

# Plurality and dependency: the view from sign language

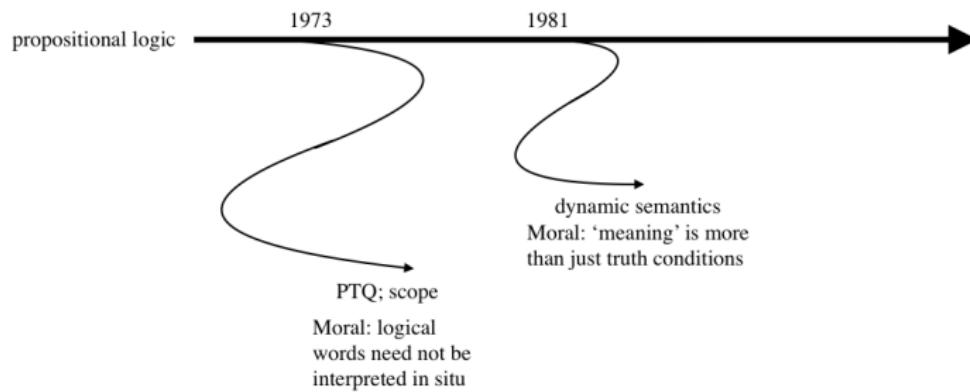
Jeremy Kuhn  
Institut Jean Nicod (CNRS, EHESS, ENS)

NYU Semantics Group  
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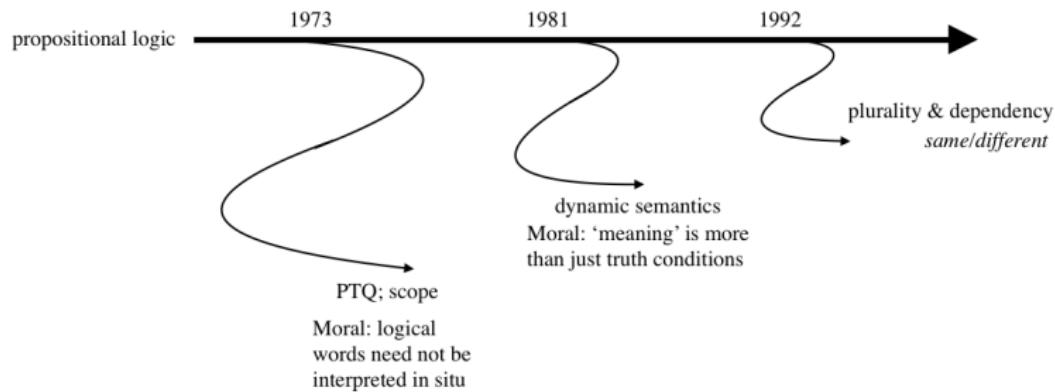
## Section 1

**Overview: plurality and dependency**

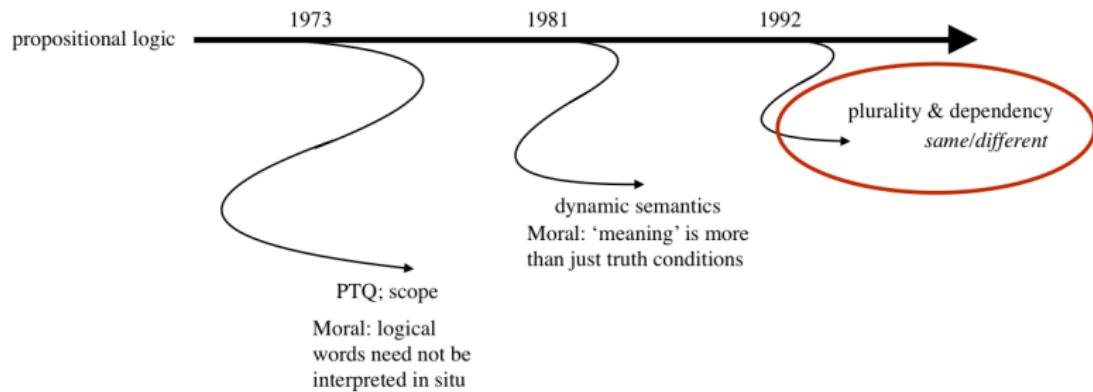
# Semantics: what tools are needed?



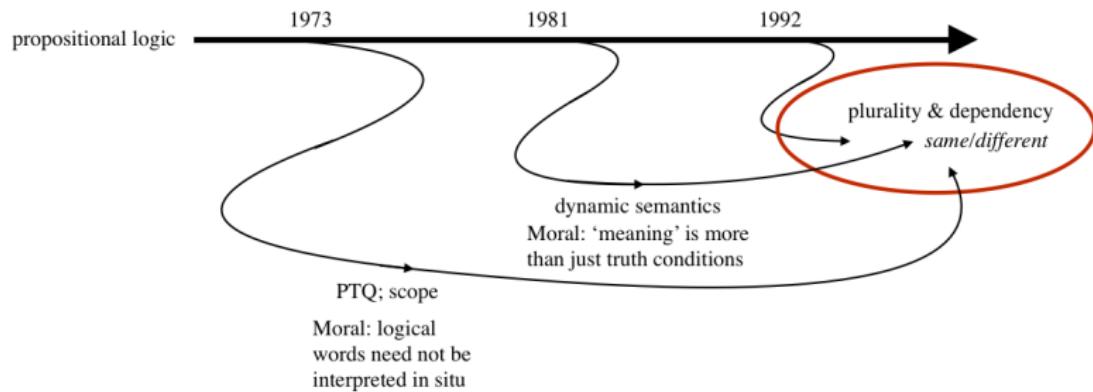
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# Today: plurality and dependency

- ▶ **Part 1:** verbal pluractionality in French Sign Language
- ▶ **Part 2:** nominal plurality in American Sign Language

# Different kinds of plurality in natural language

- (1) I saw zebras.
- (2) The boys read one book each.
- (3) John coughed again and again.
- (4) All the dogs licked the same cat.

# Plurality and dependency

(4) All the dogs licked the same cat.

- ▶ ‘external reading’: compares another individual in context.  
 (“My pet rabbit licked a cat...”)
- ▶ ‘internal reading’: compares dogs to *each other*.

▶ The internal reading of *same* is **licensed** by the presence of a plural elsewhere in the sentence.

(5) \* Fido licked the same cat.  
*(on internal reading)*

# Cross-linguistic, cross-categorial dependency

- ▶ The internal reading of *same* is an instance of a much larger pattern of **dependency** cross-linguistically.
- ▶ **Nouns:** inflection on a DP may indicate that a plurality of individuals are distributed across another plurality.

## (6) Kaqchikel Mayan (Henderson 2014)

- a. Xeqatij ox-ox      wäy.  
we-eat three-three tortilla  
'We each ate three tortillas.'
- b. \* Xe'inchäp ox-ox      wäy.  
I-handle three-three tortilla  
*Desired reading:* 'I took (groups of) three tortillas.'

# Cross-linguistic, cross-categorial dependency

- ▶ **Verbs:** inflection on a verb may indicate that a plurality of events is distributed in some way.

(7) **Chechen** (Wood 2007 via Cabredo Hofherr & Laca 2012)

- a. Bombanash lilxira.  
bomb.PL explode.PLR.WP  
'The bombs exploded.'
- b. # Bomba lilxira.  
bomb.SG explode.PLR.WP  
'The bomb exploded again and again.'

- ▶ Distribution across participants is licensed by a plurality elsewhere in the sentence.

# Theoretical question

*Theoretical question:*

- ▶ What's the relation between a dependent form and its licensor?

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*Theoretical question:*

- ▶ What's the relation between a dependent form and its licensor?

*My answer:* two essential components...

1. Wide scope of the dependent form to access a higher plurality.
2. A mechanism to keep track of functional associations.

