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Sign language iconicity and gradient effects

<https://doi.org/10.1515/tl-2018-0021>

1 Introduction

Schlenker's paper presents a very stimulating wide-ranging assessment of the import of work in sign language semantics for the foundations of semantics and universal grammar. My comments here will focus on the role of iconicity in the semantics of sign languages, which is a central theme addressed in the paper. In Section 2, I discuss the distinction between categorical iconicity and gradient iconicity. In Sections 3–4, I offer some comments on Schlenker's treatment of locus height and classifier predicates in the light of this distinction.

2 Categorical iconicity vs. gradient iconicity

The initial example used to illustrate sign language iconicity (originally from Schlenker et al. 2013) consists in the different ways, reported in (49), in which the ASL verb GROW may be modulated to represent different properties of the growing process. For instance, narrowing or broadening of the endpoints (the points at which the hands come to rest at the end of the movement) may be used to express that the amount of growth is small, medium or large.

Emmorey and Herzig (2003) pointed out that there are two types of iconicity in sign language: (a) categorical iconicity and (b) gradient iconicity. An example of categorical iconicity is handshape variation from a squeezed F (where the index finger contacts the base of the thumb) to a wide baby C handshape to reproduce medallions of different sizes. In this case, Emmorey and Herzig's tests reveal that each handshape is taken by signers as appropriate for a whole range of medallion sizes, and not just for a single size (in this sense, the handshape variants described above are categorical). An example of gradient iconicity, also reported by Schlenker in (71a), is given by the locations of a classifier for a dot (F-handshape) in different points of the signing space with respect to a classifier for a bar (B-handshape), whose position remains fixed. In this case, Emmorey

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and Herzig's tests reveal that each location of the dot classifier relative to the bar classifier is taken by signers to correspond to a different location of a dot with respect to a bar in a picture. In this sense, classifier loci (positions in the signing space) display gradient properties, since every variation in the locus of the classifier is potentially significant.

Notice that the label "iconic" is appropriate for both examples, since variations of the hand configuration and variations of the loci both reflect variations of the properties of real-world objects. Yet, the two types of iconicity are clearly distinct, both, as we just saw, in the way they are interpreted by signers and also, as Emmorey et al. (2013) point out, in relation to the neural regions involved in their processing. Categorical iconicity (classifier handshape variation to reflect properties of real objects) shows a greater activation of the left inferior frontal gyrus (IFG), known to be associated with linguistic tasks such as lexical retrieval/selection and phonological encoding. On the other hand, gradient iconicity (variation in the movement or location of classifier handshapes to reflect properties of real objects) shows greater bilateral activation of the superior parietal lobule (SPL), known to be involved in non-linguistic tasks such as online control of programming of reach movement to target locations in space and in the control of visual spatial attention.¹

So, one question that arises in connection with (49) is whether the variations of GROW in ASL exemplify categorical iconicity or gradient iconicity, since this may make a difference for the linguistic status of these variations. In commenting on the different combinations illustrated in (49), Schlenker observes: "Intuitively, there was a mapping between the physical properties of the sign and the event denoted: the broader the endpoints, the larger the final size of the group; the more rapid the movement, the quicker the growth process." This suggests that the speed of the movement and the width of the endpoints in (49) should be regarded as a case of gradient iconicity rather than as a case of categorical iconicity. Yet, the data reported by Schlenker are also consistent with narrowing and broadening being instances of categorical iconicity.

The same question also arises for other examples of iconicity discussed in the paper. For example, the use of high or low loci for pronouns in order to express differences in height, importance, power etc. is dealt with by assuming semantic rule (62), which requires that the difference in height between the locus of a pronoun and a neutral locus must be proportional to the height difference between the real-world denotations of these loci. Again, this suggests that the use of high or low loci for iconic purposes is an instance of gradient iconicity. Again, since the

¹ For a discussion of both types of iconicity in relation to classifier predicates, see also Zucchi (2017).

decision to classify locus height as a case of gradient iconicity may be relevant for its linguistic status, I think it is important to provide evidence supporting this decision. However, the data presented by Schlenker in (55)–(58) (and in the original source, Schlenker et al. 2013) are not sufficient to draw any conclusion in this respect. Indeed, (55)–(58) are compatible with a simple three-way distinction among high, neuter and low loci and give no indication whether finer distinctions among high loci (or low loci) may be semantically relevant.

