Sign language linguistics
Day 3: Semantics

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Section 1

Overview: semantics

Semantics: the study of meaning

▶ The linguistic field of **semantics** is the study of meaning.

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▶ What is meaning?

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  conditions it would be true and false.

  ▶ The earth is roughly spherical.
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  ▶ Jeremy likes walnuts.

Semantics: the study of meaning

▶ To know the meaning of a sentence is to know under which conditions it would be true and false.

    ▶ The earth is roughly spherical.
    ▶ France is a country in east Asia.
    ▶ Jeremy likes walnuts.
    ▶ The first human will walk on Mars in 2025.

The syntax semantics interface

- ▶ Syntax is a recursive engine.
    - ▶ *Result:* there are infinitely many sentences.
- ▶ But you can interpret these sentences, too.

- ▶ **Frege:** the meaning of a sentence is determined by the meanings of its parts.

- ▶ Close connection with syntax.
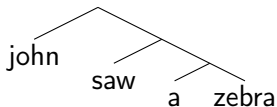
john
saw
a   zebra

Meanings as sets

▶ We can describe the meanings of constituents using sets.

▶ A sentence of the form [NP VP] is true if the object denoted by the NP is in the set denoted by the VP.

    (1)   John is tall.

    (2)   The president of the US plays basketball.

    (3)   Sherlock Holmes is a detective.

Notation

Some notation:

- ▶ Sets are described using curly braces: $\{x, y, ...\}$
- ▶ $x \in S$ iff x is an element of S.
- ▶ $S \cup T$ is the set of distinct elements that are in S or in T.
- ▶ $S \cap T$ is the set of distinct elements that are in S and in T.

- ▶ For example:
    - ▶ $A = \{a, b, c, d\}$; $B = \{a, b, e, f\}$
    - ▶ $c \in A$; $c \notin B$
    - ▶ $A \cup B = \{a, b, c, d, e, f\}$
    - ▶ $A \cap B = \{a, b\}$

Conjunction and disjunction

- $\llbracket$and$\rrbracket \approx \cap$
- $\llbracket$or$\rrbracket \approx \cup$

    (4) Celine sang or danced.

    (5) Bruno is tall and blond.

- Draw some pictures.

Syntax-semantics interface: ambiguity

▶ Because meanings depend on syntactic structure; if there are two possible structures, this generates **ambiguity**.

(6) Mary ate the apple on the table.

(7) *A real headline:*
Woman abandoned at university as baby graduates from same institution.

Syntax-semantics interface: ambiguity

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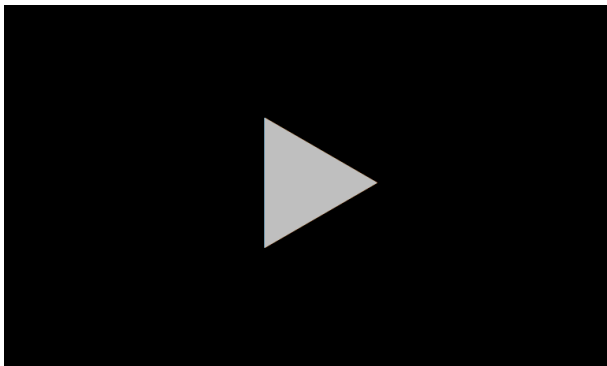
▶ What are the two trees for (6)?

Exercise: Syntax and semantics
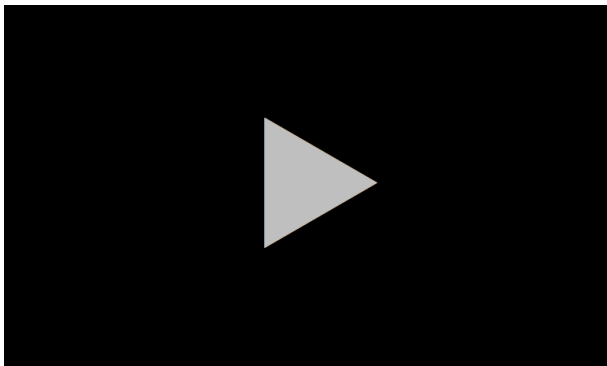
(8)   Mary is drunk and confused or guilty.

Exercise: Syntax and semantics
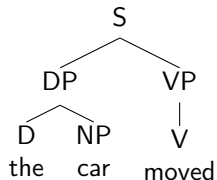

(9) Mary is drunk and confused or guilty.
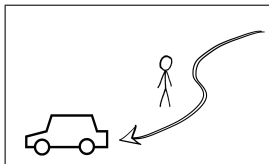
Iconicity in the grammar

Symbolic meaning

(Lillo-Martin, ...)

```
        S
       / \
      DP   VP
     / \    |
    D   NP  V
   the car moved
```
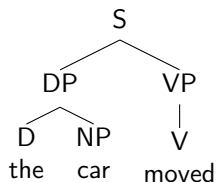
Iconic meaning

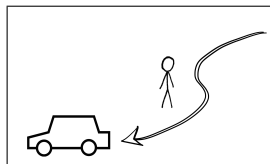(Cuxac, Liddell, ...)

Iconicity in the grammar

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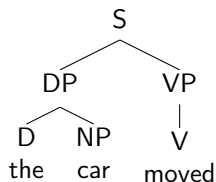(Lillo-Martin, ...)

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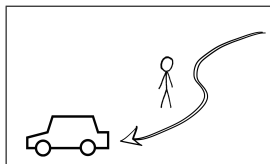
Iconicity in the grammar

Symbolic meaning
(Lillo-Martin, ...)

Iconic meaning
(Cuxac, Liddell, ...)

▶ An iconic mapping defines a **set of individuals or events**.
Thus, add an iconic predicate **directly into the logical form**.

Roadmap for today

1. What kind of meaning does a picture have?

2. How do we integrate two different kinds of meanings into a single interpretation?

3. What are the points of *interface* between logical meaning and iconic meaning?

   ▶ Pluractionality
   ▶ Telicity
   ▶ Role-shift constructions

Section 2

Pictorial semantics (see Greenberg 2015)

A semantics of pictures?

▶ Is it possible to give a precise semantics for pictures?

▶ Why not?

▶ Just as you can state the meaning of a sentence with respect to **truth conditions** (i.e., the set of conditions under which the sentence is true), you can state the meaning of a picture with respect to **accuracy conditions**.

Accuracy judgments

Accuracy judgments

Accurate   Inaccurate

Accuracy judgments

Accurate   Inaccurate

Moral: possible to assign 'truth' or 'accuracy' conditions to pictures.

Another examples

Another examples

Accurate

Inaccurate

Underspecification

Accurate

Accurate

Underspecification

Accurate Accurate

Moral: pictorial information may be underspecified.

Underspecification

▶ What kinds of information can be underspecified?

Underspecification

- ▶ Preservation of **connections** but not **distance**.

Underspecification

▶ Preservation of **connections** and **distance**.
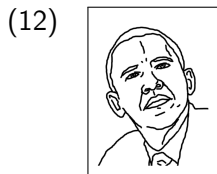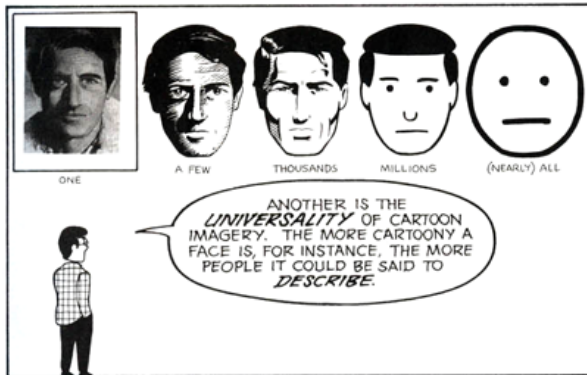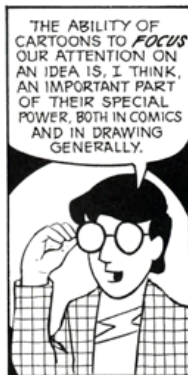
Analogy to underspecification in natural language

▶ Both sentences and pictures can be underspecified with respect to certain information.

