

Sign Language Semantics Day 2: Pronouns: variables, features, and pictures

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Section 1

Overview

Review

- ▶ Last class, we discussed two ways that the sign language modality sheds new insight into natural language semantics.

1. **Visibility:** making overt some linguistic mechanisms hypothesized but covert in spoken language
2. **Iconicity:** form-meaning mapping is non-arbitrary and structure preserving

(Schlenker 2015)

- ▶ Today: I'm going to focus on these two properties in one of the simplest domains: singular pronouns.

Visibility: singular loci

- ▶ First, perhaps the most famous claim of visibility in ASL.
(Lillo-Martin and Klima 1990)
- ▶ **The observation:** locations in space ('loci') can be used to disambiguate pronominal reference.
- ▶ **The insight:** Loci literally *are* formal variables (he_x vs. he_y).

Visibility: singular loci

- ▶ I will investigate this analysis a little bit deeper, especially in light of theories that discard the notion of variables in general.

(Spoiler alert)

- ▶ I will ultimately argue that loci are *not* formal variables.
 - ▶ They lack certain essential properties of variablehood.
- ▶ On the relevant formal fronts, seem to share important properties with *morphosyntactic features*.
 - ▶ Loci as features is a better conceptual match.

Visibility: singular loci

- ▶ But! Although I will eventually argue that loci \neq variables...
- ▶ The hypothesis of visibility is extremely productive.
 - ▶ It forces us to address in a very concrete way what it *would* look like if something were a variable.
 - ▶ Takes an abstract notion (variablehood), and brings it down to earth in a clearly empirical way.

Iconicity: singular loci

- ▶ Next, I turn to cases where pronouns show iconic effects.
 - ▶ Set relations of plural pronouns
 - ▶ Height/orientation of singular pronouns
- ▶ Analysis in terms of a presupposed feature.

Spatial syncretisms?

- ▶ Finally, new and open questions regarding patterns where nouns or verbs are underspecified for locus.

Methodology

- ▶ Native signers of ASL.
- ▶ **Playback method:** (Schlenker 2010)
 1. One native signer signs sentences of interest; they are videotaped.
 2. The same signer assess these sentences for acceptability (usually by comparing several sentences).
 3. Step 2 is repeated at different times, with the same or with different signers [to assess the stability of the judgments].
- ▶ Often, ratings on a 7-point scale [7=best] (simplified here)
- ▶ *A note:* Videos include *ungrammatical* sentences, too. We'll see some here.

Finally, notational conventions

- ▶ I will be discussing several pronominals:
 - ▶ IX (=index), a pointing index finger, is a pronoun, 'he'/'him'
 - ▶ SELF, a fist, is a reflexive, 'himself'
 - ▶ POSS, a flat hand, is a possessive, 'his'
- ▶ Other words transcribed with closest English translation in small caps.
- ▶ Locations in space will be indicated with lower-case letters (e.g. IX-a).

Section 2

Loci: variables or features?

Background: Indexing individuals in space

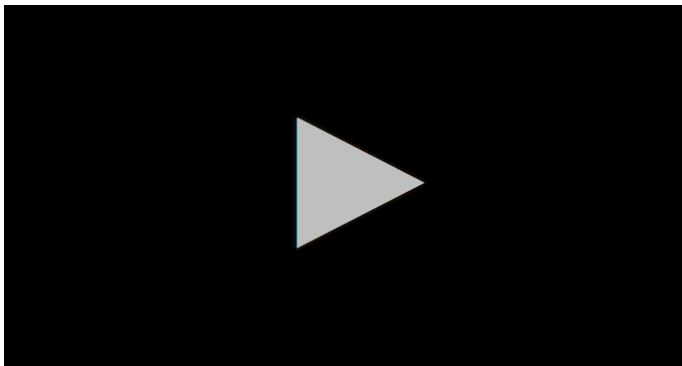
- ▶ Pronominal ambiguity in English:

(1) John told Bill that he would win.

- a. John told Bill that John would win.
- b. John told Bill that Bill would win.

- ▶ In ASL: ambiguity can be eliminated with the use of space!
 - ▶ NPs may be associated with locations ('loci').
 - ▶ Pronouns point to locus of their antecedent.

Background: Indexing individuals in space



- (2) IX-a JOHN TELL IX-b BILL {IX-a/IX-b} WILL WIN.
'John_i told Bill_j that he_{i/j} would win.'

Background: Indexing individuals in space



IX-a



JOHN



TELL



IX-b



BILL



IX-a



IX-b



WILL



WIN

Background: Indexing individuals in space

- ▶ Some unique properties of loci:
 - ▶ There are theoretically infinitely many possible loci.
 - ▶ There is an arbitrary relationship between a given noun phrase and the locus where it is assigned.
- ▶ In spoken language, no analogous phonetic marker is able to disambiguate logical forms.