One more observation is in order before I turn to the discussion of Schlenker's analyses of specific iconic phenomena. Gradient iconicity, as Emmorey and Herzig point out, should not be taken to mean that any variation in the iconic item is actually significant. What is required, in any given context, is that *some* mapping between the properties of the iconic item and the properties of its referent obtains. Thus, slight differences in form may be regarded as nonsignificant in some contexts, and categorical iconicity and gradient iconicity may be indistinguishable in these contexts. The point, however, is that, with gradient iconicity there is no limit *in principle* to how fine-grained a mapping may be presupposed across contexts, the only bound being imposed by physical limitations in perception or production. Thus, although testing for categorical or gradient iconicity may not be a trivial task, the two types of iconicity are clearly distinct conceptually and, as the experimental results mentioned above indicate, the distinction is empirically grounded.

3 The grammatical status of locus height

Now consider the semantic rule proposed by Schlenker for locus height:

(62) Height specifications

Let c be a context of speech, s an assignment function and w a world (with $c_w =$ the world of c).

If i is a locus, n is a locus with neutral height, h is a measure of the heights of loci in signing space, h_c is a measure (given by the context c) of heights of objects in c_w , and $\alpha_c > 0$ is a parameter given by the context c ,

$\llbracket IX-i \rrbracket^{c,s,w} = \#$ iff $s(i) = \#$ or $[(h_c(i) \neq h_c(n) \text{ and } h_c(s(i)) - h_c(s(n)) \neq \alpha_c(h(i) - h(n)))]$. If $\llbracket IX-i \rrbracket^{c,s,w} \neq \#$, $\llbracket IX-i \rrbracket^{c,s,w} = s(i)$.

Rule (62) assumes that, if the pronoun has any denotation, the difference in height between the locus of the pronoun and the neutral locus must be proportional to the height difference between the real-world denotations of these loci. As pointed out above, this suggests that the use of high or low loci for iconic purposes is an

instance of gradient iconicity.² Suppose this is correct. What is the status of (62) with respect to the grammar of ASL?

Schlenker's discussion suggests three possible answers:

1. Rule (62) does not belong to the linguistic module, but to a separate depictive module.
2. Rule (62) belongs to the grammar of ASL: height specifications of loci are overt realizations of interpretable features on par with other interpretable features like gender features.
3. Rule (62) accounts for the interaction between the grammar of ASL and co-occurring gestures: locus height specifications should be assimilated to gestures.

Let us discuss these three options in detail.

Cogill-Koez (2000a,b) argued that sign languages, unlike spoken languages, are dual-representation languages, which use both a linguistic way of conveying information and a depictive (schematic) way. Under her proposal, it may be natural to adopt option 1 and regard (62) as belonging to the depictive mode of representation, as distinct from the linguistic mode. However, I think that there are some reasons to reject this move. First, one may question the dual-representation view of sign languages. For one thing, in sign languages, there are no attested constructions that are purely depictive, contrary to what might be expected if sign languages were dual-representation languages: what we find instead, even in instances of gradient iconicity, is a mixture of linguistic and iconic elements. For example, Cogill-Koez regards classifier predicates as examples of the depictive mode of communication at its purest, but classifier handshapes occurring in these predicates are clearly linguistic in nature, as evidence of various kinds indicates: indeed, classifier handshapes are conventional, enter in the formulation of grammatical rules³ and, as mentioned in Section 2, the processing of classifier handshape variation activates brain areas involved in linguistic tasks⁴ (see Zucchi 2012, 2017 for a more detailed discussion of some of these points). Second, rule (62) governs both the logical aspect and the iconic aspect of the interpretation of pronouns: pronouns are treated as variables whose value is determined by the assignment function, with an associated semantic presupposition which reflects the iconic import of pronoun locus. This makes

² Indeed, given that no constraint is imposed on the values that measure *h* of locus height can take, any variation in height is potentially significant.

³ Benedicto and Brentari (2004).

⁴ Emmorey et al. (2013).

it implausible to view (62) as located in a depictive module distinct from the linguistic one.

Let us now turn to option 2, by which (62) is a semantic rule of the ASL grammar. As I understand it, this assumption amounts to treating locus height as morphemic. Moreover, since (62) predicts that any difference in height is potentially significant, it amounts to assuming that ASL has an infinite number of morphemes. Indeed, if locus height is regarded as an interpretable feature, then, since no constraint is imposed on the values of measure *h* of locus height, the locus height feature may take a potentially infinite number of meaningful values. If this were the case, it would mean that sign languages, unlike spoken languages, lack the property of discrete infinity (Chomsky 1988), which requires the minimal meaningful units of the language to be finite.

