

Iconic Variables in ASL and LSF

Goals: We argue that some sign language loci (i.e. positions in signing space that realize discourse referents) are *both* formal variables and simplified representations of what they denote; in other words, they are simultaneously logical symbols and pictorial representations. We develop a 'formal semantics with iconicity' that can account for their dual life; the key idea is that some geometric properties of signs must be preserved by the interpretation function. We thus seek to reconcile insights from the 'formalist camp', which emphasizes the similarity between loci and formal indices (e.g. Lillo-Martin and Klima 1990), and insights from the 'iconic camp', which emphasizes iconicity (e.g. Liddell 2003).

Methods: Our initial data were collected from native ASL and LSF signers (Deaf children of Deaf, signing parents) using the 'playback method', whereby controlled paradigms are signed on a video and later assessed (comparatively, and iteratively) on 7-point scale by the same and/or by different signers.

[1] Structural iconicity: The simplest instance of an iconic constraint concerns plural ASL and LSF loci, usually realized as circular areas. These can be embedded within each other, and we hypothesize that this gives rise to cases of *structural iconicity*, whereby topological inclusion in signing space is mapped into mereological inclusion of the denotations. We study 'complement set anaphora', as in (1):

(1) ?Few / #Most students came to class. They [*intended*: the students who didn't come] stayed home instead.

Complement set anaphora (whereby *they* in (1) is read as referring to the students that did *not* come) is limited (with *few*) and impossible (with *most*); Nouwen 2003 argues that when it is available, complement set anaphora involves *inferred* discourse referents: no grammatical mechanism makes available a discourse referent denoting the complement set – here: the set of students who *didn't* come; by contrast, a discourse referent does denote the students that *did* come. We make two claims: **Claim I.** When a default plural locus is used in ASL, data similar to (1) can be replicated – e.g. complement set anaphora with *most* is quite degraded [= (2)b]. **Claim II.** When embedded loci are used, the effect is circumvented: one large locus (written as *ab*, but signed as a single circular locus) denotes the set of all students; a sub-locus (= *a*) denotes the set of students who came; and a complement locus (= *b*) thereby becomes available, denoting the set of students who didn't come (= (2)a) (averages over 5 trials and 3 informants; 1st rating: average over trials; 2nd rating: over informants; LSF data are similar).

(2) a. Obviating the deviance of compset anaphora b. Replicating the deviance of compset anaphora

Context: I teach a linguistics class at NYU.

a. [6.7 [6.5]] POSS-1 STUDENT IX-arc-ab FEW IX-arc-a
a-CAME. IX-arc-b b-STAY HOME

b. [6.3 [5.8]] POSS-1 STUDENT IX-arc-ab MOST IX-arc-a
a-CAME. IX-arc-b b-STAY HOME

[3.6 [3.6]] POSS-1 STUDENT FEW a-CAME CLASS. IX-arc-a a-STAY HOME

d. [2.8 [2.7]] POSS-1 STUDENT MOST a-CAME CLASS.
IX-arc-a a-STAY HOME

'Few/Most of my students came to class. They stayed home.'
(Inf 1, 8, 225; 8, 226; 8, 285; 8, 300; 8, 305; 8, 348)

We account for Claim I and Claim II by assuming that (i) Nouwen is right that in English, *as well as ASL and LSF*, the grammar *fails* to make available a discourse referent for the complement set, i.e. the set of students who didn't come; but (ii) the mapping between plural loci and mereological sums preserves relations of inclusion and complementation, which in (2)a makes available the locus *b*:

(3) Let LOC be the set of plural loci that appear in signing space, and let *s* an admissible assignment function that assigns values to loci. We make the assumptions in (a)-(b), where we view plural loci as sets of geometric points, and loci denotations as sets of individuals.