The same system?

- ▶ **Important question:**
“Is this really the same linguistic system as English pronouns?”
- ▶ **Answer:** Yes.

The same system: semantics

- ▶ Pronouns show quantificational binding: bound pronouns co-vary with the quantifier.
- (3) [ALL BOY]_a WANT [ALL GIRL]_b THINK {IX-a/IX-b} LIKE {IX-b/IX-a}.
'Every boy wants every girl to think that {he/she} likes {her/him}.'
- ▶ Further, generalized quantifiers at two different loci may range over the same set of individuals.
- (4) WHEN SOMEONE_a HELP SOMEONE_b, {IX-a/IX-b} HAPPY.
'When someone helps someone, the {former/latter} is happy.'

The same system

- ▶ Setting aside the use of space, ASL pronouns otherwise look just like systems in spoken languages:
 - ▶ Free and bound uses
 - ▶ Binding Theory Conditions A and B (Koulidobrova 2009)
 - ▶ Crossover effects (Lillo-Martin 1991, Sandler & Lillo-Martin 2006)
 - ▶ Resumptive uses for island extraction (Lillo-Martin 1986)
- ▶ **Conclusion:** same abstract pronominal system in ASL and spoken language.

Okay, then what are loci?

Let's go back to the examples where they're most important.

Loci as Variables

- (1) IX-a JOHN TELL IX-b BILL {IX-a/IX-b} WILL WIN.
'John_i told Bill_j that he_{i/j} would win.'

- ▶ Striking parallels between loci and formal variables!
 - ▶ appear on pronoun and antecedent
 - ▶ there are arbitrarily many
 - ▶ disambiguate pronouns under multiple levels of embedding

- ▶ Lillo-Martin and Klima (1990): **loci are the overt phonological manifestation of variable names.**

The Variable-Free Hypothesis

On the other hand:

- ▶ A rich thread of semantic work argues that the logic underlying natural language does not make use of formal variables.
- ▶ Variables are not logically necessary for expressive purposes.
 - ▶ Any Turing complete language can be translated into Combinatory Logic, which makes no use of variables.

(Curry and Feys 1958)

- ▶ Some telling titles:

- ▶ Quine 1960: “Variables explained away”
- ▶ Szabolcsi 1987: “Bound variables in syntax (Are there any?)”
- ▶ Jacobson 1999: “Towards a Variable-Free Semantics”

(and further works by Steedman, Szabolcsi, and Jacobson, among others)

Variable-Free Semantics

- ▶ **One motivation from parsimony:** Variables are never overt in natural language — in (spoken) language, there is never a phonological difference between 'he_x' and 'he_y'.
(Jacobson 1999)
- ▶ **BUT!**
As we have seen, ASL provides a potential counterexample to this generalization.
- ▶ A conflict!

Another way to look at it

- ▶ The Curry-Feys isomorphism is a sword that cuts both ways: anything that is expressible without variables can also be expressed with variables.
- ▶ **The question, then:** to what extent do these linguistic objects seem to have the formal properties of variables?
- ▶ What are the formal properties of variables?
- ▶ In doing this, it will be helpful to provide another hypothesis that we can test against. Features.

The Hypothesis

(5) **The (strong) loci-as-variables hypothesis:**

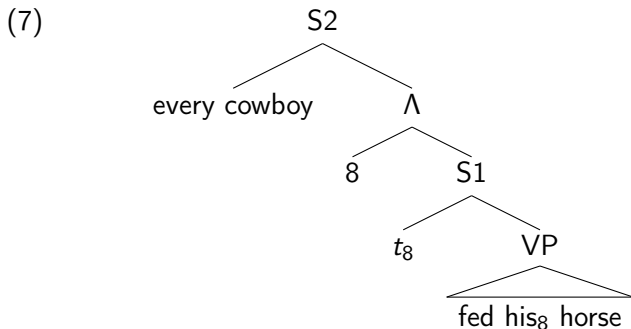
There is a one-to-one correspondence between ASL loci and formal variables.

(6) **The loci-as-features hypothesis:**

Different loci correspond to different values of a morphosyntactic spatial feature.

Binding with variables

- Standard Heim and Kratzer:



- (8) a. $\llbracket S1 \rrbracket = \lambda g[g(8) \text{ fed } g(8)\text{'s horse}]$
 b. $\llbracket 8 \ S1 \rrbracket = \lambda g \lambda x \llbracket S1 \rrbracket^{8 \rightarrow x}$

Binding with variables

- ▶ **Variable capture:** A variable is bound by the lowest operator which scopes over it and quantifies over that variable.

$$\begin{aligned}(9) \quad & \exists x[\forall x.R(x, x)] \\ & = \exists x[\forall y.R(y, y)] \\ & \neq \exists x[\forall y.R(y, x)]\end{aligned}$$

- ▶ Critically, assignment functions are **functions**: each variable is mapped to only one individual.
- ▶ So, if loci are variables, then a given locus can only index a single individual.