(8) the same book  $\lambda x$  [Every girl read  $x$ ]



g1 b1

g2 b2

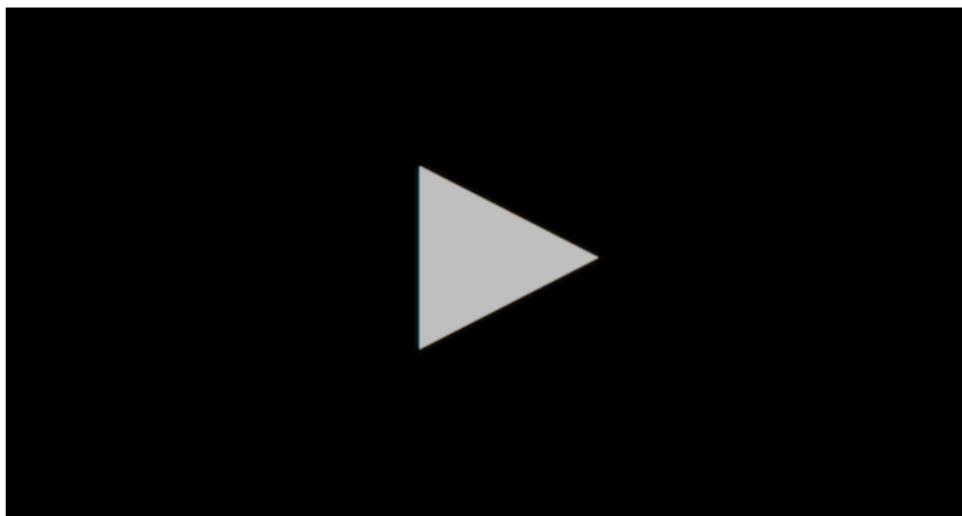
g3 b3

# Plurality in sign language!

- ▶ Sign languages (ASL, LSF, ...) make a very intuitive, morphological natural class out of these constructions.
  - ▶ Semantic objects corresponding to verbal plurality (i.e. multiple events) involve a repeated motion.
  - ▶ Semantic objects corresponding with nominal plurality are arranged in space in the horizontal plane.
- ▶ The use of space and iconicity in sign language shed new light on our theoretical question.

# Verbal plurality

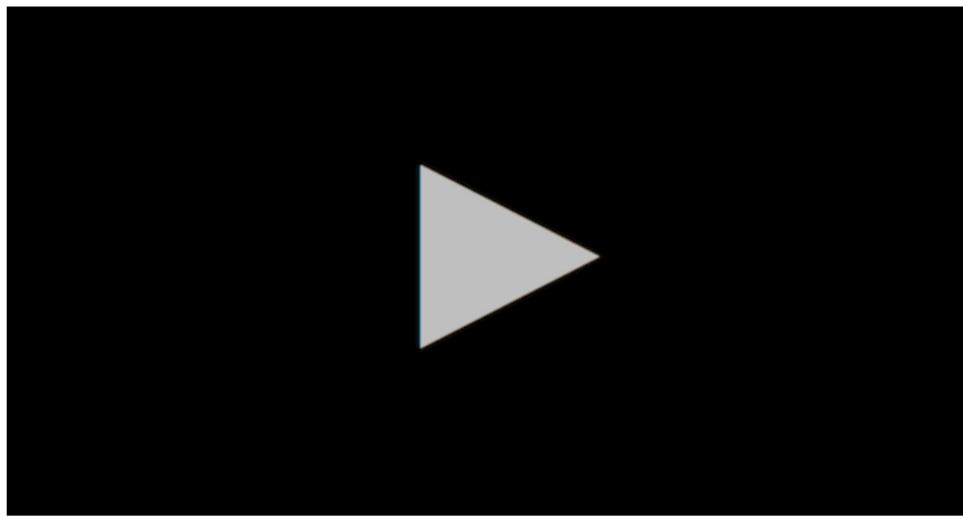
- ▶ Example 1 (French Sign Language):



- (9) FRIEND IX-arc ARRIVE-alt.  
'My friends each arrived.'

# Nominal plurality

- ▶ Example 2 (American Sign Language):



- (10) BOY IX-arc READ ONE-arc BOOK.  
'The boys read one book each.'

## Section 2

### Verbal 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

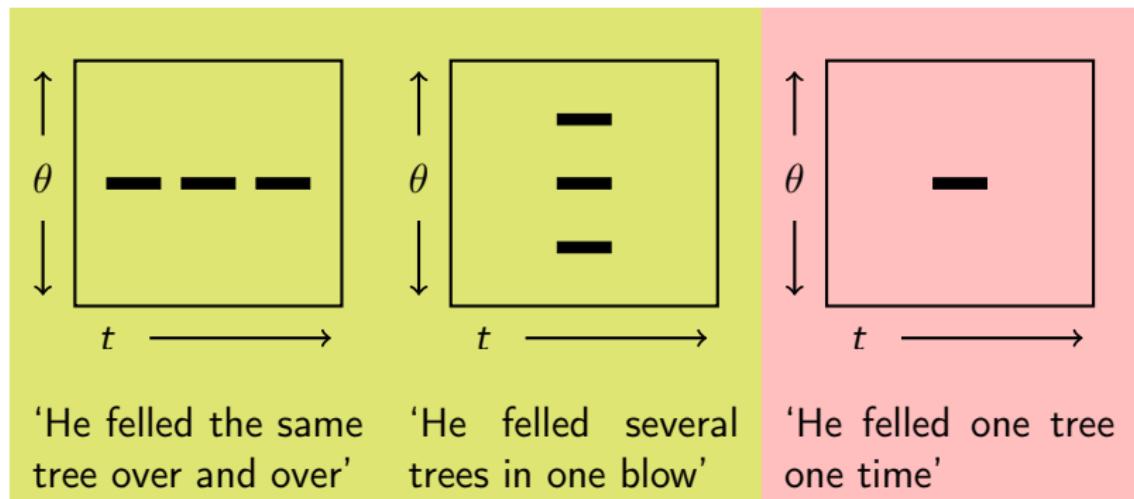
# Pluractionality along many dimensions

- ▶ Upriver Halkomelem (Thompson 2009):

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

- ▶ True if ...
  - a. He chopped down the same (magic) tree over and over.
  - b. They chopped down the trees.
- ▶ False if ...
  - c. He chopped down the tree (once).

# Pluractionality along many dimensions



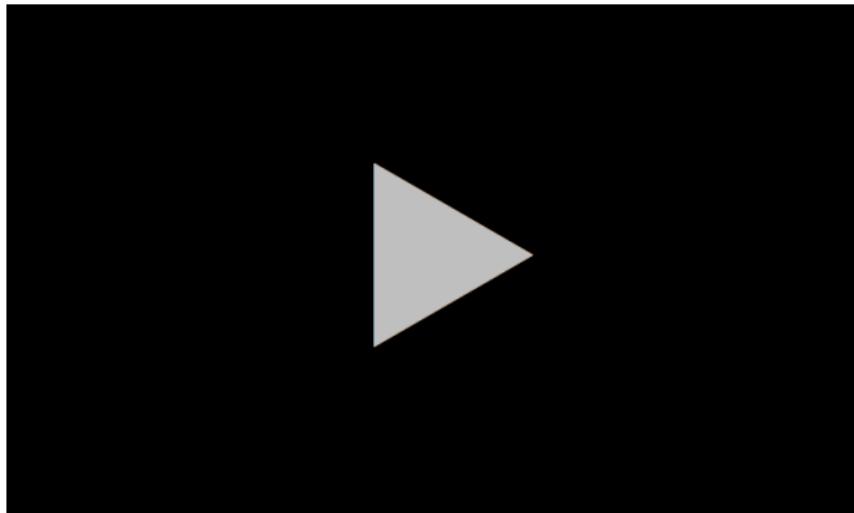
- ▶ Pluractional means: “you have more than one line.”

# 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

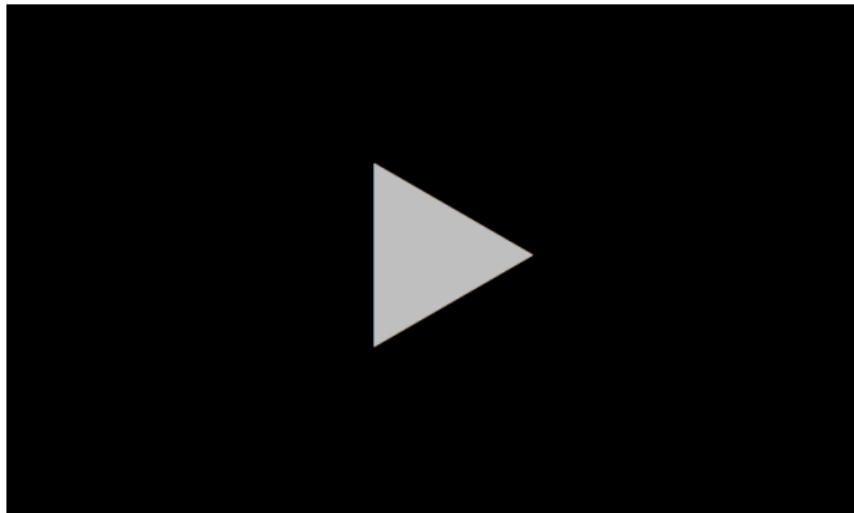
# Pluractionality in French Sign Language

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.

# Distribution over different dimensions

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

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

- (12)     ONE PERSON FORGET-alt SEVERAL WORDS.  
‘One person forgot each of several words.’

- (13)    \* ONE PERSON FORGET-alt ONE WORD.