(10) I have one sibling.
(A brother or a sister?)

(11) It's raining.
(Who is president of the US?)

(12)

(What color is Obama's tie?)
(What is going on outside the picture frame?)

McCloud (1993), *Understanding Comics*

Iconic predicates

▶ The meaning of a picture is a set of individuals or events.
(Zucchi et al. 2012, Schlenker et al. 2013, Davidson 2015)

▶ A set of individuals:

$$\left[\!\!\left[\;\raisebox{-0.5em}{}\;\right]\!\!\right] = \{john, bill, steve, ...\}$$

▶ A set of events:

$$\left[\!\!\left[\;\raisebox{-2em}{}\;\right]\!\!\right] = \{event_1, event_2, event_3, ...\}$$
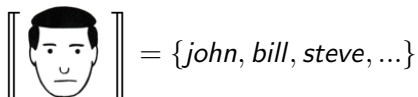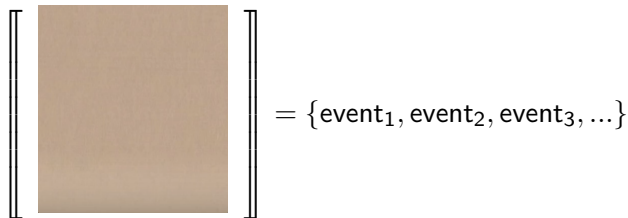
▶ Observe that this is the same semantic **type** as nouns or verbs.

Iconicity definition

Let us be a bit more precise:

▶ A sign is **iconic** if there is a structure-preserving mapping from the form of the sign to its meaning.

▶ Given a phonetic form Φ, an **iconic predicate** is the set of individuals or events iconically match Φ.

▶ Being the same type as logical meanings, the two may interact.

$$\left[\!\!\left[\; \vcenter{\hbox{}} \;\right]\!\!\right] \;\wedge\; [\![\text{linguist}]\!] = \{john, steve, ...\}$$

Section 3

Background: events and plurality

Events

- ▶ We will be assuming a semantic ontology that includes **events**.
- ▶ Events are minimal parts of the world.
  - ▶ E.g. there is an event in which John kisses Bill—no other information about the world is included in this event.
- ▶ Verbs denote sets of events.

Events – motivation

(13)   The girl broke the window with a hammer.

▶ ⟦broke the window⟧ ∩ ⟦with a hammer⟧
  = the set of *events* in which the window was broken
    ∩ the set of *events* in which the hammer was used as a tool

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   ▶ ≠ the set of individuals who broke the window
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   ∩ the set of individuals with a hammer
  ▶ ≠ the set of individuals who broke the window
   ∩ the set of individuals who used a hammer as a tool

Plurality

▶ We will assume that both individuals and events show mereological structure.

> **mereology** = the study of *parthood*

▶ '$\preceq$' defines a partial order; $x \preceq y$ means that x is part of y.

  ▶ E.g. Ann is part of the plurality containing Ann, Ben, and Cat.

▶ *Summation:*
  $x \oplus y$ is the smallest object z such that $x \preceq z$ and $y \preceq z$.

  ▶ *Note:* if x and y are type α, $x \oplus y$ is also type α.

The star operator

▶ The star-operator, written *, returns the algebraic closure of a set with respect to sum formation.

   (14) $^*P = \{x | \exists P' \subseteq P[x = \bigoplus P']\}$
         '$^*P$ is the set of all objects that can be made by summing non-empty subsets of P.'

▶ Example:
    $P = \{a, b, c\}$
    $^*P = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

Plural nouns

▶ The meaning of the plural suffix /-s/ is just the star operator.

(15) There is a boy in the room.

$\llbracket boy \rrbracket = \{a, b, c\}$

(16) There are boys in the room.

$\llbracket boys \rrbracket = {}^*\llbracket boy \rrbracket = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

▶ '*the*' takes the unique maximal salient plurality in a set

(17) $\llbracket the\ boys \rrbracket = a \oplus b \oplus c$

Inherently pluralized verbs

▶ **Observation**: on cumulative readings, (unmarked) verbs can denote plural events.

    (18)   The boys left.

    (19)   Two girls invited three boys.

▶ Assumption: lexical predicates are inherently pluralized with the star operator.   (Krifka 1992 and Kratzer 2008)

    ▶ *Arrive* denotes the set of all singular or plural arriving events.

Distributive readings

▶ Additionally, there are **distributivity operators**, relatives of the star operators, that may pluralize a predicate at other points in the derivation.

(20) The boys each read one book.

▶ $[\![\text{read 1 book}]\!] = \lambda e[\text{read}'(e) \wedge \text{pat}(e) \in book \wedge |\text{pat}(e)| = 1]$

▶ Assume '*each*' $\approx$ the star operator

▶ What's the meaning of $[\![\text{each read one book}]\!]$?

Section 4

Pluractionality

Pluractionality

▶ In many languages of the world, verbs show "pluractional" inflection, often created by reduplication.

▶ These contribute the notion that the sentence in some way describes **a 'multitude' of events**.

    ▶ An event happened again and again
   ▶ Many things happened at the same time

Pluractionality along many dimensions

▶ Upriver Halkomelem (Thompson 2009):

(21) **yáleq'** -et -es te   theqát   (cf. yáq'-et)
      fell.pl -tr. -3S det. tree

▶ True if ...

   a. He felled the trees. (all in one blow, or one after the other)
   b. He felled the same (magic) tree over and over.
   c. They felled the tree.
   d. They felled the trees.

▶ False if ...

   e. He felled the tree (once).

Pluractionality along many dimensions

'They felled the trees at the same time'   'He felled the same tree over and over'   'He felled one tree one time'
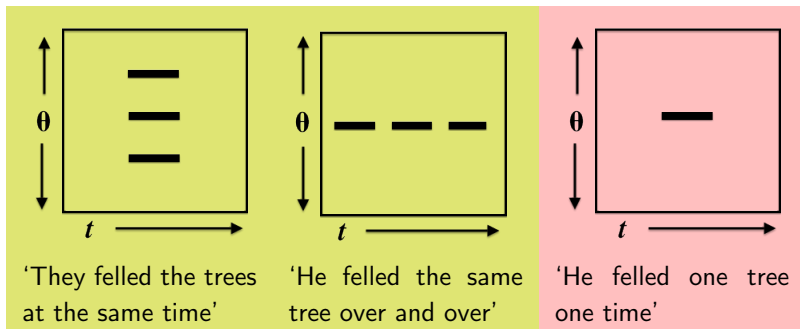
▶ Pluractional means: "you have more than one line."

Cross-linguistic, cross-categorial dependency

- ▶ Part of a larger pattern across languages and across domains.

- ▶ **Nouns:** inflection on a DP may indicate that a plurality of individuals are distributed in some way.

(22)   Korean (Oh 2005)

        Namcatul-i sangca twu-kay-<u>ssik</u>-ul   wunpanhayssta
        men-Nom   boxes   two-Cl-Dist-Acc carried3

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   a.   'The men carried two boxes each.'   OR

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      men-Nom   boxes   two-Cl-Dist-Acc carried3

  a. 'The men carried two boxes each.'   OR

  b. 'The men carried two boxes at each time/occasion.'