Variables vs. features

- (10) a. Jay told Bob that [his_[+masc] cat licked his_[+masc] dog].
b. Jay told Bob that [his_x cat licked his_x dog].

Locus recycling \neq locus sharing

- ▶ Can one locus be used for two different individuals?
- ▶ Preliminary answer: clearly yes!
 - ▶ Indexing something in space once doesn't lock you in for life.
 - ▶ Even in adjacent sentences, loci are recycled.
- ▶ But, this is not a valid counter-example.
- ▶ Two occurrences of a formal variable may be semantically independent with an intervening operator:

- (11) a. $\exists x[P(x)] \wedge \exists x[Q(x)]$
b. $\exists x[P(x)] \wedge \exists y[Q(y)]$

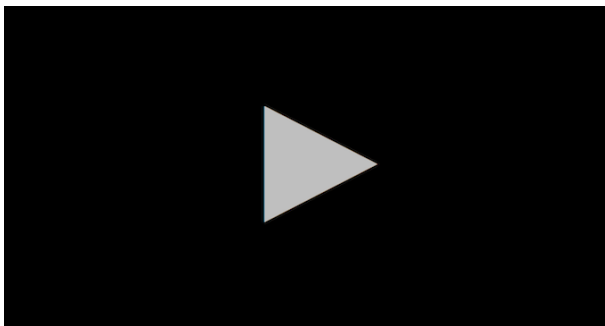
The test case

- ▶ The critical configurations: cases of variable capture.
- ▶ We're searching for examples with two pronouns, indexed at the same locus, both free within the same sub-expression.

(12) ...NP_a [...NP_a [...IX-a...IX-a...]]...

- ▶ **I will present:** Two different kinds of examples instantiating this schema.
- ▶ **We will find:** A shared locus does *not* force co-reference.
 - ▶ Falsifies the strong loci-as-variables hypothesis.

Counterexample 1: Locus sharing of free pronouns



- (13) EVERY-DAY, JOHN_a TELL MARY_a IX-*a* LIKE IX-*a*.
BILL_b NEVER TELL SUZY_b IX-*b* LIKE IX-*b*.
'Every day, John_i tells Mary_j that he_i likes her_j. Bill_k never
tells Suzy_l that he_k likes her_l.'

Ex 1: Locus sharing

(13) EVERY-DAY, JOHN_a TELL MARY_a IX-*a* LIKE IX-*a*.

- ▶ Both John and Mary are indexed at locus *a*!
Both Bill and Suzy are indexed at locus *b*!
- ▶ How do we know it's the same locus?
(And not just two *really* close together)
 - ▶ **Production:** Signer instructed to repeat loci.
 - ▶ **Reception:** Sentence judged as “technically ambiguous,” but with one weird reading in which John is informing Mary of her own mental state.

The influence of pragmatics

- ▶ Why aren't such sentences more common?
 - ▶ Pragmatic principle: "Avoid ambiguity."
 - ▶ In (13), of four logical readings, two are eliminated by Condition B and one due to implausibility.
 - ▶ **Prediction:** If ambiguity reintroduced, ratings go down.
- (14) ?? EVERY-DAY, JOHN_a TELL MARY_a IX-*a* THINK IX-*a* SMART.
BILL_b NEVER TELL SUZY_b IX-*b* THINK IX-*b* SMART.
'Every day, John tells Mary that he thinks {he/she} is smart. Bill never tells Susan that he thinks {he/she} is smart.'

(Specifically, on the 7 point scale, goes from 6/7 to 4/7.)

English: Pronouns under *only*

- ▶ English: Pronouns under *only* may optionally co-vary in the focus alternatives.

(15) a. [Only Mary_x] $\lambda y.y$ did her_x homework.

→ John didn't do Mary's homework.

b. [Only Mary_x] $\lambda y.y$ did her_y homework.

→ John didn't do his own homework.

- ▶ In (a), the pronoun is free and co-referential with Mary;
in (b), the pronoun is bound by the lambda operator.

English: Pronouns under *only*

- ▶ When two pronouns appear under *only*, two mixed readings are available: one pronoun bound and one free.

(16) Only Billy told his mother his favorite color.

(17) a. [Only Billy_x] $\lambda y.y$ told x 's mother y 's favorite color.

Context: When Billy's mother has his friends over to play, she tends to ask them all sorts of personal questions, which they are usually reluctant to answer. Yesterday, she asked them what their favorite color is, but only Billy answered.

b. [Only Billy_x] $\lambda y.y$ told y 's mother x 's favorite color.