a. Conditions on LOC: for all *a, b* ∈ LOC, (i) $a \subseteq b$ or $b \subseteq a$ or $a \cap b = \emptyset$; (ii) if $a \subset b$, $(b-a) \in \text{LOC}$

b. Conditions on *s*: for all *a, b* ∈ LOC, (i) $a \subset b$ iff $s(a) \subset s(b)$; (ii) if $a \subset b$, $s(b-a) = s(b)-s(a)$

If *a* is a proper sublocus of a large locus *ab*, we can infer by (3)a(ii) that $(ab-a)$ (i.e. *b*) is a locus as well; by (3)b(i), that $s(a) \subset s(ab)$; and by (3)b(ii), that $s(b) = s(ab)-s(a)$. Complement set anaphora becomes available because ASL/LSF can rely on an iconic property which is inapplicable in English.

[2] Locus-external iconicity: Under restricted conditions, loci can be introduced high or low in signing space, to refer to entities that are tall/powerful/important or short. Importantly, the inferences are preserved with pronouns (*IX-a* in (4)) embedded under negation; we treat them as presuppositions.

(4) YESTERDAY IX-1 SEE R [= body-anchored proper name]. IX-1 NOT UNDERSTAND IX-a^{high / normal / low}.

Inferences: high locus – R is tall, or powerful/important; normal locus: nothing special; low locus: R is short
We take height specifications to have the same kind of presuppositional semantics as gender features (Cooper 1983), but with an iconic component, as seen in (5) (the crucial presupposition is in bold).

(5) Let *c* be a context of speech, *s* an assignment function and *w* a world (c_w = 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, $h_c(c_w)$ is a measure of height denotations in c_w given by the context *c*, and $\alpha_c > 0$ is a parameter given by the context *c*. Then: $[[IX-i]]^{c,s,w} = \#$ iff $s(i) = \#$ or $li - nl \neq 0$ and $h_c(\underline{c_w})(s(i)) - h_c(\underline{c_w})(s(n)) \neq \alpha_c(h(i) - h(n))$. If $[[IX-i]]^{c,s,w} \neq \#$, $[[IX-i]]^{c,s,w} = s(i)$.

The part in bold requires that the height difference between the denotations in c_w of $s(i)$ and $s(n)$ be proportional to the height difference between the loci i and n , with a multiplicative parameter $\alpha_c > 0$. Importantly, the height of denotations is assessed relative to the world c_w of the context: the presupposition is indexical, as is that triggered by *she* in English: in (6), *she* is can *only* be read *de re*.

(6) Bill wore a dress and make-up and John didn't realize that he was a man. He said that he/#she looked great and that he/#she was staring at him. (Sharvit 2008)

[2.1] We tested this prediction in ASL: in both (7)a-b, the height presupposition triggered by *IX-b^{high}* is satisfied with respect to my cousin's beliefs, but only in (7)b is it satisfied in c_w – and hence acceptable.

(7) POSS-1 COUSIN IX-a (a) WRONGLY THINK [scores: 3 3 3] / (b) KNOW [scores: 7 7 7]

POSS-1 YOUNG BROTHER TALL. IX-a THINK IX-b^{high} BASKETBALL PERSON.

'My cousin (a) wrongly thinks (b) knows that my younger brother is tall. He thinks he is a basketball player.'

[2.2] We also tested the iconic component of (5) in ASL by varying the position of the denotations:

(8) Context: People seek self-knowledge in the weirdest of situations.

YESTERDAY VERY TALL PHILOSOPHER PERSON (a) CL-stand_a (b) CL-sit_a (c) CL-lie_a PARK.

SUDDENLY IX-a^{high/normal/low} UNDERSTAND IX-a^{high/normal/low} / SELF-a^{high/normal/low}

'Yesterday a very tall philosopher was (a) standing (b) sitting (c) lying in the park. Suddenly he understood him / himself.'

IX-a / *SELF-a* targeted three different heights: high, normal, low. In all cases, *IX-a* was dispreferred, as this is a configuration of local binding which requires a reflexive pronoun. Within the *SELF-a* examples, high loci were possible in the 'standing' condition, less so in the 'sitting' condition, and degraded in the 'lying' condition. In other words, *SELF-a* behaves in this case as an 'iconic reflexive'.