Across languages

These appear in Korean, Telugu, Hungarian, Romanian, Kaqchikel
Mayan, Tlingit, Côte d'Ivoire French, ...

Pluractionality in French Sign Language

▶ In LSF, too, verbs may be modified with reduplication to indicate pluractionality.

▶ There are at least two different morphemes that appear across a wide range of verbs.

   ▶ /-rep/ is full repetition of the exact same motion of the verb
   ▶ /-alt/ is alternating repetition of the two hands

▶ Examples:

   ▶ FORGET
   ▶ ARRIVE
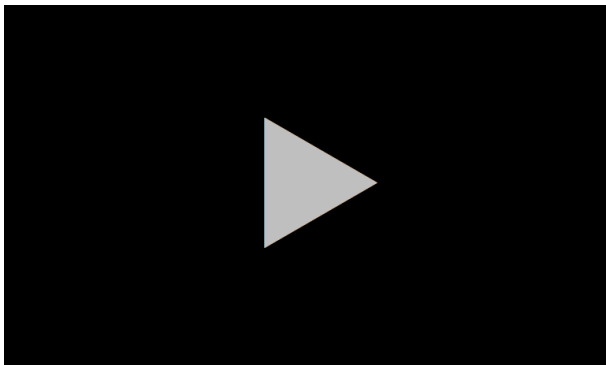   ▶ GIVE

   ▶ LEAVE
   ▶ SPIT
   ▶ TAKE

Pluractionality in French Sign Language

LSF: GIVE (singular), GIVE-rep, GIVE-alt
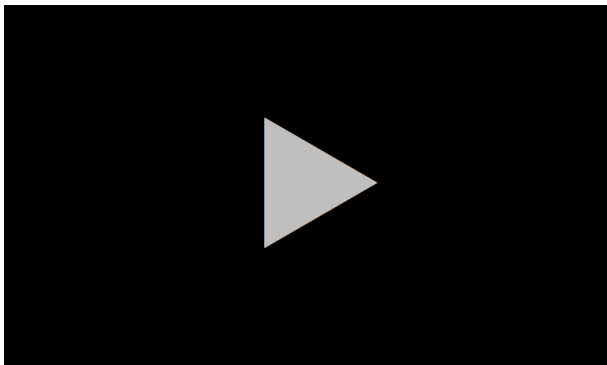
Pluractionality in French Sign Language

LSF: FORGET (singular), FORGET-rep, FORGET-alt

Pluractionality in French Sign Language

▶ What is the difference in meaning?

▶ Roughly:

    ▶ FORGET-rep = forget again and again

    ▶ FORGET-alt = forget many things
                        OR
              many people forget

▶ Exactly the same dimensions of pluractionality as earlier; /-alt/
and /-rep/ carve up the space of pluractional meanings.
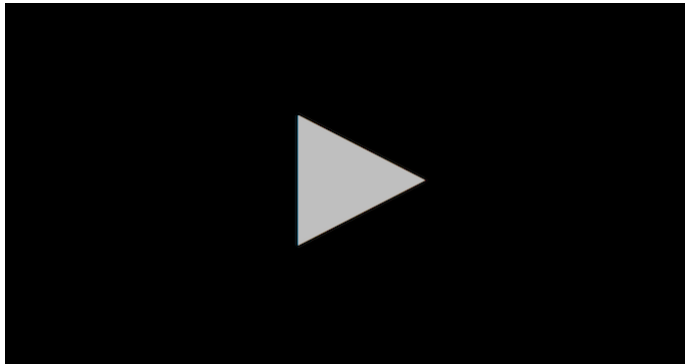
Verbal plurality

▶ Example 1 (French Sign Language):
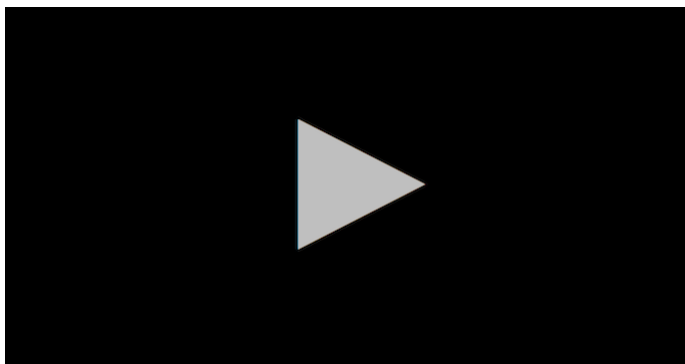
(23)   OFTEN ONE PERSON FORGET-rep ONE WORD.
        'One person repeatedly forgot a word.'

Verbal plurality

▶ Example 2 (French Sign Language):

(24)   MY FRIENDS IX-arc ARRIVE-alt.
        'My friends each arrived.'

/alt/: distribution over participants

▶ /-alt/ entails that subevents have different participants.

▶ Thus, needs to be licensed by a plural in an argument position.

(25)   GROUP PEOPLE BOOK GIVE-1-alt.   **pl. agent**
        'A group of people gave me books.'

(26)   ONE PERSON FORGET-alt SEVERAL WORDS.   **pl. theme**
        'One person forgot several words.'

▶ Although (25)-(26) are compatible with events spread over time, distribution over time alone is not sufficient for /-alt/.

(27)   *(OFTEN) ONE PERSON FORGET-alt ONE WORD.
        Intended: 'One person (often) forgot one word.'

/rep/: distribution over time

▶ In contrast, /-rep/ entails distribution over time.

(28)   OFTEN ONE PERSON FORGET-rep ONE WORD.
       'One person often forgot one word.'

(29)   MIRKO BOOK a-GIVE-1-rep.
       'Mirko gave me a book repeatedly.'

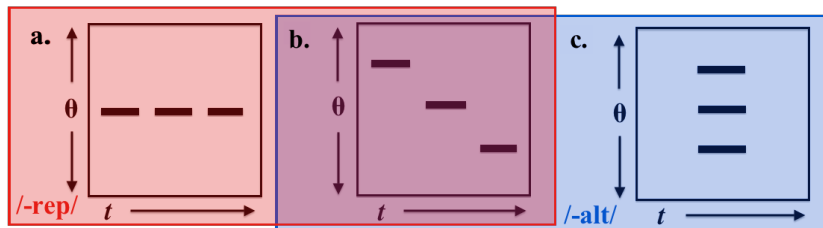▶ Distribution over time, even with a plural argument.

(30)   MY FRIENDS CL:plural FORGOT-rep BRING CAMERA
       'My friends repeatedly forgot to bring a camera.'

   a.   ✓ several times; each time, all forgot
   b.   * a single time; all forgot

/-rep/ vs. /-alt/

		/-rep/	/-alt/
a.	distribution over only time	$\checkmark$	*
b.	distribution over only participants	$\checkmark$	$\checkmark$
c.	distribution over participants and time	*	$\checkmark$

Question: how is plurality introduced?

(31) a. Every three seconds, John coughed once.
   b. John coughed repeatedly for several minutes.

▶ Intuitively different.

▶ Let me anticipate, and suggest that the analytic difference is the following:

   ▶ '*every three seconds*' is a pluralizing operator (like *)
   ▶ '*repeatedly*' is a filter, leaving only non-atomic events

▶ How can we test empirically?

Question: how is plurality introduced?

An empirical difference:

(32)   a. John read one book every week.
            ✓many books   ✓one book

        b. John read one book repeatedly.
            *many books   ✓one book

(33)   a.   Every three seconds, John ate one strawberry.

        b. # John ate one strawberry repeatedly.