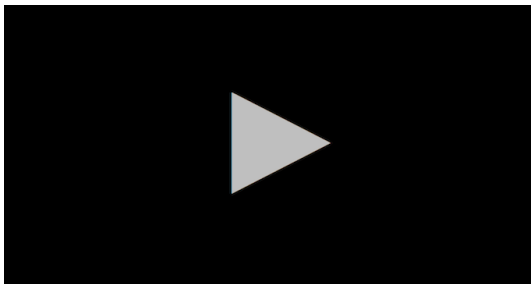
Context: Sally recently learned that Billy's favorite color is pink and soon told everybody else in the class. Later, Billy told his mother the situation, and said he was worried that the children would spread the gossip to their mothers. But Billy had nothing to worry about.

ASL: Pronouns under *only*

- ▶ If ASL loci are variables, then the use of loci should make these mixed readings unavailable.
 - ▶ Two spatially co-indexed pronouns — denoting the same variable — must be captured by the same operator.
 - ▶ Both must give the same reading: bound or free.

ASL: Pronouns under *only*

- ▶ However, mixed readings *are* attested.



- (18) IX-a BILLY ONLY-ONE past-TELL POSS-a MOTHER POSS-a
FAVORITE COLOR.

'Only Billy told his mother his favorite color.'

Can be: bound-bound, bound-free, free-bound, or free-free.

Result (both examples)

- ▶ The loci-as-variables hypothesis **undergenerates**.

Loci as features

- ▶ An alternative way to think about loci: loci are morpho-syntactic features, parallel to gender and person in English.
 - ▶ A pronoun may be bound by any NP that bears the same features.
 - ▶ Sentence (13) no longer a problem.

(13) EVERY-DAY, JOHN_a TELL MARY_a IX-*a* LOVE IX-*a*.
'Every day, John_i tells Mary_j that he_i loves her_j.'

- ▶ Compare:

(19) John_[*masc*] told Bill_[*masc*] that he_[*masc*] loves him_[*masc*].

Uninterpreted features

- ▶ What about pronouns under *only*?
- ▶ **Heim:** under focus sensitive operators, features may remain **uninterpreted**. E.g. (20a) entails that John didn't do his homework, even though he is not a female.

- (20) a. Only Mary did her homework.
b. Only I did my homework.
→ *Both sentences have bound and free readings for the pronoun.*

Uninterpreted features

- ▶ Sentence (18) is exactly parallel: the pronoun bears a spatial feature which is uninterpreted in the focus alternatives.

(18') IX-**a** JENNY TOLD-ME IX-**b** BILLY ONLY-ONE past-TELL POSS-**b**
MOTHER POSS-**b** FAVORITE COLOR.
'Jenny told me that only Billy told his mother his favorite color.'

- ▶ E.g. on the *bound-bound* reading, (18') entails that Jenny didn't tell her mother her favorite color, even though she is not indexed at locus *b*.

Summary

- ▶ The strong loci-as-variables hypothesis has been falsified.
- ▶ In contrast, loci share important formal properties with morphosyntactic features.

Summary

- ▶ The strong loci-as-variables hypothesis has been falsified.
- ▶ In contrast, loci share important formal properties with morphosyntactic features.
- ▶ But note:
 - ▶ Even if a variable-based analysis of loci is falsified, it does *not* mean that variables don't exist in natural language, it just means that loci aren't them.

Where do we go from here?

- ▶ At this point, there are essentially two directions.
- ▶ The first route abandons variables completely.
 - ▶ Since we have shown that ASL loci do not necessitate a variable-based analysis, we can provide a purely feature-based analysis in a Variable-Free, Directly Compositional framework.
 - ▶ Kuhn (2015), "ASL loci: variables or features?" *J. of Semantics*
- ▶ Alternatively, weaker forms of the variable-based hypothesis are available.
 - ▶ Schlenker (to appear), recognizing the problems presented here, presents one such weakening: an analysis in terms of "featural variables."

Loci as Variables and as Features?

► “Featural variables”:

- NPs may bear two variables: a covert variable i (like spoken language), and an optional overt variable a (the locus).
- Quantificational binding binds both the covert and overt variable.
- Indexing an NP at locus a adds a feature that presupposes that $s(i) \in s(a)$ on an assignment s .
- This feature is uninterpreted under focus.

► Definition of IX- a :

- $$\llbracket IX_{i-a} \rrbracket^s = s(i) \quad \text{if} \quad s(i) \in s(a)$$

$$\quad \quad \quad \# \quad \quad \text{otherwise}$$

Section 3

...or pictures?

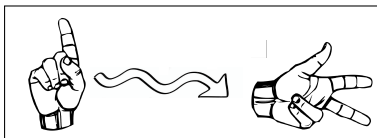
Another tension: iconicity

What's the interaction of the combinatorial grammar with iconic, pictorial representations?