Of course, one might be willing to bite the bullet here. One might claim that (62) is a grammatical rule of ASL and that sign languages differ from spoken languages, among other things, because, by exploiting the possibilities offered by the fact that signs are performed in space, they may build complex meanings by drawing on an infinite number of basic meaningful units. Yet, there are some considerations that tell against this move. First, it is not obvious why the difference between the visual modality and the auditive modality should make a difference for discrete infinity. In principle, one might imagine a spoken language in which different degrees of tallness are proportional to the length of the vowel in “tall”:

/tɔl/
 /tɔɔl/
 /tɔɔɔl/
 ...

Yet, there are no spoken languages that work in this way (at least no spoken languages in which this option is grammaticalized). So, why should sign languages, unlike spoken languages, lack the property of discrete infinity? In principle, as far as expressing height is concerned, locating signs in space does not seem to introduce iconic options that are not expressible in spoken languages. Thus, treating locus height as morphemic and giving up discrete infinity for sign languages leaves us with the unanswered question why sign languages should lack a central property of other natural human languages.

Second, rule (62) amounts to assuming that locus height is a case of gradient iconicity and, as pointed out above, Emmorey et al. (2013) found neurological evidence that other instances of gradient iconicity involving locus (classifier handshape locus) are processed by an area of the brain known to be involved in

non-linguistic tasks. While these results cannot be extrapolated to locus height, they should make us wary of regarding locus height as morphemic.

Let us now turn to option 3. According to this option, locus height should be regarded as a gesture. One way to understand the option is to think of locus height as having the same status as a gesture accompanying an utterance of (i) in which I wave my hand way above my head with the palm facing the head:

(i) Yesterday I saw Kareem Abdul-Jabbar.

Thus understood, locus height specification, much as my gesture accompanying (i), would simply be an optional gesture whose function is to add a further specification to the propositional content independently expressed by the signed utterance. It is well-known that gestures may further specify the content of co-occurring speech in face-to-face conversation (Kendon 2004). Locus height, as the gesture co-occurring with (i), would do that by providing some indication of the degree of tallness of the individual referred to by linguistic material.⁵

It is worth pointing out that the gestural view of locus height leads us to expect the fact, noted by Schlenker et al. (2013), that height specifications project above negation. Schlenker reports that signers consistently infer from (17) that R is tall, normal or short depending on whether the pronoun locus is above, at, or below the neutral locus:

(17) YESTERDAY IX-1 SEE R [= body-anchored proper name]. IX-1 NOT UNDERSTAND IX-a^{high/normal/low}
 ‘Yesterday I saw R [= body-anchored proper name]. I didn’t understand him.’

Similarly, an utterance of (ii) below, accompanied by the same gesture co-occurring with (i), still elicits the inference that Kareem Abdul-Jabbar is tall:

(ii) Yesterday I did not see Kareem Abdul-Jabbar.

This way of describing what is going on with locus height of pronouns does not yet tell us what the status of (62) is, unless we are willing to say more about the status of the gestures that accompany speech, to which locus height is assimilated. Traditionally, co-speech gestures are regarded as non-linguistic, thus

⁵ It should be noted here that in sign language the locus of the pronoun adds the information concerning the height of the referent indirectly, via a mapping of locus height in signing space to height in real space. In the utterance of (i) I considered, on the other hand, the co-occurring gesture may indicate the height of Kareem Abdul-Jabbar directly, by demonstrating how taller than me he is.

belonging to a module separate from the grammatical module. However, recent work reviewed by Emmorey and Ozyurek (2014) has uncovered “a surprising degree of overlap between the cortical regions and processes that support both sign and spoken language and co-speech gesture processing.” Moreover, Xu et al. (2009) report neuroimaging data showing that symbolic gestures (pantomimes and emblems) and their spoken glosses “activate a common, left-lateralized network of inferior frontal and posterior temporal regions” of the brain. On the basis of this evidence and of the fact that iconic function and logical function are carried by the same expressions (the locus of pronouns may be both iconic and an indicator of binding), Schlenker suggests that a live alternative to the traditional view is to consider spoken language and co-speech gestures as belonging to a single module. If one adopts this alternative, the gestural view of locus height specifications is consistent with regarding them as linguistic in some sense (although they should be treated differently from features).