*/-rep/* entails distribution over time.

- (14)     ONE PERSON FORGET-rep ONE WORD.  
‘One person repeatedly forgot one word.’

# /-rep/ vs. /-alt/

- a. distribution over only time
- b. distribution over only participants
- c. distribution over participants and time

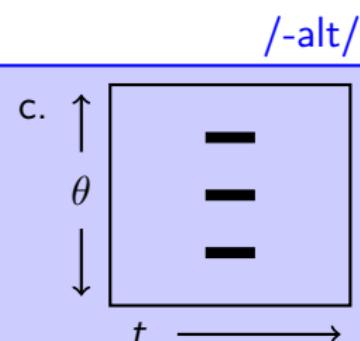
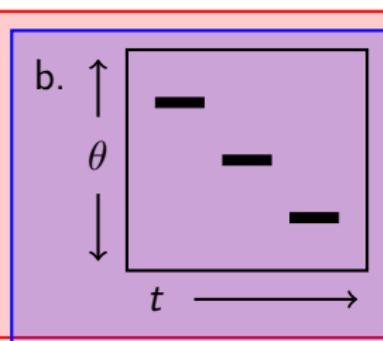
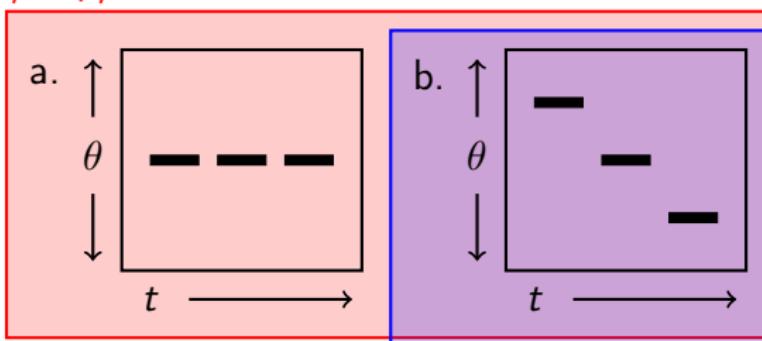
/-rep/    /-alt/

✓                \*

✓                ✓

\*                ✓

*/-rep/*



*/-alt/*

# Formal definitions

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

$$(15) \quad [-\text{alt}] = \lambda V e [V(e) \wedge \exists e', e'' \preceq e [\theta(e') \neq \theta(e'')]]$$

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

$$(16) \quad [-\text{rep}] = \lambda V e [V(e) \wedge \exists e', e'' \preceq e [\tau(e') \neq \tau(e'')]]$$

'/-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:  $\langle \text{ag}(e), \text{th}(e), \dots \rangle$ ;  $\tau$  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.

- (17) a. \* EACH BOY GATHER.  
'Each boy gathered.'
- b. BOY EACH FORGET-alt BRING CAMERA.  
'Each boy forgot to bring a camera.'

# The temporal domain

A similar puzzle in the temporal domain:

- (18) 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.'

# 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)

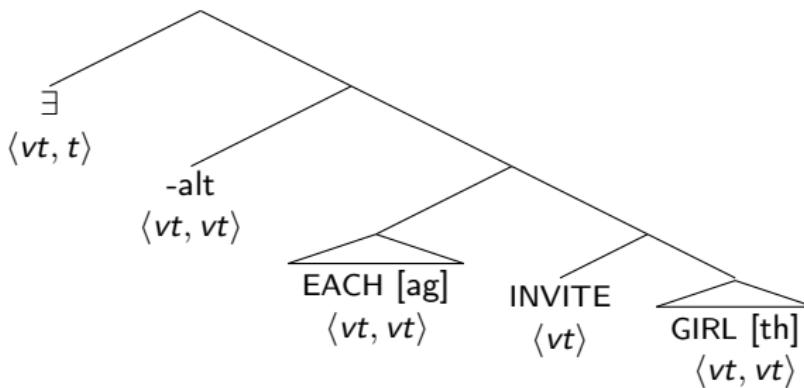
# Scopable pluractionality

## Option 2:

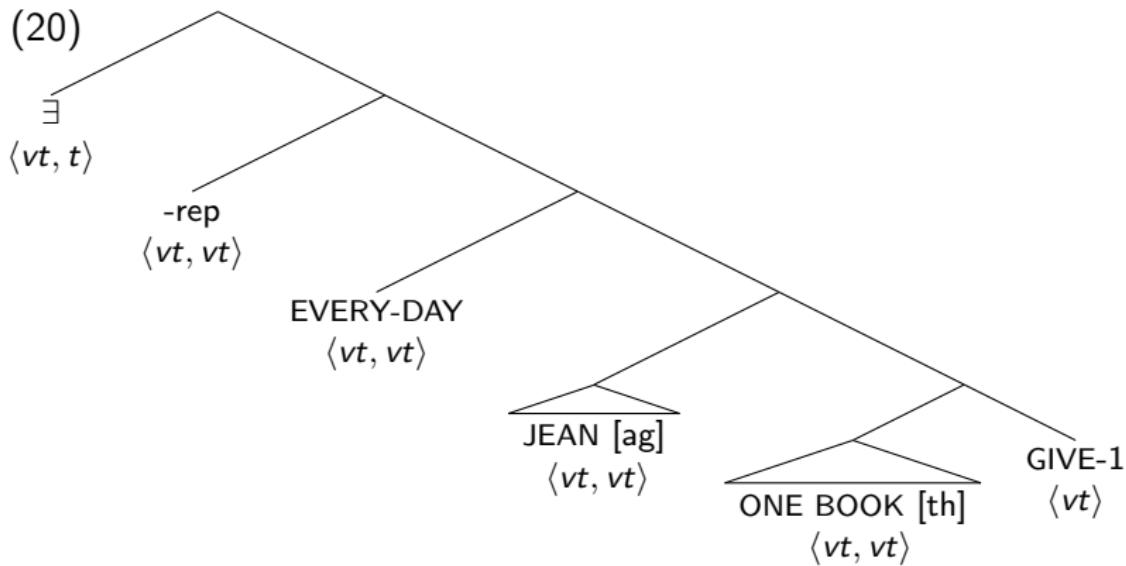
- ▶ The distributive quantifier introduces a plurality of events *from a global perspective*.
- ▶ The variation condition of /-alt/ is able to escape from the distributive scope of EACH to get access to this global plurality.
- ▶ The effect is that the plurality condition is evaluated as though attached at a higher node.

# Scopable pluractionality

(19)



# Scopable pluractionality



# Pluractionality Summary

Interim summary:

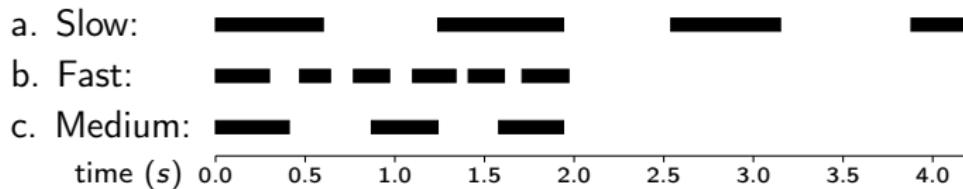
- ▶ The pattern of pluractional verbs in LSF fits perfectly into a broader typology of pluractionality in spoken languages.
- ▶ We established a compositional puzzle, and sketched a solution. (But the jury's still out.)
  
- ▶ But wait, there's more...

# Iconic preservation of rate

Additionally, an iconic mapping...

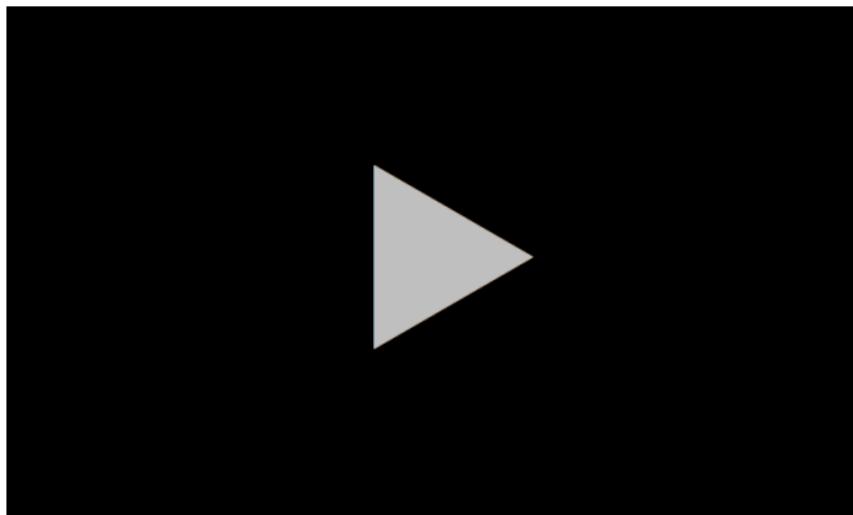
- ▶ **Claim:** rate of reduplication is iconically mapped to the rate of the event repetition.