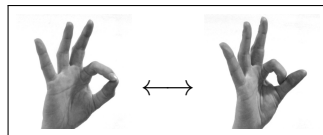
- ▶ **We've seen:** the patterns that we see in sign language fit closely with discrete and categorial patterns familiar from spoken language.
- ▶ **But:** sign language is also well known for its ability to express meaning in a demonstrative, picture-like way.

Pictorial content

- ▶ **Iconicity:** A construction is iconic if there is a structure-preserving mapping from the form of a sign to its meaning.
- ▶ Examples (ASL):



“The person walked up to the vehicle along a wavy path.”



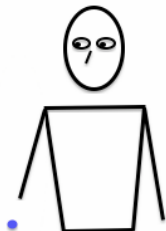
small disk \longleftrightarrow smaller disk
(Emmorey & Herzig 2003)

Pictorial content on pronouns

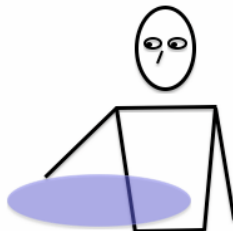
- ▶ Schlenker, Lamberton, and Santoro 2013 focus on two cases of iconicity on pronouns:
 1. Set relations of plural pronouns
 2. Height/orientation specification of singular pronouns

Set relations and plural pronouns

- ▶ We have seen: singular individuals indexed at points in space.
- ▶ Plurals (i.e. sets of individuals) are indexed over areas of space (i.e. sets of points).



singular locus

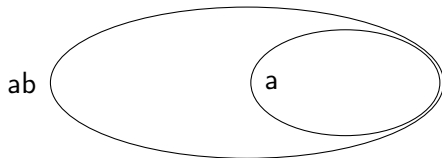


plural locus

Set relations and plural pronouns

Schlenker, Lamberton, and Santoro 2013 show:

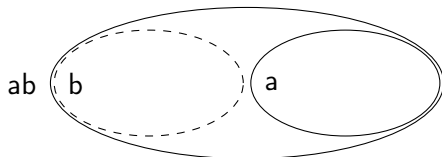
- ▶ When one plural locus is a sub-area of another plural locus, an inference: the denotation of the first is a subset of the denotation of the second.



- ▶ Iconicity = structure preserving mapping.
 - ▶ Here, the structure is mereological structure (=parthood).

Set relations and plural pronouns

- ▶ Various plural discourse referents introduced.
- ▶ Like spoken language, a discourse referent introduced for each of the two plurals indicated (the superset and subset).
- ▶ Additionally, a plural pronoun over (roughly) the difference between the two areas retrieves a discourse referent denoting the **complement set**—the subset minus the superset.



- ▶ This discourse referent emerges by virtue of the iconic interaction of the other two plurals.

Set relations and plural pronouns

(21) **English**

Most students came to class. They stayed home instead.

(22) **ASL without iconic construction**

MY STUDENT MOST CAME CLASS. IX-arc-a STAY HOME.

(23) **ASL with iconic construction**

✓ MY STUDENT IX-arc-ab MOST IX-arc-a CAME CLASS.
IX-arc-b STAY HOME.

Set relations and plural pronouns

Proposal (Schlenker et al. 2013):

- ▶ Let LOC be the set of plural loci that appear in signing space, and let s be an assignment function that assigns values to loci.
 - a. Iconic closure of LOC under complementation:
 - (i) for all $a, b \in \text{LOC}$, if $a \subset b$, $(b - a) \in \text{LOC}$
 - b. Iconic constraints on s : for all $a, b \in \text{LOC}$, if $a \subset b$,
 - (i) $s(a) \subset s(b)$;
 - (ii) $s(b - a) = s(b) - s(a)$

(Schlenker, Lamberton, and Santoro 2013)

Singular pronouns and height/orientation

Case 2: locus height interpreted as height of referent.

(24) YESTERDAY IX-1 SEE R [=body-anchored proper name].
IX-1 NOT UNDERSTAND IX-a- $\{\text{high/normal/low}\}$.
'Yesterday I saw R. I didn't understand him.'

(25) *Inferences:*

- a. high locus → R is tall
- b. normal locus → no inference
- c. low locus → R is short

► Analogous results with 'directional verbs.'

Singular pronouns and height/orientation

- ▶ Not just a feature [\pm tall].
- ▶ Depends on orientation of individual.

(26) TREE BRANCH SEVERAL GIANT {HANG-rep/STAND-rep}.
IX-a WANT IX-1 1-ASK-a-{high/medium/low}-rep.
'Several giants were {hanging/standing} on a tree branch.
One said he wanted me to ask him questions.'

'hanging'



'standing'



- ▶ Ungrammaticality with high/hanging, low/standing conditions.