Notice, however, that, if we regard co-speech gestures as linguistic items (albeit distinct from features), one consequence is that we should regard spoken languages as lacking the property of discrete infinity. Indeed, co-speech gestures like the one accompanying (i) display gradient iconicity, as there is a potentially infinite number of meaningful variations of the gesture, and it is unlikely that these variations could be generated by the combination of a finite number of basic meaningful gestures.⁶ Moreover, while the meanings of some co-speech gestures are clearly dependent on conventions established in particular communities, iconic co-speech gestures like (ii) are clearly non-conventional. Thus, the effect of counting co-speech gestures as linguistic items is that one must give up both discrete infinity and conventionality as characteristic properties of spoken languages. The same would be true for sign languages, if locus height specifications were assimilated to co-speech gestures and then co-speech gestures were regarded as linguistic.

In fact, the neuroimaging data showing that sign and spoken language and gesture (with or without speech) share the same brain regions need not be taken as evidence that gestures are linguistic. As both Emmorey and Ozyurek and Xu et al. observe, these data may simply indicate that the brain regions traditionally identified as committed to linguistic tasks are in fact assigned to a more general semiotic function.⁷ This way of viewing the neuroimaging results about gestures

⁶ The strategy of accounting for gradient iconicity as the result of combining a finite number of basic iconic items was proposed by Supalla (1982, 1986) to analyse classifier predicates of motion of ASL. See Cogill-Koez (2000b: p. 181–3) for discussion.

⁷ This view is consistent with regarding as an indication of non-linguistic status the fact that the processing of an item shows greater activation of brain areas devoted to non-linguistic tasks.

allows one to preserve the distinction between the linguistic and the gestural component, and to regard discrete infinity and conventionality as defining criteria of what belongs to the linguistic module. If this view is correct, however, rule (62) should be unpacked into two different rules: a grammatical rule which states the dependency of the denotation of the pronoun from the assignment and a pragmatic rule which augments the linguistic content by adding the specifications indicated by the non-linguistic gestural component (locus height).

There is another possible way of pursuing the idea that locus height is gestural, which is not discussed by Schlenker, although it is a natural extension of an analysis of classifier predicates he mentions. This way consists in assuming that locus height is a demonstration fixing the reference of a hidden demonstrative. Davidson (2015), Zucchi et al. (2011), Zucchi (2012, 2017) have proposed to deal with gradient iconicity of classifier predicates by assuming that these predicates involve demonstrative reference. One might try to extend the proposal to locus height in ASL. One way to work toward this goal is to assume that an utterance of (iii) in which the locus height of the pronoun is used to convey information about the height of the referent means something like (iv), accompanied by a gesture indicating the degree of tallness:⁸

(iii) YESTERDAY IX-1 SAW IX-a.

(iv) Yesterday I saw him, who is this tall.

This way of dealing with iconic effects of locus height specifications allows us to regard the semantic rule that accounts for (iii) as a rule of the ASL grammar (much as the rule accounting for (iv) is a semantic rule of the English grammar), compatibly with the view that locus height specifications are gestural in nature. How exactly this informal suggestion is to be implemented I leave to another occasion.

How does the view that locus height is a reference fixing demonstration differ from the previous view of locus height as a co-speech gesture? According to the previous view, an utterance of (iii) would be analogous to an utterance of “Yesterday I saw him,” where “him” co-occurs with a gesture indicating the height of the individual referred to by the pronoun. In this case, the propositional content of the utterance may be fixed independently of the locus height gesture (for example, if the previous utterance provides an antecedent for the pronoun) and locus height simply has the function of specifying this independently expressed content further. On the other hand, if the locus height gesture is a demonstration fixing the referent of a covert demonstrative, it has the function of fixing

⁸ Again, it should be noticed that by uttering (iv), but not by uttering (iii), I may demonstrate how tall the pronoun referent is directly.

the propositional content of an utterance of (iii). Whether the latter view can be turned into an adequate account of locus height is an open question at this point. In the next section, however, I will argue that classifier predicates require treating the gestural component as fixing the propositional content of the utterance (unless we are willing to give up the view that sentential utterances express propositions).

4 The role of gestures in classifier predicates

Schlenker suggests that an analysis which directly incorporates iconic conditions in semantic rules (like the one in (62) for locus height) may be extended to classifier predicates as well. In particular, he suggests that such an analysis may deal with Emmorey and Herzig's example of gradient iconicity reported in (71a), in which the positions of an F-handshape and a B-handshape in the signing space are used to describe the relative positions of a dot with respect to a bar in the real space. For a sketch of the analysis, the reader is referred to Schlenker (2011), where Emmorey and Herzig's example is dealt with by means of the following rule:

- (10) If i is a locus, $[[F\text{-classifier}_i B\text{-predicate}]^{c,s} = \# \text{ iff } s(i) = \# \text{ or } [[B]^{c,s} = \#$. If $[[F\text{-classifier}_i B\text{-predicate}]^{c,s} \neq \#$, $[[F\text{-classifier}_i B\text{-predicate}]^{c,s} = 1 \text{ iff } \langle i, B \rangle$ is iconically projectable to $\langle s(i), [[B]^{c,s} \rangle$ along the 'geometric' dimension.

