversimplification. Nontrivial differences such as those seen here may in fact be directly attributable to specific characteristics of the two different transmission systems together with more general cognitive constraints.

Let's take simultaneity and sequentiality as an example of interaction of this sort. The simultaneity of structure so often noted in sign language syllables (and at **all** levels of structure, Sandler and Lillo-Martin, 2006) finds an explanation in the advantages of the visual system for perceiving different elements in a display, both central and peripheral, quickly and simultaneously. The auditory system is bad at that, but has a clear advantage in temporal resolution – the ability to perceive and process sequentially occurring speech signals (Brentari, 2002). This makes more variegated segmental structure and sequential affixation more likely in the oral/aural modality. The study of such physical properties of the system must complement linguistic analysis in order to motivate constraints on structure of language in both modalities. Ignoring the physical basis of phonological properties and constraints by attributing them to UG, or GEN in Optimality Theory (Prince and Smolensky, 1993), deprives us of the possibility of reaching a deeper understanding of their nature and origin.

Together with anatomical differences in the transmission system, there is evidence that more general cognitive constraints are at work in shaping grammatical form. In an early comparative study on the temporal duration of words and of propositions in English and in ASL, hearing native signers, born to deaf parents, were asked to tell the same story in English and in ASL. While the signs took longer to articulate, only 2-3 per second compared to 4-5 spoken words, the length of a proposition in the two stories was uniform (Bellugi and Fischer, 1972). The simultaneous layering of morphological complexity in sign languages compensates for slower manual articulation in order to arrive at an optimal rate of proposition production, which may be constrained equally in the two modalities by short term memory (Wilson and Emmorey, 2006).

Sign languages have syllables. And aspects of the morphological complexity they typically exhibit are best represented as autosegmental/templatic, a formalism that elegantly reveals the structure of some spoken languages as well (McCarthy, 1981). That is what the UG-guided spotlight illuminates. However, outside its glare we discern specific properties of the syllable and of the templates that differ in the two modalities. Moreover, as in the case of the syllable, the possibility that even the universal organizational elements are arrived at through the interaction of a variety of capabilities and constraints in each modality cannot be dismissed. Accounting for a system as complex as language requires a broader view.

These examples barely scratch the surface: the inventory of grammatical structures and properties common to spoken and signed languages is remarkable, and comprises a weighty body of language universals. In this sense, sign languages require us to pay attention to uniformity, and they roundly confirm the basic tenet of modern linguistics which holds that language represents a coherent cognitive system, possessed by humans and only humans. But the same examples often reveal diversity in the form that human language can take.

## 4. Language emergence and the role of culture in determining language form

In the emergence of linguistic form in a new sign language that my colleagues and I have been studying, a diversity of factors can be seen to play a role. The first four deaf signers of the new sign language were born about 75 years ago in an insular Bedouin community in present day Israel. Today, deaf villagers number about 150. Their language, Al-Sayyid Bedouin Sign Language (ABSL), is fully functional, with certain regularities in word order (Sandler et al., 2005) and indications of the emergence of other basic linguistic features (Aronoff et al., 2008; Padden et al., in press; Sandler et al., in press-a, in press-b).

But in this language, we have found no minimal pairs, and we find a good deal of variation in sign production across individuals, significantly more than in more established sign languages (Israel, 2009). For these and other reasons, we have argued that the ABSL lexicon contains holistic iconic images, and that this fully functional language does not yet have a crystallized phonological system (Sandler et al., in press-a). At the same time, our data suggest that conventionalization, due to interaction among members of the community across generations, leads to the beginnings of phonology, pointing to a role for culture in the emergence of grammatical form. This raises the possibility that even in modern humans, basic design features of human language in both modalities self-organize from a complex array of interacting components, and are not conferred on the species ready-made.

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