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



# Verb-internal gradience

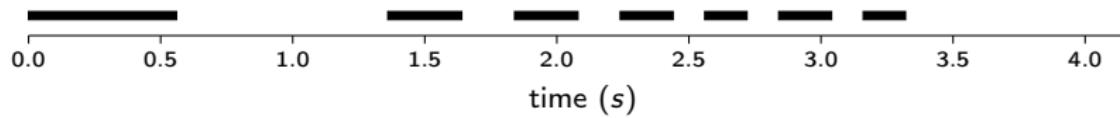
GIVE-rep (accelerating), GIVE-rep (decelerating)



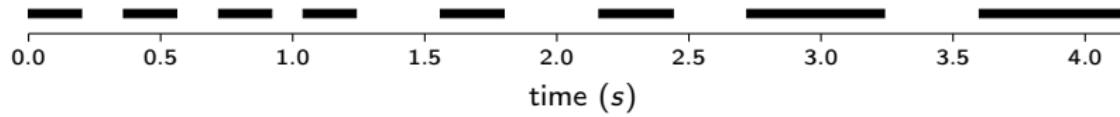
# Gradience and iconicity

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

## a. Acceleration

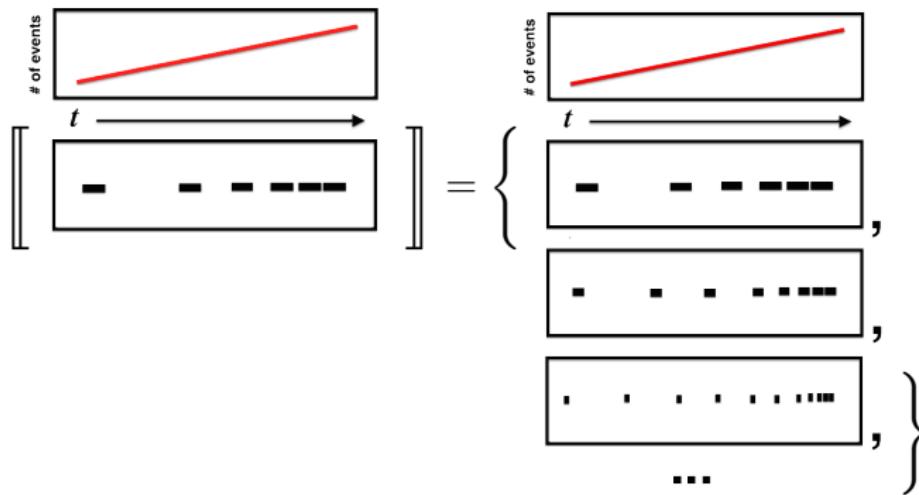


## b. Deceleration



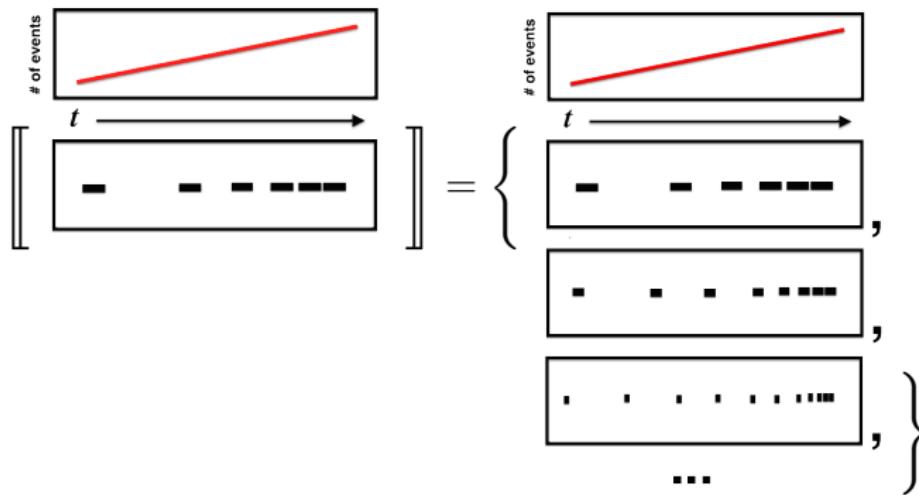
# Iconicity: proposal sketch

- ▶ **Proposal:** An iconic form can be associated with any sequence of events that matches the contour of the phonetic form.



# Iconicity: proposal sketch

- ▶ **Proposal:** An iconic form can be associated with any sequence of events that matches the contour of the phonetic form.



- ▶ Observe: this is just a predicate of type  $\langle v, t \rangle$

# Proposal sketch

Two components of our proposal:

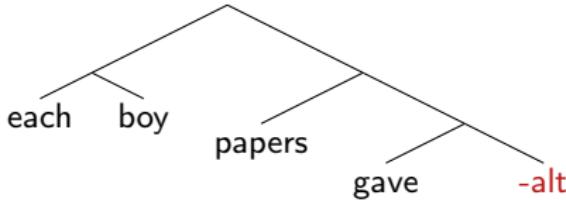
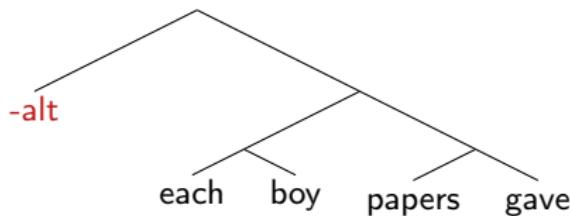
1. A combinatorial morpheme with iconic component:

$$(22) \quad [-\text{alt}] = \lambda V e. \underbrace{V(e) \wedge \exists e', e' \preceq e [\theta(e') \neq \theta(e'')]}_{\text{Logical component}} \wedge \underbrace{\text{Icon}^\Phi(e)}_{\text{Iconic component}}$$

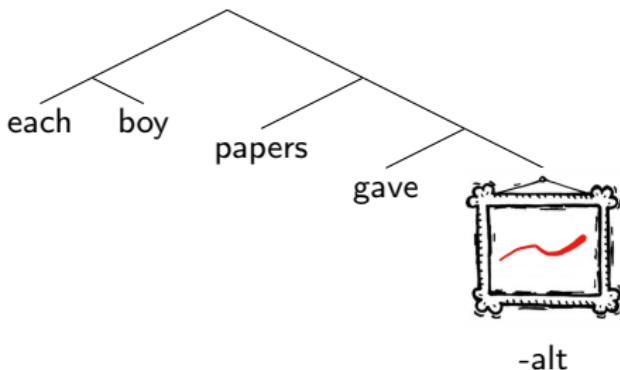
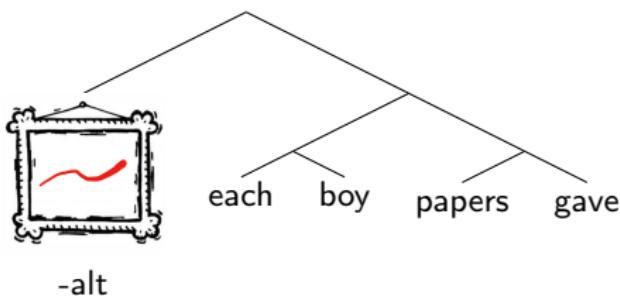
2. Composition that allows /-rep/ and /-alt/ to take scope.

**Prediction:** 'Scopable iconicity'

# Scopable iconicity



# Scopable iconicity



# Scopable iconicity

- ▶ Scopable iconicity in the temporal domain.

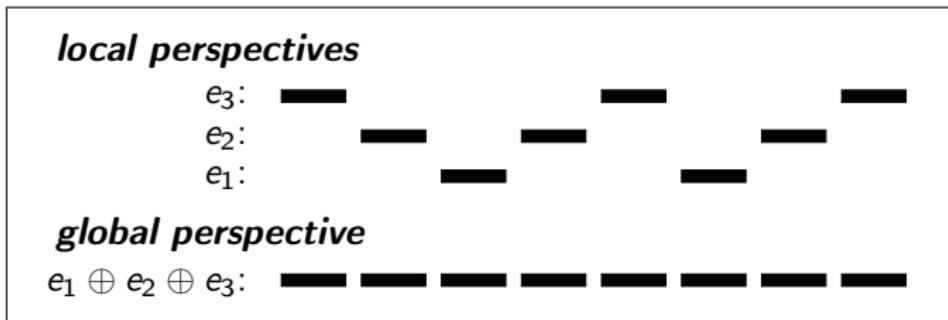
- (23) PERSON JEAN BOOK EVERY-DAY GIVE-1-rep-fast.
- a. 'On each day, Jean gave me books repeatedly and fast.'
  - b. 'On each day, Jean gave me a book; that is a fast rate to give books.'