Here, $\langle i, B \rangle$ is iconically projectable to $\langle s(i), [[B]^{c,s} \rangle$ along the "geometric" dimension means that there is a natural geometric projection that maps the relative position of locus i and sign B and the objects they denote, namely $s(i)$ and $[[B]^{c,s}$.

(Schlenker 2011: p. 230)

Notice that the same question concerning the grammatical status of rule (62) also arises for (10). Since, as was mentioned in Section 3, there is robust evidence that classifier handshapes are linguistic items, it is implausible to assume that constructions like those in (10) belong to an independent depictive module. Moreover, if classifier locus is analysed as an interpretable feature, then this feature may take a potentially infinite number of meaningful values, contrary to the assumption that natural human languages are characterized by the property of discrete infinity. As neuroimaging evidence reported in Emmorey et al. (2013) indicates that processing of locus change of classifier handshape induces greater activation of brain areas involved in non-linguistic tasks, it seems plausible to regard the relative loci of the F-classifier handshape and the B-classifier handshape as gestural.

If this is correct, (10) should be unpacked to reflect the role played by the gestural component. In the discussion of locus height in the previous section, I outlined two ways of analysing the role of gestures: they could further specify an independently expressed propositional content or they could be demonstrations which help to fix the propositional content. Notice, however, that in the case of (71a) it is implausible to regard the relative positions of the F-handshape and the B-handshape as accompanying gestures having the function of further specifying a propositional content independently expressed by the linguistic utterance. For one thing, if we ignore the relative positions of the F-handshape and the B-handshape, it is not clear what the content of an utterance of [F-classifier; B-predicate] is. The problem is even more evident for classifier predicates of motion of the kind discussed in Supalla (1982). These predicates essentially consist of a classifier handshape which moves in the signing space to represent the movement of an object belonging to the class denoted by the classifier. For instance, in ASL the movement of the 3-handshape classifier for vehicle illustrated in (vi) (from Valli and Lucas 2000) may express the proposition in (vii):



(vi)

(vii) a car drove by

In principle, any variation in the path of the classifier handshape in the signing space is potentially significant. Moreover, Emmorey et al. (2013) report that processing of path changes of classifier handshapes also exhibits greater neurological activation of non-linguistic areas of the brain. Thus, again, a gestural analysis of classifier movement is plausible. Yet, if we take the movement away in (vi), it is not clear what proposition is expressed. If we take the movement away, it is not even obvious that a predicate of motion is present: the very process of forming a predicate of motion from the classifier requires that the classifier be moved in the signing space. So, in this case, it seems that a non-linguistic gesture is required in order to get a predicate denotation and thus to express a propositional content. Under the view that movement is an accompanying gesture further specifying a propositional content independently expressed by a sentential utterance, it is not clear how one can make sense of (vi).

One way to make sense of (vi), if one wants to pursue the view that movement is a gesture which further specifies an independently expressed content, is to give up the idea that the content expressed by a sentential utterance is a *propositional* content. Recanati (2003) and others advocate that linguistic material may underspecify the propositional content and, in particular, it may be the case that, in order to express a proposition, some propositional constituents have to be pragmatically supplied instead of being linguistically articulated. Following this lead, one might claim that the grammar of ASL does not assign a proposition to an utterance like (vi) and that the propositional content is determined by enriching the content provided by the grammar with the content pragmatically provided by the gesture.

A way of accounting for the interpretation of (vi) which allows one to hold on to the view that sentential utterances express propositions has been proposed by Davidson and Zucchi. The intuitive idea behind these proposals is that movement in classifier predicates of motion is a gesture which fixes the referent of a hidden demonstrative (i.e. a demonstration), in the same way in which the reference of the demonstrative in (viii) may be fixed by a gesture:

(viii) the car moved in a way similar to this.

If this is correct, (vi), like (viii), would express a propositional content once the context supplies a referent for the linguistically articulated (albeit covert) indexical material of the utterance. A similar proposal may also be extended to classifier predicates of location, like those involved in (71a). Again, it seems to me that in principle both views examined here could be pursued. Which one is best depends, in part, on how the distribution of labour between semantics and pragmatics should be modelled.

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