Making indefinites dependent

▶ Why is this? Suppose:

  ▶ $e_1 \vdash$ Alice read *The Left Hand of Darkness* Monday
  ▶ $e_2 \vdash$ Alice read *American Gods* Monday
  ▶ $e_3 \vdash$ Alice read *Catch-22* Monday
  ▶ $e_4 \vdash$ Alice read *Catch-22* Tuesday
  ▶ $e_5 \vdash$ Alice read *Catch-22* Wednesday

▶ $[\![\text{read one book}]\!] =$
    $\lambda e.[\![\text{read}]\!](e) \wedge \textbf{theme}(e) \in book \wedge |\textbf{theme}(e)| = 1$

▶ $[\![\text{read one book}]\!] =$
    $\{$ $\}$

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▶ $[\![$read one book$]\!] =$
  $\{e_1, e_2, e_3, e_4, e_5, e_3 \oplus e_4, e_3 \oplus e_5, e_4 \oplus e_5, e_3 \oplus e_4 \oplus e_5\}$

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  $\{ \hspace{8cm} \}$

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▶ $⟦\text{read one book}⟧ =$
  $\lambda e.⟦\text{read}⟧(e) \wedge \textbf{theme}(e) \in book \wedge |\textbf{theme}(e)| = 1$

▶ $⟦\text{read one book}⟧ =$
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▶ $⟦\text{read one book repeatedly}⟧ =$
  $\{\qquad\qquad e_3 \oplus e_4, e_3 \oplus e_5, e_4 \oplus e_5, e_3 \oplus e_4 \oplus e_5\}$

Question: how is plurality introduced?

Two possibilities:

▶ /-alt/ and /-rep/ pluralize a singular event

  ▶ i.e., they are equivalent to the star operator.
  ▶ /-alt/ would be similar to English *each*

▶ They are a cardinality checker on a previously pluralized predicate.

Differences in predictions

(34) a. EVERY-DAY JEAN ONE WORD FORGET.
          'Every day, Jean forgot one word.'

          ✓many words   ✓one word

      b. JEAN ONE WORD FORGET-rep.
          'Jean forgot one word repeatedly.'

          *many words   ✓one word

(35) a. STUDENT EACH FORGOT ONE WORD.
          'Each student forgot one word.'

          ✓many words   ✓one word

      b. STUDENT IX-arc FORGOT-alt ONE WORD.
          'The students forgot (the same) one word.'

          *many words   ✓one word

Empirical summary

(36)

	operator	filter
participants	EACH	-alt
time	EVERY-DAY	-rep

Formal definitions

▶ Formally, we can give a small modification to existing analyses of pluractionals (Lasersohn 1995).

    (37) $[\![\text{-alt}]\!] = \lambda V e[V(e) \wedge \exists e', e'' \preceq e[\theta(e') \neq \theta(e'')]]$

         '/-alt/ takes a verb denotation V and gives the set of V-ing events

         that have at least two subparts with different thematic arguments.'

    (38) $[\![\text{-rep}]\!] = \lambda V e[V(e) \wedge \exists e', e'' \preceq e[\tau(e') \neq \tau(e'')]]$

         '/-rep/ takes a verb denotation V and gives the set of V-ing events

         that have at least two subparts with different runtimes.'

▶ $\preceq$ indicates parthood; $\theta(e)$ is a tuple of the participants of an event: $\langle \text{ag}(e), \text{th}(e), ... \rangle$, τ is runtime

A puzzle

A compositional puzzle:

- ► /-alt/ requires a plural argument over which events can vary.
- ► /-alt/ is licensed by EACH, even though it distributes to atoms.

(39) a. * EACH BOY GATHER.
            'Each boy gathered.'

      b. BOY EACH FORGET-alt BRING CAMERA.
          'Each boy forgot to bring a camera.'

A compositional puzzle

▶ Normally, 'EACH BOY X-ED' can be paraphrased as:

   ▶ 'John Xed,' and 'Tom Xed,' and 'Oscar Xed,' and so on.

▶ This is why you can't say 'EACH BOY GATHER.'

   ▶ *JOHN GATHER, etc.

▶ But consider (40).

   (40)   EACH INVITE-alt GIRL.
            'Each one invited a girl.'

▶ $\overset{?}{=}$ 'JOHN INVITE-alt GIRL' and 'TOM INVITE-alt GIRL,' etc.

▶ But each of these conjuncts is ungrammatical alone!

The temporal domain

A similar puzzle in the temporal domain:

(41) EVERY-DAY ONE BOOK JEAN GIVE-1-rep.
   a. 'Every day, Jean gave me one book.' *(preferred reading)*
   b. 'Every day, Jean gave me one book repeatedly.'

Spoken languages

▶ This is formally identical to the puzzle of dependent indefinites under distributive quantifiers.   (Balusu 2006, Henderson 2014)

Korean (Oh 2005):

(42) Haksayng twu-myeng-i kakkak sangca han-kay(-ssik)-lul   wunpanhayssta.
       student   two-CL-nom each   box   one-CL(-DIST)-acc carried
       'Two students each carried one box.'

Possible solutions

Two possible solutions.

Option 1:

▶ No built-in variation condition.

▶ Dependency marking is the expression of syntactic agreement with a higher operator that introduces pluractionality.

▶ This operator can be overt or covert.

(Oh 2001, 2005; Kimmelman 2015)

Scopable pluractionality

Option 2:

▶ The distributive quantifier introduces a plurality of events *from a global perspective*.

▶ The variation condition of /-alt/ is able to escape from the distributive scope of EACH to get access to this global plurality.

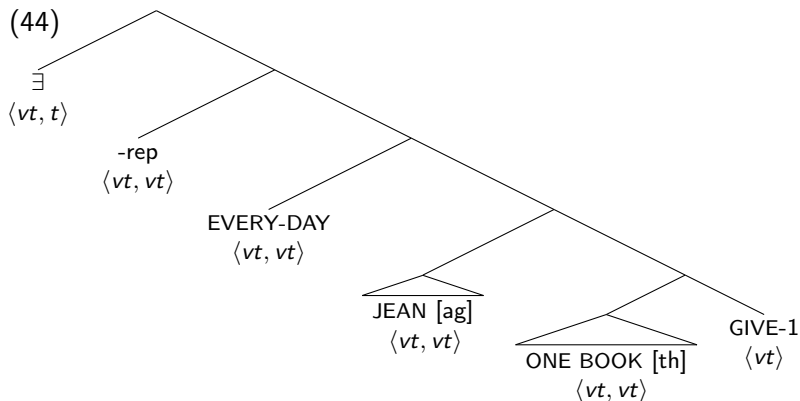▶ The effect is that the plurality condition is evaluated as though attached at a higher node.

Scopable pluractionality

(43)

Scopable pluractionality

(44)

∃
$\langle vt, t \rangle$

-rep
$\langle vt, vt \rangle$

EVERY-DAY
$\langle vt, vt \rangle$

JEAN [ag]
$\langle vt, vt \rangle$

ONE BOOK [th]
$\langle vt, vt \rangle$

GIVE-1
$\langle vt \rangle$
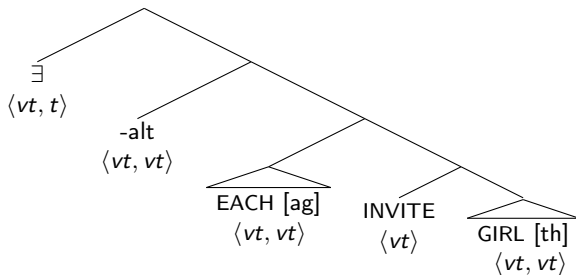
Pluractionality Summary

Interim summary:

▶ The pattern of pluractional verbs in LSF fits perfectly into a broader typology of pluractionality in spoken languages.