# Scopable iconicity under EACH

- ▶ Recall our earlier debate: low scope or high scope under EACH?
- ▶ Scopable iconicity allows us to read the structural position off the truth conditions.

# 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.
- (24) 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.

## Summary: verbs

- ▶ Two reduplicative verbal forms in LSF.
- ▶ First, we showed that the meanings fit in with more general patterns of cross-linguistic pluractionality.
- ▶ Then, we argued that the sign language patterns additionally display iconic effects.
- ▶ This iconic component provided leverage into a compositional puzzle.

## Section 3

### Nominal plurality

# Plurality in the nominal domain

- ▶ Recall: nouns, too, may display patterns of dependency:

- (25) The boys read one book each.
- (26) All the boys read the same book.
- (27) Every boy read a different book.

# Dependent indefinites

- ▶ In many languages, a DP may be inflected to indicate that it depends on another plurality in the sentence or in context.
- ▶ These are called **dependent indefinites**. (Farkas 1997)

(28) Telugu (Balusu 2006)

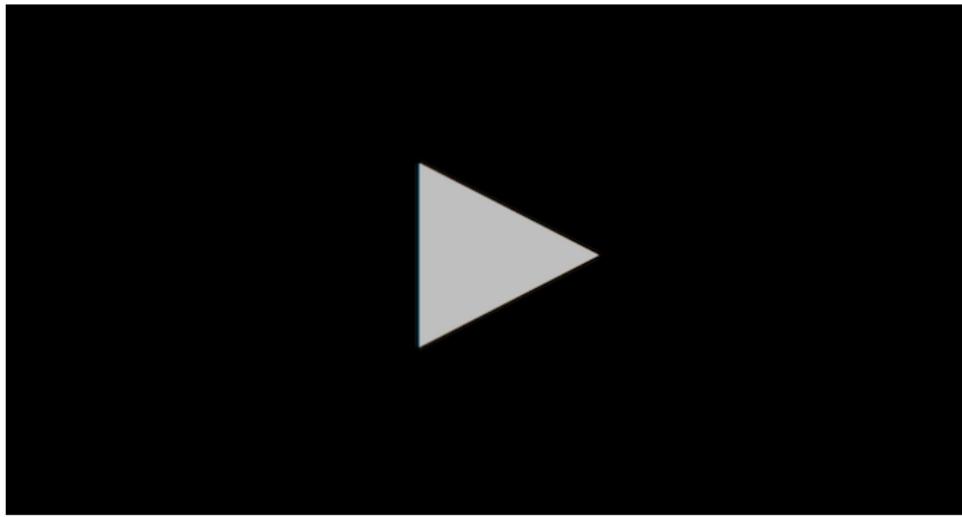
pill-a-lu renDu-renDu kootu-lu-ni cuus-ee-ru.  
kids two-two monkey-Pl-Acc see-Past-3PPL  
'(The) kids saw two monkeys each.'

- ▶ *Distributive meaning*: two monkeys per kid

# Dependent indefinites in ASL

- ▶ In ASL, too, dependent indefinites can be generated by moving a numeral (ONE, TWO, ..., NINE) across an area of space.
- ▶ As for dependent indefinites in Telugu and other languages, this generates a distributive meaning.

# Dependent indefinites in ASL



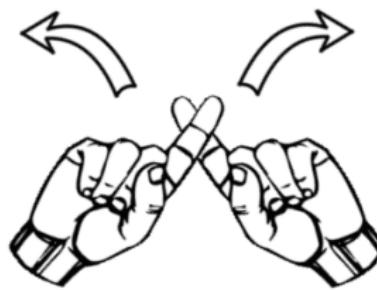
- (29) a. ALL BOY LIFT ONE TABLE.      ✓coll.      ✓dist.  
b. ALL BOY LIFT ONE-arc TABLE.      \* coll.      ✓dist.  
    'All the boys lifted a table.'

# SAME and DIFFERENT

- In ASL, the adjectives SAME and DIFFERENT show exactly the same pattern.



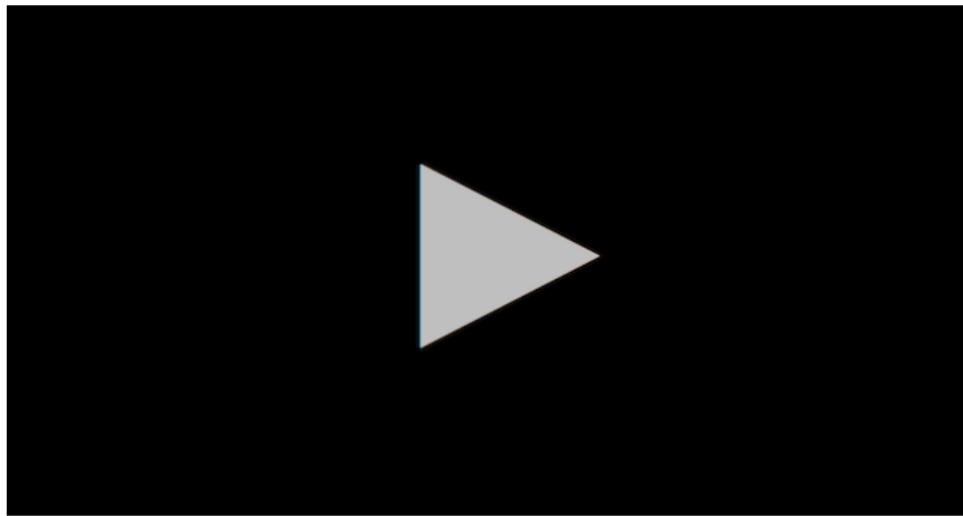
SAME



DIFFERENT

# SAME and DIFFERENT

- ▶ SAME/DIFFERENT may show the same spatial inflection.



- (30) BOY IX-arc-a READ {ONE/SAME/DIFFERENT}-arc-a BOOK.  
'The boys read {one book each/the same book/different books}.'

# A meaning of dependency

- ▶ For SAME/DIFFERENT, too, a meaning of dependency:

English:

- (31) All the boys read the same book.      ✓external      ✓internal  
(32) All the boys read different books.      ✓external      ✓internal

ASL:

- (33) BOY IX-arc-a READ SAME-arc-a book.    \*external      ✓internal  
(34) BOY IX-arc-a READ DIFF-arc-a book.    \*external      ✓internal

# A licensing puzzle

- ▶ A key property: **licensing**
- ▶ In many languages, dependent indefinites are...
  - ▶ ...licensed by plurals,
  - ▶ ...licensed by distributive operators,
  - ▶ ...ungrammatical when all arguments are singular.

# Licensing examples

(35) **Kaqchikel Mayan** (Henderson 2014)

- a. Xeqatij ox-ox      wäy.  
we-eat three-three tortilla  
'We each ate three tortillas.'
- b. Chikijujunal ri tijoxela' xkiq'etej ju-jun tz'i'.  
each                the students hugged one-one dog  
'Each of the students hugged a dog.'
- c. \* Xe'inchäp ox-ox      wäy.  
I-handle three-three tortilla  
*Desired reading:* 'I took (groups of) three tortillas.'

# Licensing examples

(36) Telugu (on the 'participant key' reading) (Balusu 2006)

- a. Pilla-lu renDu-renDu kootuluni cuuseeru  
kid-Pl two-two monkeys saw  
'(The) kids saw two monkeys each.'
- b. Prati pillavaaDu renDu-renDu kootuluni cuuseeDu  
Every kid two-two monkeys saw  
'Every kid saw two monkeys (each).'
- c. \* Raamu renDu-renDu kootuluni cuuseeDu  
Ram two-two monkeys saw  
'Ram saw two monkeys each.'

# Licensing examples

## (37) Albanian (Rushiti 2015)

- a. Fëmijët kanë parë nga pesë mace.  
children-the have seen DIST five cats  
'The children have seen five cats each'
- b. Në çdo dhomë kishte nga dy fotografi.  
in every room there-were DIST two photos  
'There were two (different) photos in each room'
- c. \* Në dhomë kishte nga dy fotografi.  
in room there-were DIST two photos  
*Desired reading:*  
'There were two (different) photos in the room.'

# Licensing examples

(38) English *same* (on internal reading):

- a. The students gave the same answer.
- b. Each student gave the same answer.
- c. \* Edith gave the same answer.

# Connections

- ▶ Sound familiar?