Iconic and grammatical behavior

- ▶ These iconic effects also show grammatical effects:

- ▶ Conditions A and B.
- ▶ Presuppositional behavior.
- ▶ Uninterpreted under focus and ellipsis.

- (27) a. *Context*: a giant (locus a) and a dwarf (locus b) are in astronaut training in an arbitrary position.
- b. IX-a-upper LIKE SELF-a-upper, IX-b-neutral NOT ____.
- ‘The giant liked himself, but the short person didn’t.’

- ▶ **Upshot**: looks like a feature!

How encode?

- ▶ No problem: iconic mappings define sets of objects.
- ▶ We need non-standard (for semanticists) tools to describe this mapping (but it's not hard).
 - ▶ Can do in terms of geometric projections (Greenberg 2013).
- ▶ Standard semantic type— $\langle e, t \rangle$ —so can be encoded as usual.

(28) Definition of *she* (English):

$$\begin{array}{ll} \text{a. } \llbracket \text{she} \rrbracket^s = s(i) & \text{if } s(i) \in \llbracket \text{female} \rrbracket \\ & \# \quad \text{otherwise} \end{array}$$

(29) Definition of IX-high (ASL):

$$\begin{array}{ll} \text{a. } \llbracket \text{IX-high} \rrbracket^s = s(i) & \text{if } s(i) \in \{x \mid x\text{'s torso is high}\} \\ & \# \quad \text{otherwise} \end{array}$$

Convergence!

- ▶ A unified picture from part 1 and part 2!
- ▶ Loci—in both iconic and grammatical uses—are incorporated as a presupposed or featural component on a pronoun.

Section 4

Spatial syncretisms?

New questions

- ▶ What does a feature-based account buy us?
- ▶ What can it inform us about features elsewhere in language?

Preliminary answers:

- ▶ A featural analysis gives us a way to think about patterns of **agreement** and **underspecification**
- ▶ But, as we've seen, locus 'features' are unique in several ways: unboundedly many and arbitrary placement.
 - Extra flexibility to test underspecification paradigms.

New questions

- ▶ Preliminary data and analysis.
- ▶ Synthesis of results and insights from:
 - ▶ Steinbach and Onea 2015 (DGS)
 - ▶ Kuhn 2015 (ASL)
 - ▶ Schlenker 2011 (ASL and LSF)

Directional verbs as agreement

- ▶ Spoken language phi-features induce morphological change of verbal forms.

- (30) a. A boy sleeps. (Match)
b. * A boy sleep. (Mismatch)

- ▶ Sign language loci induce morphological change of verbal forms.

- (31) a. BOOK, JOHN-a a-GIVE-b MARY-b. (Match)
b. * BOOK, JOHN-c a-GIVE-b MARY-b. (Mismatch)

- ▶ See also Lillo-Martin and Meier 2011 and replies.

Underspecification in spoken language

- English past tense is underspecified for number.

- (32) a. The boys sleep. c. * The boys sleeps.
 b. * The boy sleep. d. The boy sleeps.
- (33) a. The boys slept.
 b. The boy slept

Underspecification in sign language

Underspecified verbs and pronouns (ASL):

- ▶ Non-directional verbs do not specify the locus of their argument(s).

(34) a. JOHN-a LIKE ICECREAM.

b. JOHN-b LIKE ICECREAM.

‘John is happy.’

- ▶ Null pronouns are not specified for locus.

(35) a. JOHN-a THINKS \emptyset WILL WIN.

b. JOHN-b THINKS \emptyset WILL WIN.

‘John thinks he will win.’

Underspecification in space

Steinbach and Onea 2015 on German Sign Language (DGS):

- ▶ A pronoun at a neutral location is underspecified for locus.

(36) **DGS** (Steinbach and Onea 2015)

MARIA IX-a NEW TEACHER IX-b LIKE. ...

‘Maria likes the new teacher.’

a. IX-a SMART.

‘Maria is smart.’

b. IX-b SMART.

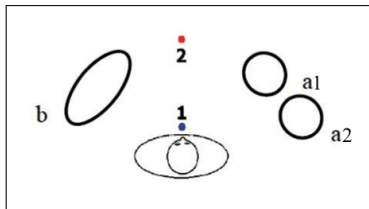
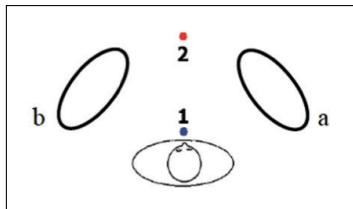
‘The new teacher is smart.’

c. IX-neutral SMART.

Ambiguous: ‘{Maria / The new teacher} is smart.’

Levels of underspecification

- ▶ Steinbach and Onea 2015 on DGS:
- ▶ Levels of underspecification (not just the neutral locus)
- ▶ Pointing generally to the right can retrieve discourse referents established more specific loci on the right.