▶ We established a compositional puzzle, and sketched a solution.

▶ But wait, there's more...

Iconic preservation of rate

Additionally, an iconic mapping…
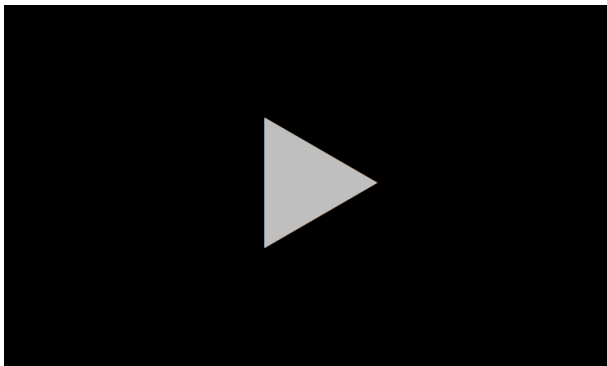
▶ **Claim:** rate of reduplication is **iconically mapped** to the rate of the event repetition.

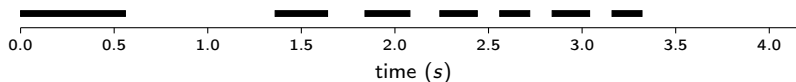(45)   a. GIVE-slow   b. GIVE-fast   c. GIVE-medium

a. Slow:
b. Fast:
c. Medium:
   time (s) 0.0   0.5   1.0   1.5   2.0   2.5   3.0   3.5   4.0
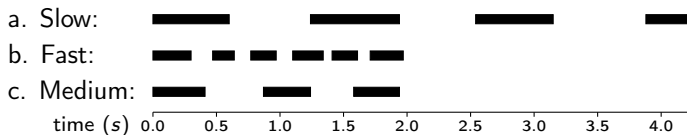
Verb-internal gradience

GIVE-rep (accelerating), GIVE-rep (decelerating)

Gradience and iconicity

▶ Of note, these mappings preserve gradient geometric information about the form of the sign.

a. Acceleration

b. Deceleration
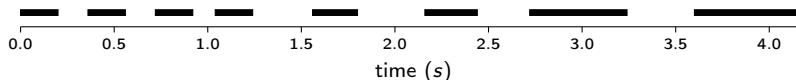
Iconicity: what's (not) preserved

▶ In fact, it's possible to preserve quite a lot of information:

  ▶ E.g. speeding up, reaching a plateau, then decelerating again

▶ BUT, notably **<u>not</u>** preserved: the exact number of repetitions.

  ▶ No inference for the "GIVE-rep (accel.)" example that the speaker gave something exactly eight times.

▶ General finding for sign language: "three means plural."

▶ General cognitive finding (Carey 2009): relative cardinality judgements is easier than absolute cardinality judgements.

Iconicity: proposal sketch

▶ **Proposal:** Repetition associated not with a discrete set of points, but with a continuous distribution of events over time.

▶ The verb is true of any sequence of events which matches the same contour.
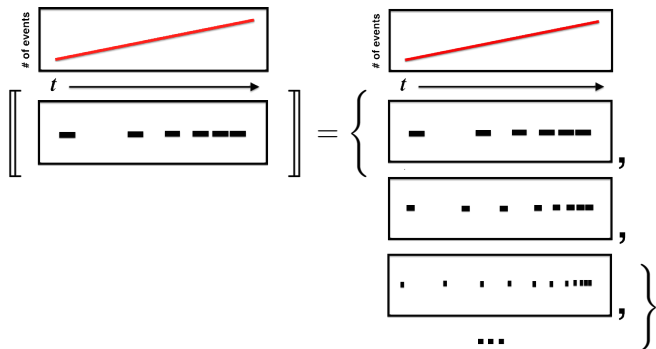
Iconicity in the grammar

▶ Now, notice that what we've just done is associate a verb with a set of plural events — in other words, we have a predicate type $\langle v, t \rangle$ that we can pop into a formal definition.

(46) $[\![\text{-alt}]\!] = \lambda V e[V(e) \land \exists e', e'' \preceq e[\theta(e') \neq \theta(e'')] \land \textbf{Icon}^{\Phi}(e)]$

'/-alt/ takes a verb denotation V and gives the set of V-ing events that have at least two subparts with different thematic arguments and that have the temporal distribution shown.'

(47) $[\![\text{-rep}]\!] = \lambda V e[V(e) \land \exists e', e'' \preceq e[\tau(e') \neq \tau(e'')] \land \textbf{Icon}^{\Phi}(e)]$

'/-rep/ takes a verb denotation V and gives the set of V-ing events that have at least two subparts with different runtimes and that have the temporal distribution shown.'
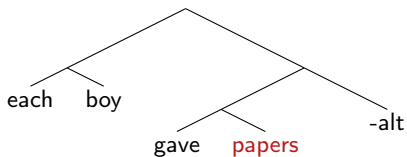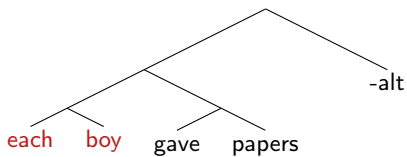
Proposal sketch

Two components of our proposal:

1. A combinatorial morpheme with iconic component:

(48) $\llbracket$-alt$\rrbracket =$
$\lambda Ve. \underbrace{V(e) \wedge \exists e', e' < e[\theta(e') \neq \theta(e'')]}_{\text{Logical component}} \wedge \underbrace{\mathbf{Icon}^{\Phi}(e)}_{\text{Iconic component}}$
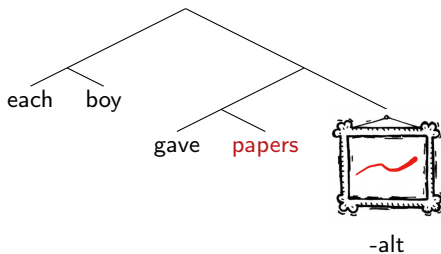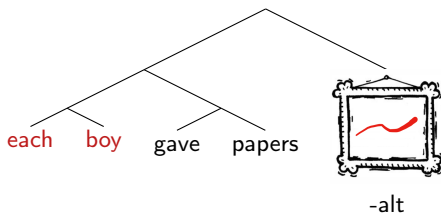
2. Composition that allows /-rep/ and /-alt/ to take scope.
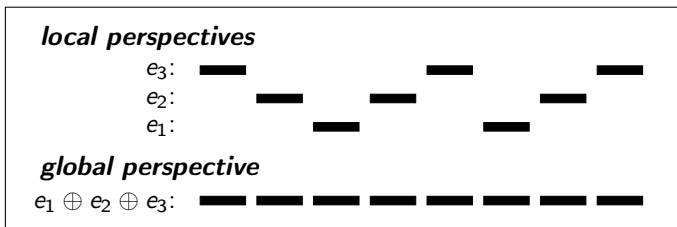
Prediction: 'Scopable iconicity'

Scopable iconicity

Scopable iconicity

Scopable iconicity

▶ Consider the case of the overworked secretary:

▶ A set of slow event sequences may sum up to a plural event that occurs rapidly.

▶ **Prediction:** The perspective of the iconic component depends on where the pluractional inflection takes scope.