# Licensing examples

- ▶ American Sign Language fits in perfectly:

## (39) ASL

- a. BOYS IX-arc-a READ ONE-arc-a BOOK.  
‘The boys read one book each.’
- b. EACH-EACH-a PROFESSOR NOMINATE ONE-arc-a  
STUDENT.  
‘Each professor nominated one student.’
- c. \* JOHN-a READ ONE-arc-a BOOK.  
*Desired reading:* ‘John read one book.’

# Again, a compositional puzzle

Exactly the same compositional puzzle as before:

- ▶ How are dependent constructions licensed under operators that distribute down to atomic individuals?

Previously I argued:

- ▶ Dependent forms are licensed by scoping high.

Something more needed:

- ▶ Not just a plurality of individuals.
- ▶ Additionally, an assertion about these individuals:
  - ▶ Two books per boy.
- ▶ Need to keep track of the boy-book association.

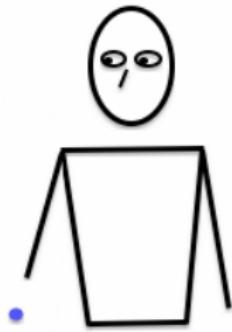
# A compositional puzzle

The new question:

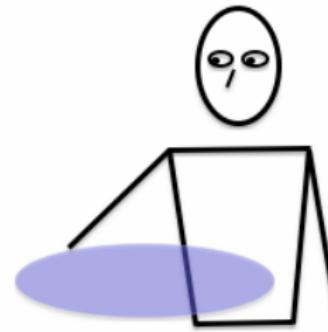
- ▶ What is the semantic architecture that allows us to keep track of dependencies introduced by distributive quantifiers?
- ▶ The use of space in ASL will suggest an answer.

# The use of space in ASL

- ▶ Singular individuals indexed at points in space.  
(Lillo-Martin and Klima 1990, *i.a.*)
- ▶ Plurals are indexed over areas of space.



singular locus



plural locus

# Dependent indefinites in space

## A spatial representation of dependency:

- ▶ Dependent indefinites are obligatorily signed over the same area of space as their licensor.

- (40)    **EACH-a** PROFESSOR SAID **ONE-arc-a** STUDENT WILL  
RECEIVE B.  
'Each professor said that one student will receive a B.'
- (41) ?? **EACH-a** PROFESSOR SAID **ONE-arc-b** STUDENT WILL  
RECEIVE B.  
'Each professor said that one student *from each contextually salient group* will receive a B.'

# Removing ambiguity in ASL

- ▶ Because the arc-motion agrees with the licensor, we can specify **what the indefinite is dependent on**.
- ▶ Consider a sentence with two potential licensors.

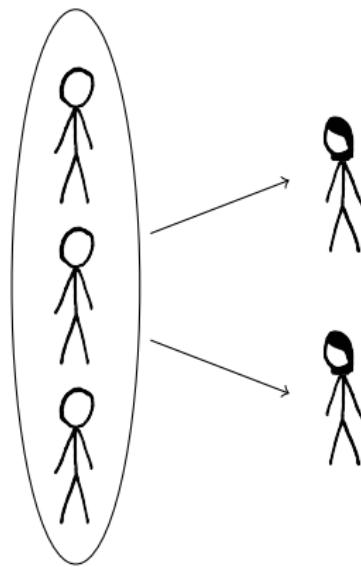
(42) **Hungarian** (p.c. Dániel Széredi; four speakers)

A fiúk két-két könyvet adtak a lányoknak.  
The boys two-two book give.3Pl the girls  
'The boys gave the girls two books each.'

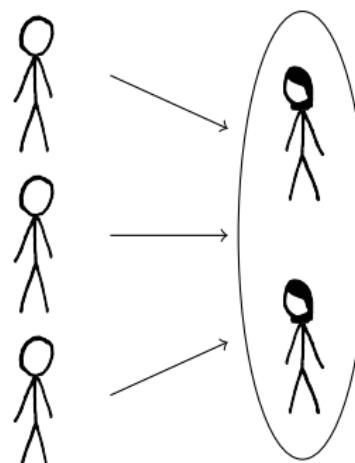
- ▶ Judgement: 'two-two' can depend on either boys or girls.

# Ambiguity with multiple licensors

Distribution across the girls.

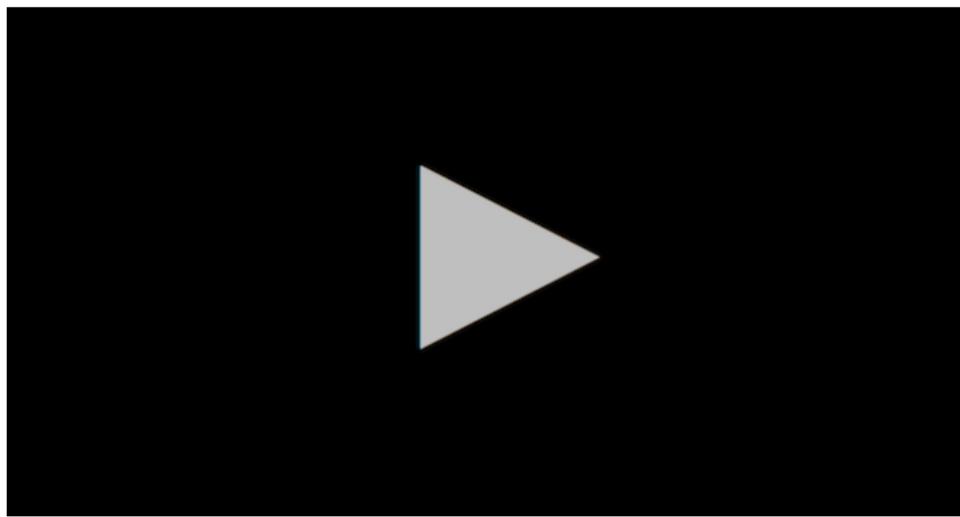


Distribution across the boys.



# No ambiguity in ASL

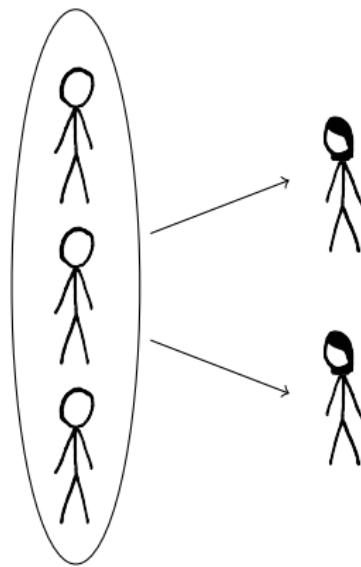
- ▶ With the use of space, ASL can disambiguate!



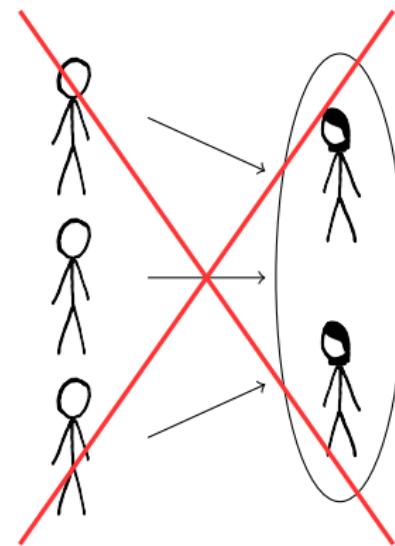
- (43) ALL-a BOY-a GAVE ALL-b GIRL-b ONE-arc-b BOOK.  
'All the boys gave all the girls one book *per girl*.'

# No ambiguity in ASL

Distribution across the girls.



\*Distribution across the boys.



# Towards a solution

- ▶ We can use these facts to get a handle on the compositional questions.
- ▶ To do so, a historical detour regarding the connection between sign language and discourse reference.

# Two waves of dynamic semantics

- ### ► A puzzle:

(44) A boy entered the room. He started to sing.

## Dynamic semantics

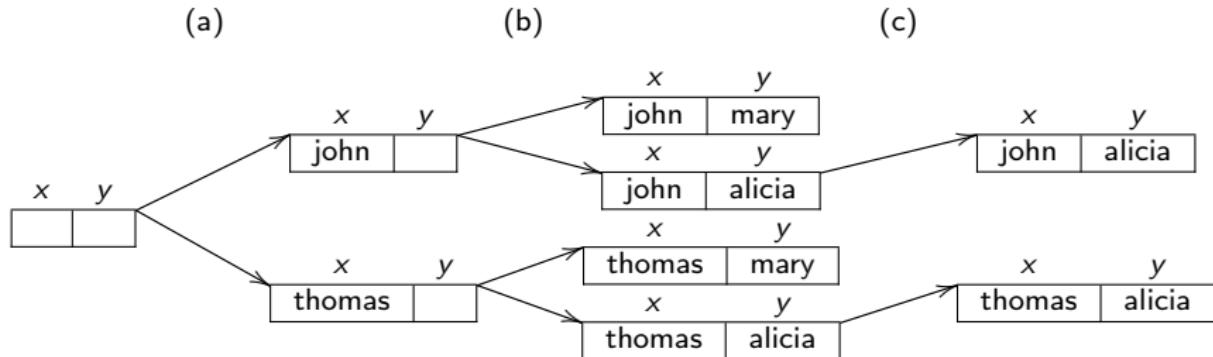
- #### ► Wave 1: Dynamic semantics of singular discourse referents

(Kamp 1981, Heim 1982)

- ▶ Discourse keeps track of a list of referents (i.e. antecedents).
  - ▶ Pronouns select ('point to') individuals from this list.