(adapted from Steinbach and Onea 2015)

More underspecification in ASL?

Underspecification of IX in ASL (unclear):

- ▶ Paradigms with neutral pronouns mixed.
 - ▶ Koulidobrova and Lillo-Martin (to appear): 'IX-neutral' may carry a presupposition that rules out bound readings.
- ▶ Very little data about levels of underspecification (only because nobody has looked).
 - ▶ (I'll present some early results in a moment.)
- ▶ Still: I think that non-agreeing verbs and null pronouns motivate the parallel already.

Syncretisms in spoken language

- ▶ A **syncretism** is a case where two morphological forms of a word are identical.
- ▶ **English**: the nominative and accusative forms of the second person singular pronoun display a syncretism.

	1sg	3sg.masc	2sg
nominative	I	he	you
accusative	me	him	
genetive	my	his	your

- ▶ **German:** Verbs select for

- (38) a. Er findet Frauen.
he find women-ACC/DAT
b. Er hilft Frauen.
he help women-ACC/DAT

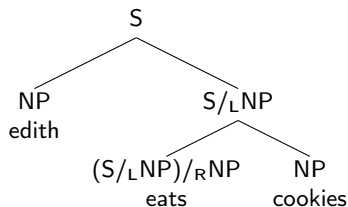
Syncretisms in German

- ▶ **English:** Verbs select for the category of their argument.
- ▶ The verb *become* takes either NPs or AdjPs.

- (39) a. John grew wealthy. c. * John turned into wealthy.
 b. * John grew a Republican. d. J. turned into a Republican.
- (40) a. John became wealthy.
 b. John became a Republican.

Categorial grammar

- ▶ Subcategorization frames are listed in lexical entries.
- ▶ Only NP and S (and a few others) are taken to be primitives.
- ▶ **Composition rules:**
 - 1 $A \rightarrow A/RB \quad B$
 - 2 $A \rightarrow B \quad A/LB$
- ▶ $VP = S/LNP =$ “give me an NP to my left and I’ll return an S”



Conjunctive and disjunctive categories

$$(41) \quad A \rightarrow A \wedge B$$

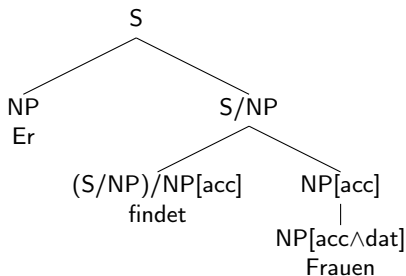
‘Something of category of A can be decomposed into something of category $A \wedge B$.’

$$(42) \quad A \vee B \rightarrow A$$

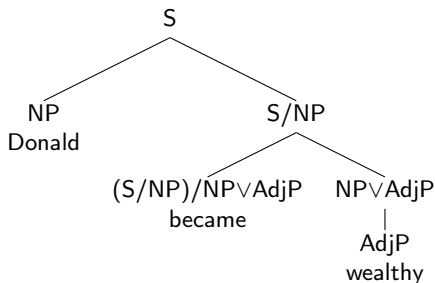
‘Something of category of $A \vee B$ can be decomposed into something of category A .’

Example with German

- ▶ *Frauen* is of category 'NP[acc \wedge dat]' which means that it can serve as an accusative NP **and** it can serve as a dative NP.
- ▶ You can remove a conjunct from an argument.

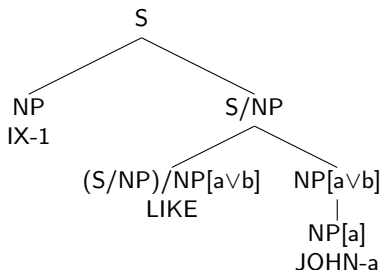


- ▶ *Become* is of category ' $(S/NP)/NP \vee \text{AdjP}$ ' which means that it will be satisfied if you provide it an NP **or** an AdjP.
- ▶ You can add a disjunct to an argument.



Extending to ASL

- ▶ LIKE is of category $'(S/NP)/NP[a \vee b]'$ which means that it will be satisfied if you provide it an NP at locus a **or** at locus b.



- ▶ Note: so far, this is essentially the fragment in Kuhn 2015.

What predictions?

- ▶ **Bayer and Johnson 1995:** predictions about coordination.
- ▶ *And* and *or* are category-polymorphic.