Scopable iconicity and EACH

▶ Systematically, when EACH is the licensor, the iconic component must be interpreted from a global perspective.

(49)   a.   BOY EACH-a BOOK a-GIVE-1-alt-slow.
            'Each boy gave me books, which happened slowly from a global perspective.'

       b.   BOY EACH-a BOOK a-GIVE-1-alt-fast.
            'Each boy gave me books, which happened quickly from a global perspective.'

▶ **Conclusion:** the pluractional marker takes high scope with respect to EACH.

Scopable iconicity
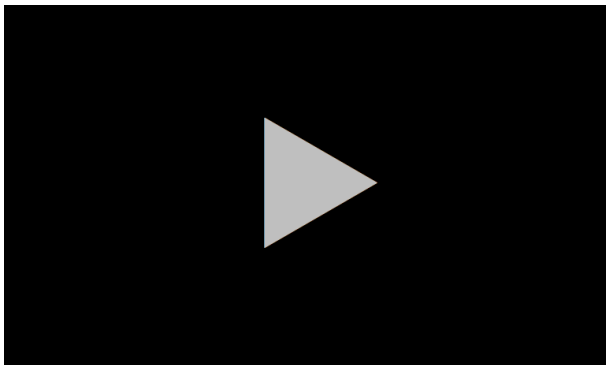
(50) JEREMY OBJECTS VARIOUS a-GAVE-1-alt-decelerating.
      NEXT MIRKO VARIOUS OBJECTS b-GAVE-1-alt-decelerating.
      SEVERAL c-GAVE-1-alt-decelerating.
      EACH-abc abc-GAVE-1-alt-accelerating MORE FULL-UP ALONE.

Summary: verbal pluractionality

▶ Here, we focused on two reduplicative verbal forms in LSF.

▶ First, we showed that the meanings fit in with more general patterns of cross-linguistic pluractionality.

  ▶ Distribution over time vs. distribution over participants

▶ Then, we argued that the sign language patterns additionally display iconic effects.

  ▶ Critically: in comparative forms, gradient interpretation.

▶ We proposed a single compositional system, and discussed implications for a recent compositional debate.

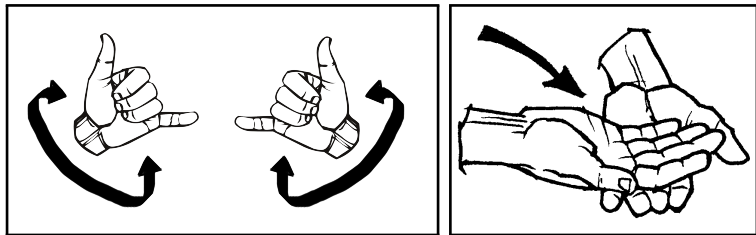Section 5

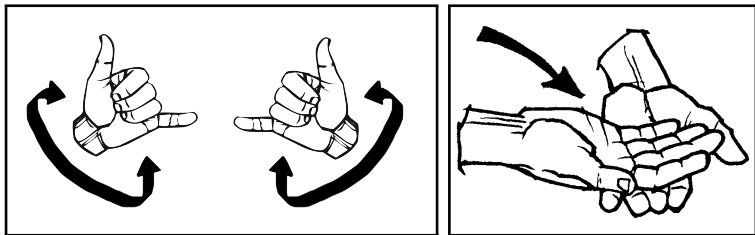# Telicity and iconic scales

Let's play a game!

Match the sign with its meaning!

a. decide
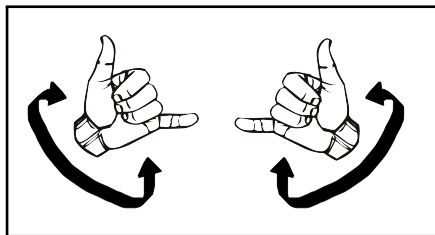
b. ponder

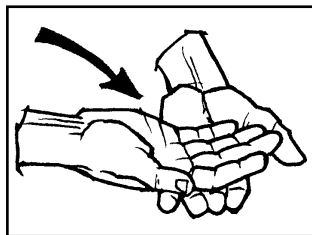I have a confession to make...

I have a confession to make...

play   arrive

▶ Something in common?

<div align="center">

play   arrive

vs.

ponder   decide

</div>

▶ Something in common?

    play   arrive
                        vs.
    ponder   decide

▶ Yes! Telicity!
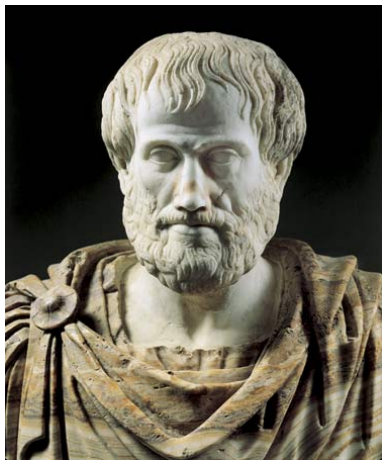
(this guy)

"In all things which have a plurality of parts, and which are not a total aggregate but a whole of some sort distinct from the parts, there is some *telos* [cause]."

"It is clear that there is some difference between ends: some ends are *energeia* [energy], while others are products which are additional to the *energeia*."

-Aristotle

Two types of verbs

▶ Telic events : have a point of culmination

- ▶ 'John ate an apple **in** 30 seconds.'
- ▶ 'John painted a picture **in** five minutes.'
- ▶ 'John came to a decision **in** 30 minutes.'
- ▶ 'John arrived at the party **in** two minutes.'

▶ Atelic events : happen over time with no culmination

- ▶ 'John slept **for** eight hours'
- ▶ 'John waited **for** five minutes'
- ▶ 'John pondered the question **for** 30 minutes'
- ▶ 'John played with his friends **for** two hours'

Telicity

▶ A predicate P is **divisible** iff every temporal sub-event of P is also an event of which P holds.

▶ Atelic verbs are divisible.

  ▶ Example: If there is an event in which Max slept from 10pm to 6am, then the period from 2am-3am is also an event in which Max slept.

▶ Telic verbs are not divisible.

  ▶ Example: If there is an event in which Max painted a picture from 10pm to 6am, then the period from 2am-3am is *not* an event where Max painted a picture.

▶ (See also Champollion 2010 on 'Stratified Reference.')

Visible telicity in sign language!

▶ **Ronnie Wilbur (2003, 2008, 2009):**
  Many sign languages systematically distinguish telicity in the
  phonological movement of a verb.

  ▶ Telic verbs stop sharply, often with contact.
  ▶ Atelic verbs have a continuous, extendable movement.

▶ More examples:

  (51) **Atelic:** WALK, DISCUSS, WAIT, EXPLAIN
  (52) **Telic:** CLOSE, TURN-OFF, DIE, HIT, SIT-DOWN

Visible telicity, even for naive non-signers

▶ **Strickland, Geraci, Chemla, Schlenker, Kelepir, & Pfau 2015:** Even naive non-signers are sensitive to this connection (like y'all were).