# Standard dynamic semantics, an example

- (45) (a)  $A_x$  boy entered. (b)  $A_y$  girl exited. (c) She<sub>y</sub> was angry.



# Two waves of dynamic semantics

**Sign language contribution** (Lillo-Martin and Klima 1990)

- ▶ In sign language, discourse referents are localized in space!
- ▶ Pronouns literally point back to their antecedents.

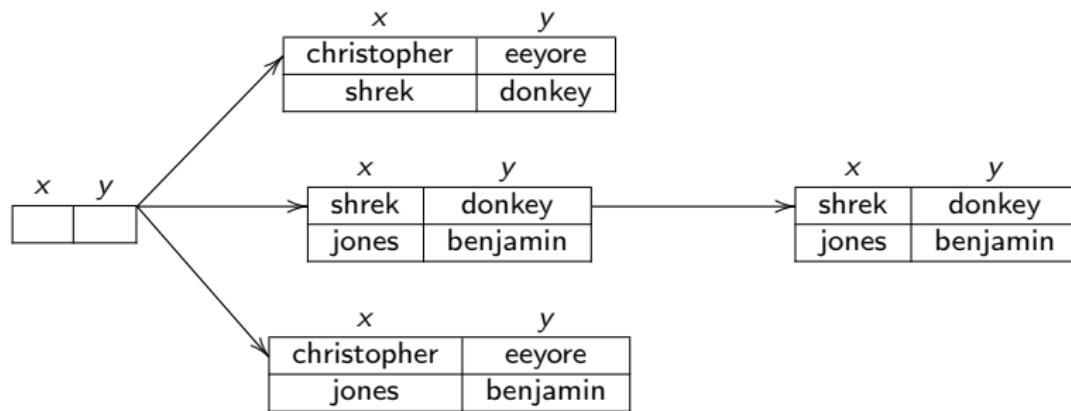


# Two waves of dynamic semantics

- ▶ Wave 2: Dynamic semantics of plurals/dependency  
(van den Berg 1996, Nouwen 2003, Brasoveanu 2008)
- ▶ Certain constructions introduce **functional referents**.
  - (46) The boys read one book each.
  - (47) All the boys read the same book.
  - (48) Every boy read a different book.
- ▶ Here, the function associates each boy with the book he read.
  - ▶ E.g., (47) is true if this function is a constant function.

# Wave 2 dynamic semantics, an example

- (49) Two<sub>x</sub> farmers each own a<sub>y</sub> donkey.  
 Neither of them<sub>x</sub> treat it<sub>y</sub> very well.

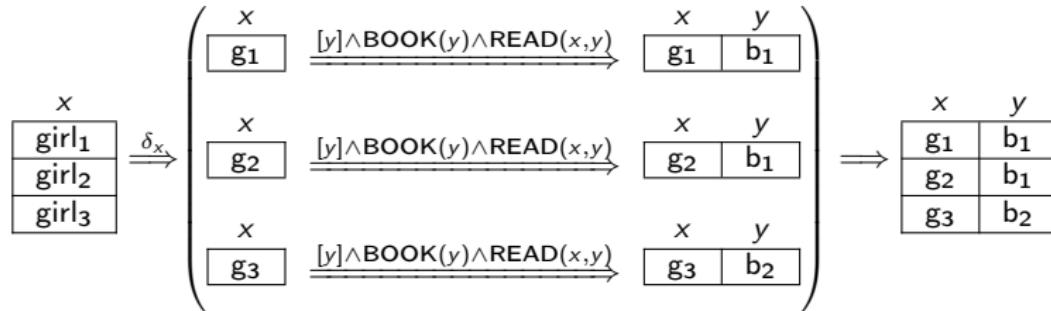


# The distributive operator

- ▶ The distributive operator  $\delta_x(\varphi)$  divides up a table with respect to the values of  $x$ , evaluates  $\varphi$  on each of these substates in parallel, then gathers up the resulting states.

(50) Three girls ...

- ... each read a book.
- $\delta_x([y] \wedge \text{BOOK}(y) \wedge \text{READ}(y, x))$



# Two waves of dynamic semantics

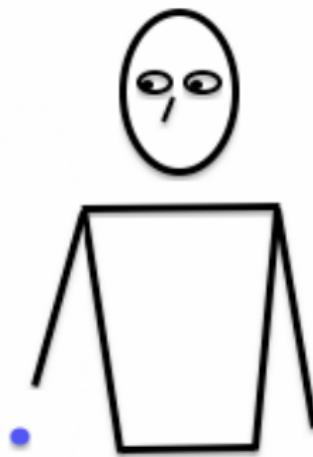
## Sign language contribution (Kuhn 2015)

- ▶ Functional reference, too, is represented visibly in space.

# Visible functions

## Singulars

X



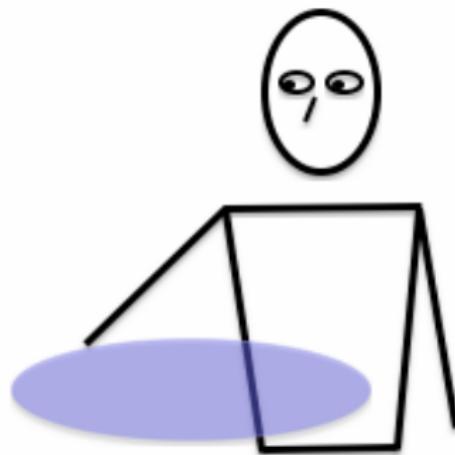
# Visible functions

Singulars

$x$

Plurals

$S : \{x\}$



# Visible functions

Singulare

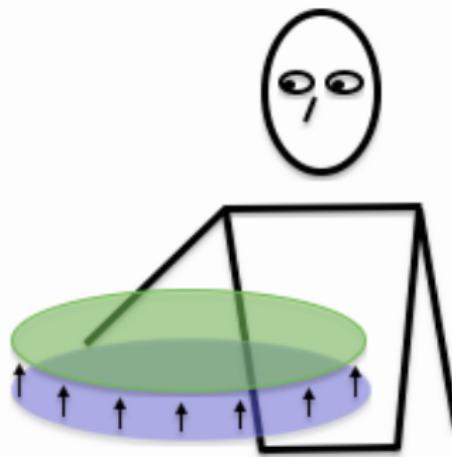
$x$

Plurals

$S : \{x\}$

Functions

$f : S \rightarrow T$



# Visible functions in sign language

- ▶ This is exactly what we see in ASL.

(51) ALL-a BOY READ ONE-arc-a BOOK.

'All the boys read one book *each*.'

(52) ALL-a BOY READ SAME-arc-a BOOK.

'All the boys read the same book *as each other*.'

(53) ALL-a BOY READ DIFFERENT-arc-a BOOK.

'All the boys read different books *from each other*.'

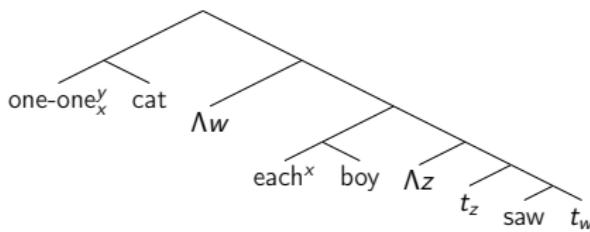
- ▶ Not just agreement; rather, 'mathematical iconicity.'

# The proposal in a nutshell

- ▶ Dependent indefinites and *same/different* check that a functional relation with certain properties has been introduced into the discourse.
- ▶ By taking scope in a dynamic system, they can control *when* this plurality condition is evaluated.