[3] Locus-internal iconicity: Despite many disagreements, Liddell 2003 and Lillo-Martin & Meier 2011 agree that the effects of iconicity are felt with directional verbs, which *target different parts of a locus depending on their meaning* – e.g. Liddell 2003 writes that 'ASK-QUESTION-*y* is directed toward the chin/neck area', while 'COMMUNICATE-TELEPATHICALLY-1^[RECIPL.y]...is directed toward the forehead'.

[3.1] On an empirical level, we shows (a) that Liddell's claims also hold of donkey and bound pronouns, (ii) both in ASL and LSF, and (iii) that the particular part of a locus which is targeted by agreement *depends on the position (upright or hanging) of the person referred to*. Thus in (9), which involves 'donkey' anaphora, two LSF signers rated 3 possible heights for the agreement component of two verbs; as in ASL, *COMMUNICATE-BY-TELEPATHY* targeted a higher locus than *EXCHANGE-THOUGHTS*.

(9) YESTERDAY LINGUIST_b PHILOSOPHER_a b,a-MEET.

1. b,a-EXCHANGE-THOUGHTS 2. b,a-COMMUNICATE-BY-TELEPATHY

'Yesterday, a linguist and a philosopher met. They 1. exchanged thoughts 2. communicated by telepathy.'

[3.3] As is predicted by an iconic analysis, the preferences were reversed when the body position of the denotations was reversed, as seen for instance in the LSF example in (10):

(10) YESTERDAY TREE BRANCH.

1. LINGUIST CL-hang_b PHILOSOPHER CL-hang_a 2. LINGUIST CL-stand_b PHILOSOPHER CL-stand_a

EXCHANGE-IDEAS COMMUNICATE-BY-TELEPATHY

'Yesterday a linguist and a philosopher were 1. hanging from / 2. standing on a tree branch. They exchanged ideas but didn't communicate by telepathy.'

An LSF signer assessed three conditions for 1. and 2., with the height targeted by *COMMUNICATE-BY-TELEPATHY* (a) higher than, (b) equal to, or (c) lower than that targeted by *EXCHANGE-THOUGHTS*. In 2., the 'standing' condition, (a) was preferred to (b)-(c), as expected; but in 1., the 'hanging' condition, (c) was preferred to (a)-(b). This suggests that a geometric component must be integrated in the analysis.

[3.3] Following Schlenker 2011, we develop an iconic and presuppositional analysis of as in (11):

(11) For any objects x and y of type e , for any context c , assignment function s , and world w , h is a measure of the heights of loci in signing space, h_c is a measure of height denotations given by the context c , and α_c (> 0) is a parameter given by the context c ,

$\llbracket [i-ASK-QUESTIONS-j] \rrbracket^{F,s,w}(y)(x) = \#$ iff $x = \#$ or $y = \#$ or $s(J) \neq y$ or $s(I) \neq x$ or **$\langle i, I \rangle$ does not stand in iconic relation R to $s(I)$ in c_w** or $\langle j, J \rangle$ does not stand in iconic relation R to $s(J)$ in c_w . If $\llbracket [i-ASK-QUESTIONS-j] \rrbracket^{F,s,w}(y)(x) \neq \#$, $\llbracket [i-ASK-QUESTIONS-j] \rrbracket^{F,s,w}(y)(x) = 1$ iff x ask questions to y in w .

The iconic component in bold can be specified in different ways for each verb. For *ASK-QUESTIONS*, the boxed part can be elaborated as: *the relative height of i within I is not roughly proportional to the relative height of the chin of $s(I)$ within the body of $s(I)$ in c_w* . For *COMMUNICATE-BY-TELEPATHY*, reference to the 'chin of $s(I)$ ' can be replaced with 'forehead of $s(I)$ ' to capture Liddell's original insight.