▶ Participants with no experience with a sign language:
  ▶ Viewed a video of individual signs, asked to guess meaning
  ▶ Presented with two possible answer choices
  ▶ E.g. participants see ASL FORGET, they might see the English 'forget' (telic) and 'negotiate' (atelic) as choices

Strickland et al. 2015:

Non-signers' inference of telic meanings in telic vs. atelic signs
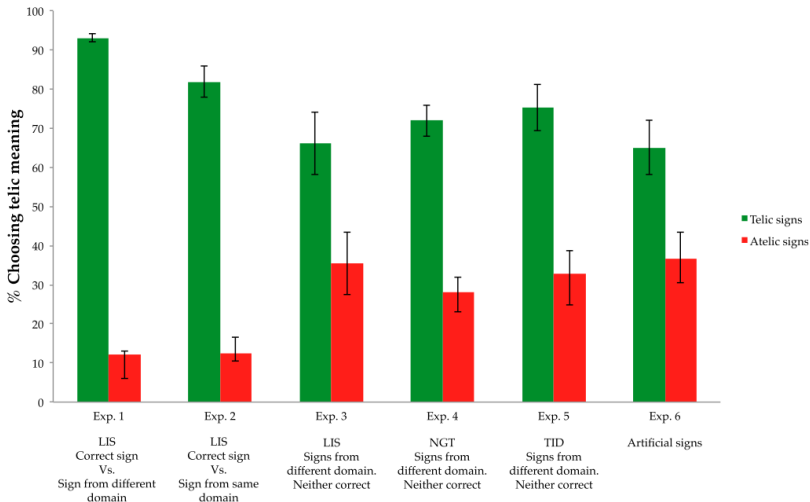
Strickland et al. 2015:

▶ The authors conclude that the study "is highly suggestive that signers and nonsigners share universally accessible notions of telicity as well as universally accessible 'mapping biases' between telicity and visual form."

Phonetic manipulations

▶ **Observation:** In ASL, Wilbur shows that the phonetic form of a verb may be manipulated with semantic effect.

▶ **Slow action**

    ▶ DIE signed slowly ≈ 'slowly die.'

▶ **Incomplete action**

    ▶ SIT-DOWN ends with contact between the signer's two hands; SIT-DOWN without contact ≈ 'almost sit down.'

Phonetic manipulations
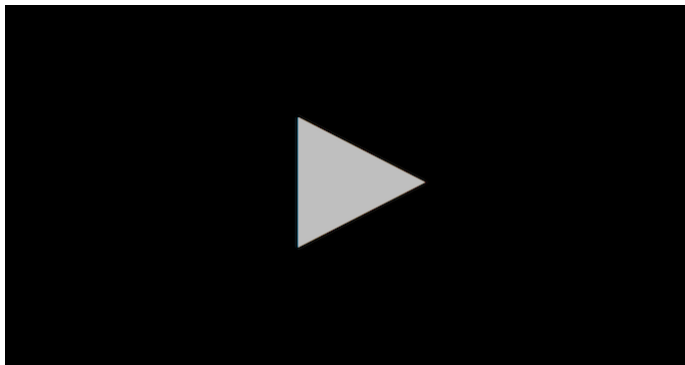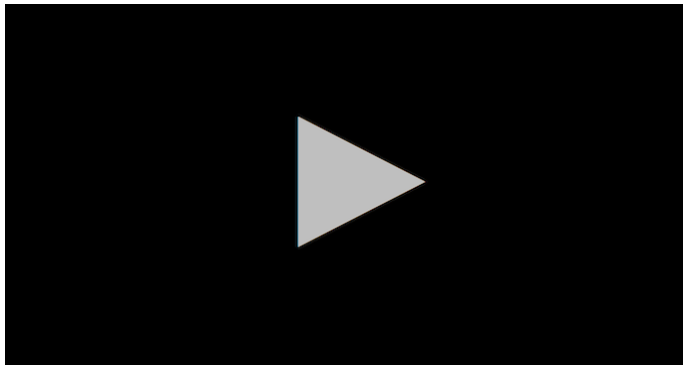

(53) LAST-YEAR MY GRANDMOTHER DIE-{normal/slow}.
      'Last year, my grandmother {died/died slowly}.'

Phonetic manipulations

(54) a. I SIT.
          'I sat down.'
      b. I SIT-incomplete FIGHT.
          'I was sitting down when a fight broke out.'

The iconic mapping

▶ How is this iconic mapping encoded in the grammar?

An answer from scales

- **Kennedy and McNally 2005:**
  Gradable adjectives are associated with **scales**.

- Possible scale structures:

totally open	top closed	bottom closed	totally closed
tall, wide	*straight, dry*	*bent, wet*	*full, closed*
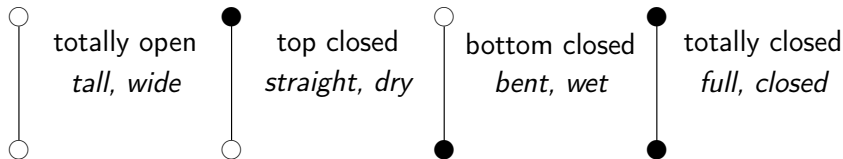
- Natural language is sensitive to these distinctions.
  - slightly wet   vs.   *slightly {tall, dry}
  - completely straight   vs.   *completely {wide, bent}

Verbal scales

▶ **Kennedy and Levin 2008:**
Verbs are sensitive to the same categories as adjectives.

  ▶ Clearest in morphologically-related adjective/verb pairs like
    wide/widen, *straight/straighten*, *open/open*.

▶ **Differences with respect to telicity!**

(55) Verbs based on closed scales have variable telicity.
    a. The towel dried for an hour.
    b. The towel dried in an hour.

(56) Verbs based on open scales are atelic.
    a. The gap between the boats widened for a few minutes.
    b. ?? The gap between the boats widened in a few minutes.

Scalar semantics

▶ Both adjectives and verbs are built from the same scales.

▶ For example:

(57)   wide   = $\mathbf{pos}_A(\text{width})$
                    =   True of an individual x iff the width of x is
                         greater than some standard.

(58)   widen   = $\mathbf{pos}_V(\text{width}_\Delta)$
                     =   True of an individual x and and event e iff
                          the change in width of x over e is greater
                          than some standard (namely, 0).
                     =   True iff x increases in width over e.
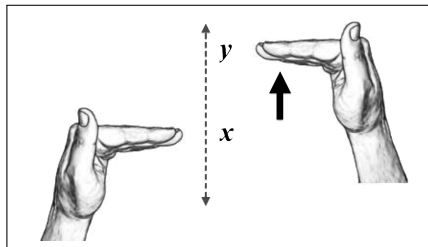
Scales in sign language

► Aristodemo and Geraci 2015 argue that scales are iconically represented for adjectives in Italian Sign Language (LIS).

► For some adjectives, a comparative form can be constructed by signing the adjective at two different positions along a path.

(59) MARIA TALL-x GIANNI TALL-scale-more-y.
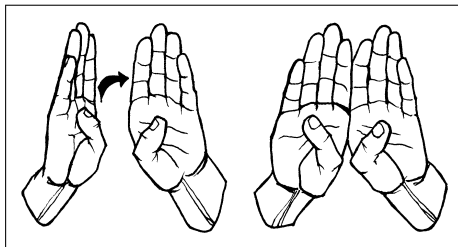   'Gianni is taller than Maria.'   **(LIS)**

Verbal scales in sign language

- ▶ **A solution:** The scales iconically represented in adjectives are also iconically represented in change-of-state verbs in ASL.

- ▶ End-marking on telic verbs is the iconic representation of the maximum of a closed scale.

CLOSE in ASL

Verbal scales in sign language

▶ *Specifically:* for each point in the production of a verb and corresponding time in the occurrence of an event:

   (a) the distance traversed from the beginning of the phonetic motion is proportional to the change along a scale from the initiation of the event.

▶ And,

   (b) When a phonetic form reaches a maximal distance (perhaps due to body contact), the event reaches a maximal degree.

For a phonetic form Φ and a measure function m, $\mathbf{Icon}_\Phi(m)$ maps an individual x and an event e to true when these conditions are met.