(43) $X \text{ and } X \rightarrow X$

(44) $X \text{ or } X \rightarrow X$

- ▶ So, you can have things like:
 - ▶ NP and NP (NP coordination)
 - ▶ S/NP or S/NP (VP coordination)

...but also conjunctive or disjunctive categories:

- ▶ $NP \vee AdjP$ and $NP \vee AdjP$

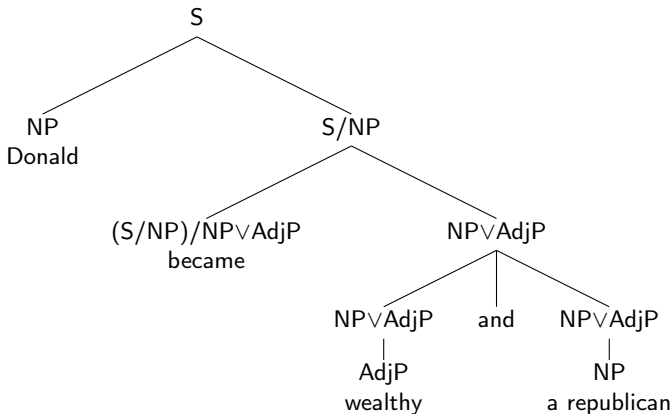
Coordination of conjunctive categories in English

- ▶ **Prediction:** ability to coordinate apparently unlike categories!
- ▶ When you coordinate an NP with an AdjP, the resulting complex constituent can only be the argument of verbs that are syncretic, subcategorizing for either NPs or AdjPs.

- (45)
- a. John became wealthy and a Republican.
 - b. * John grew wealthy and a Republican.
 - c. * John turned into wealthy and a Republican.

- ▶ 'wealthy and a Republican' is of category NP\AdjP

Coordination of conjunctive categories in English



Coordination of conjunctive categories in German

- ▶ When you coordinate a verb that subcategorizes for an accusative object with a verb that subcategorizes for a dative object, the resulting complex verb can only take arguments that are syncretic between accusative and dative.

- (46)
- a. * Er findet und hilft Männer.
 - b. * Er findet und hilft Männern.
 - c. Er findet und hilft Frauen.
'He finds and helps women.'

- ▶ 'findet und hilft' is of category (S/NP)/NP[acc \wedge dat]
 - ▶ (This derivation requires the full Lambek Categorical Grammar; see details in Bayer and Johnson 1995;)

Coordination of conjunctive categories in ASL?

- ▶ Do we see similar examples in ASL?

Coordination of conjunctive categories in ASL?

- ▶ Do we see similar examples in ASL?
- ▶ When you coordinate a DP at locus a with a DP at locus b, the resulting complex DP can only bind pronouns that are syncretic between locus a and locus b.

Coordination of conjunctive categories in ASL?

- ▶ Do we see similar examples in ASL?
- ▶ When you coordinate a DP at locus a with a DP at locus b, the resulting complex DP can only bind pronouns that are syncretic between locus a and locus b.
- ▶ E.g., null pronouns.

Coordination of conjunctive categories in ASL

- Schlenker: coordination with 'or' in ASL and LSF (ASL below):

(47) Same locus or different loci okay with null pronoun:

- a. BLACK-m OR ASIA-m WILL WIN NEXT PRESIDENT ELECTION. \emptyset WILL WIN AHEAD.
- b. BLACK-a OR ASIA-b WILL WIN NEXT PRESIDENT ELECTION. \emptyset WILL WIN AHEAD.

(48) With overt pronoun: okay if same locus; bad with two loci.

- a. BLACK-m OR ASIA-m WILL WIN NEXT PRESIDENT ELECTION. IX-m WILL WIN AHEAD.
- b. ?? BLACK-a OR ASIA-b WILL WIN NEXT PRESIDENT ELECTION. IX- $\{a/b/m\}$ WILL WIN AHEAD.

'An African-American or an Asian-American will win the next presidential election. He will win by a large margin.'

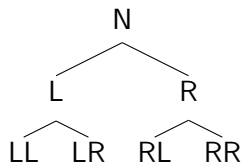
Coordination of conjunctive categories in ASL

More details:

1. Null pronouns: OK!
2. Neutral pronouns: mixed results; interesting changes in judgements (5/7→1/7); possible explanation from Koulidobrova 2012, but also from pragmatics of using loci
3. Generalization to marked loci: not just neutral locus. (preliminary results replicate report of DGS: 7/7)
4. Levels in ASL? (6/7)

Discussion

- ▶ The partial-ordering of syntactic features is spatially overt!
- ▶ What are these features like?
- ▶ Steinbach and Onea 2015: R and L morphemes:



- ▶ Alternatively, a grammatical extension of Schlenker et al.'s iconic set relations?

Section 5

Conclusions

Conclusion

- ▶ **A common theme:** as soon as you get rid of the use of space, the patterns are exactly those of spoken language.
- ▶ But, through the use of space, sign language is able to do something that is more than what we see in spoken language.
 - ▶ Elimination of ambiguity in certain constructions.
 - ▶ Power of pictorial representation.
 - ▶ Unique flexibility in syntactic paradigms.
- ▶ I've argued: this allows us a window into the deeper machinery behind the scenes.

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