Proposal sketch

- ▶ Earlier, we decomposed a verb as $\mathbf{pos}_V(m_\Delta)$.

- ▶ Now, we decompose the verb into $\mathbf{pos}_V(m_\Delta) \wedge \mathbf{Icon}^\Phi(m)$.

- ▶ $\mathbf{pos}_V(m_\Delta) \wedge \mathbf{Icon}^\Phi(m) =$
  'There is increase in m, and the change in m adheres to certain structural conditions that are iconically demonstrated.'

- ▶ For verbs with end-marking:
  'There is increase in m, and the change in m reaches a maximum degree.'

- ▶ *Result:* the iconic predicate induces a telic meaning.

Visibility and iconicity

▶ **Visibility** and **iconicity**.

▶ Based on spoken language, we postulated that telic verbs have a morphological decomposition based on a scale.

   ▶ In sign language, this scale is **visibly** overt.

▶ Further, this visible scale is sensitive to a structure-preserving mapping that is accessible even to non-signers.

   ▶ Thus, the construction is also **iconic**.

Iconicity in the grammar

Note: iconicity must be able to interact with logical meaning throughout the composition of a sentence.

▶ An iconic *function* takes a logical argument.

▶ Cannot be reduced to conjunction of an iconic predicate at sentential level:

    ▶ **Possible:**
    DIE-slow = "He died and it happened like this: slowly".

    ▶ **Not possible:**
    DIE-incomplete
              = "He died and it happened like this: incompletely".

▶ The predicate **Icon$^\Phi$** must be integrated to the same degree as the adjective *almost*, as in the English, '*she almost died.*'

Section 6

Role Shift and Quotation

Quotation as a means to introduce iconicity

▶ In spoken language, direct quotation is intuitively a way of *demonstrating* what happened.

    (60)   John said to pay attention.

    (61)   John said, 'Pay attention!'
           $\rightarrow$ these are the exact words that he said.

▶ Sentence-embedding verbs like 'said' entail a speech act, but other constructions embed more general demonstrations.

    (62)   John was all 'Ahh! I hate spiders!'

    (63)   My cat was like 'Feed me!'

    (64)   He was like [gobbling gesture].   (Davidson 2015)

Use vs. mention

▶ **Use** of a word vs. **mention** of a word:

    (65)   **Use:** John ate succotash.

    (66)   **Mention:** John said the word 'succotash'.

▶ Some cases seem to be simultaneously *use* and *mention*:

    (67)   Trump doesn't want a 'loser' to be president.

    (68)   Warren says electing Trump would be a 'really really really' big mistake for the American people.

    ▶ Mention, in that this must be the exact words that were said.
    ▶ Use, in that it retains the syntax and semantic type of original.

Use or mention?
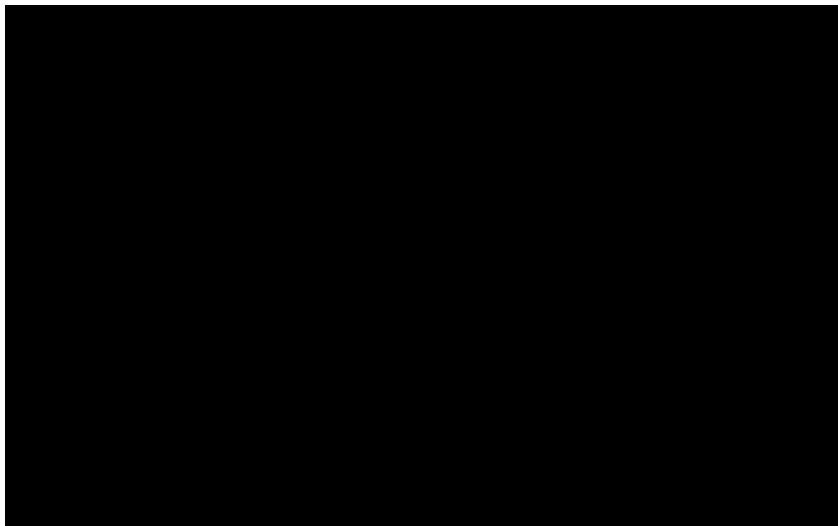
Use or mention?

(69) I hear the words 'that's final' come out of your mouth ever again, they truly will be ___.

Role shift

- ▶ In sign language, **role shift** is a perspective- taking construction, marked by shifting the body.

- ▶ **Attitude role shift:**
  - ▶ Very much like quotation in spoken language.
  - ▶ Entails the existence of a speech act.

  (70)   JOHN IX-a $\overline{\text{IX-1 LIKE ICECREAM}}^{\text{RS-a}}$.
         'John said, 'I like icecream.''

- ▶ **Action role shift:**
  - ▶ No speech act entailed.

  (71)   MARY-a $\overline{\text{1-WATCH-b}}^{\text{RS-a}}$.
         Mary was watching it (like this).

Role-shift preserves iconic information

▶ ASL, no Role Shift:

(72) IX-b HAMMER.
'He was hammering'
#*Response:* No, he was hammering upwards

▶ ASL, Action role shift:

(73) IX-b $\overline{\text{HAMMER}}^{\text{RS-b}}$
'He was like hammering [like this]'
Response: No, he was hammering upwards

Role-shift preserves iconic information

(74) $\dfrac{\overline{}^{\text{:-)}}}{\text{IX-a 1-WALK-WITH-ENERGY(CL-ONE).}}^{\text{RS-a}}$
      'He walked with energy.'

Even if smile starts before RS, the presence of RS means that it must be interpreted as the *agent* being happy.

Analysis sketch

▶ Under role shift, words are both *use* and *mention*.

  ▶ Syntax must be obeyed, but the *manner* of utterance is also interpreted.

▶ Role shift, like classifiers, introduces an iconic argument; this iconic argument captures the 'mention' qualities of the utterence.

▶ Davidson (2015) (following Supalla 1982): Can role shift be viewed a classifier of the whole body?

  ▶ Here, 'preserving internal structure' will entail that facial expressions, etc. will be retained.

Section 7

General Conclusion

Summary

Sign languages have allowed us to attack formal questions.

► How to analyze redundant distributivity marking?

   ► An iconic component allowed us to read structural position off the truth conditions.

► What is relation between verbal and adjectival forms?

   ► Evidence of underlying abstract scales for some verbs.

They also allow us to ask new questions:

► How does iconicity interface with the grammar?

Conclusion

Throughout this class...

▶ The patterns from spoken language appear in sign language.

▶ Evidence for modality-general combinatorial systems.

Sign language expands the perspective.

▶ When phonological challenges are resolved, what does simultaneous syntax look like?

▶ We should take iconicity seriously.

Many questions still open!

Thank you!

Thank you to Mirko Santoro, John Lamberton, Thomas Levêque, Laurène Loctin, to Carlo Geraci and Philippe Schlenker.

Thank you to the Linguistics Society of Korea.

Iconicity beyond sign language

(75) That was a loooong meeting.

(76) John coughed and coughed (and coughed).

(77) NBC: "Watch robots fall over again and again and again."

▶ (In fact, 17 times over the course of one minute.)

http://www.nbcnews.com/watch/nbc-news/watch-robots-fall-over-again-
and-again-and-again-460526659963

Iconicity beyond sign language

▶ Iconicity in a downward entailing environment? (h/t Chris Barker)

Kobe Bryant ✔
@kobebryant

Follow

When u give Give GIVE and they take Take TAKE at wat point do u draw a line in the sand? #hurtbeyondmeasure #gavemenowarning #love?

10:58 AM - 4 May 2013

↩ ⇄ 11,168 ★ 5,795