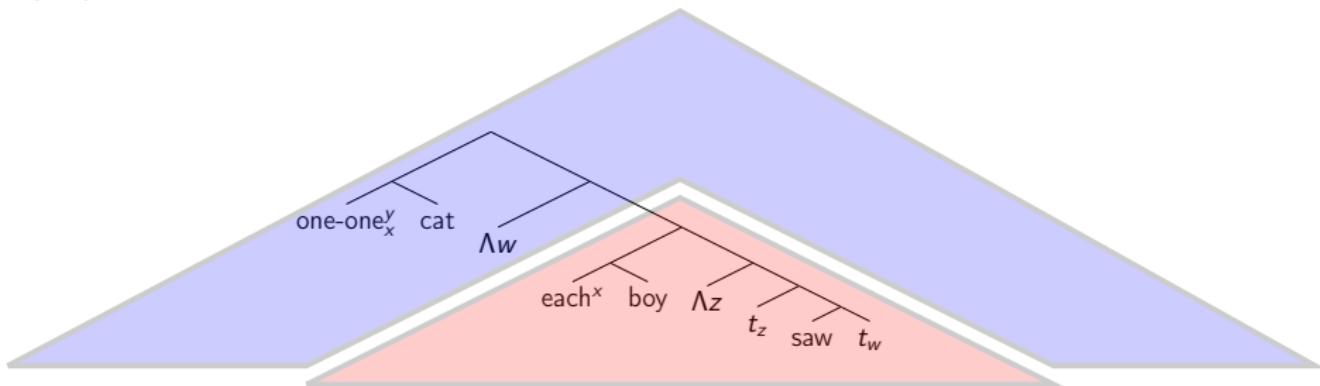
# Licensing by each

- (61) Each<sup>x</sup> boy saw one-one<sup>y</sup><sub>x</sub> cat.



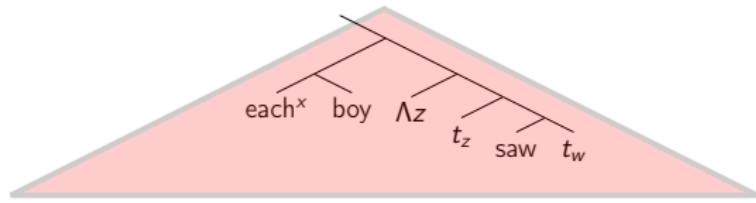
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# Licensing by each

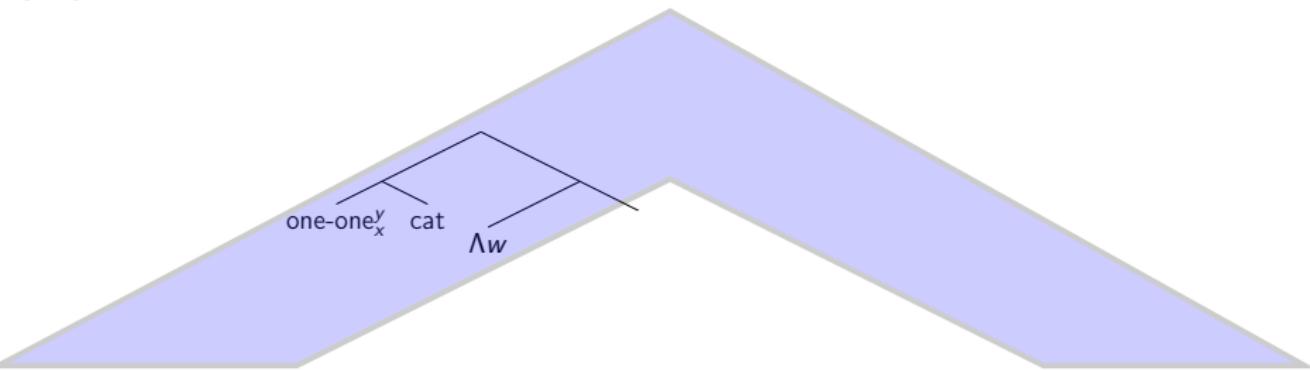
- (61) Each<sup>x</sup> boy saw one-one<sup>y</sup><sub>x</sub> cat.



introduce boys ( $x$ ) into the context and then  
for each boy  $x$ , check that  $x$  saw  $y$

## Licensing by each

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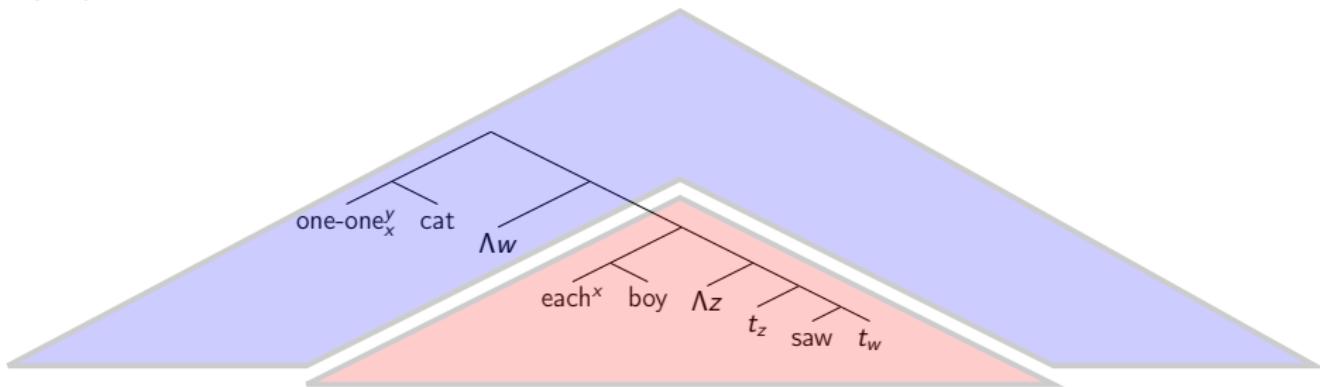


introduce cats ( $y$ ) into the context and then

check that the cats vary with  $x$  and that there is one cat per  $x$ .

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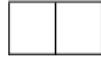


introduce cats ( $y$ ) into the context and then  
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 for each boy  $x$ , check that  $x$  saw  $y$  and then  
 check that the cats vary with  $x$  and that there is one cat per  $x$ .

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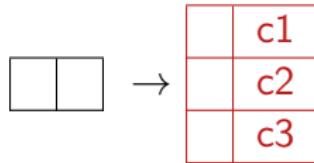
- ▶ introduce cats ( $y$ ) into the context
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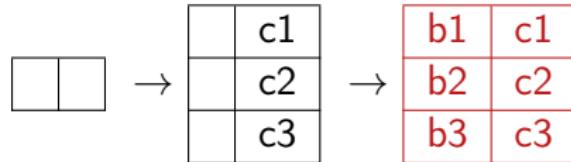
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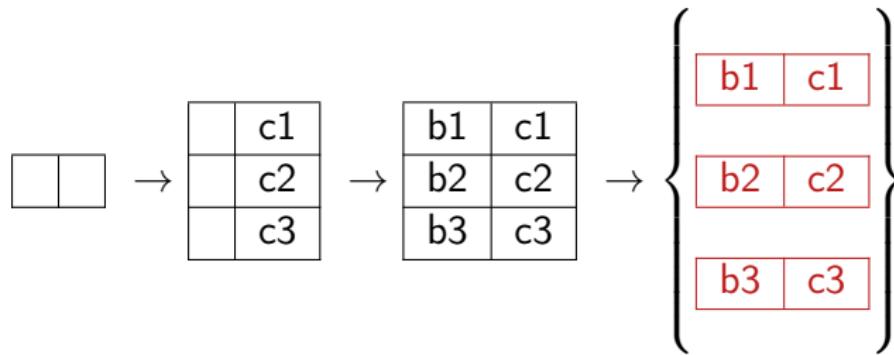
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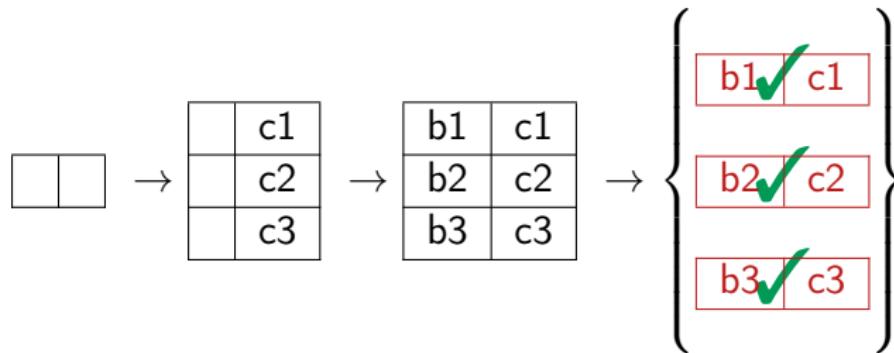
- ▶ introduce cats (*y*) into the context
- ▶ introduce boys (*x*) into the context
- ▶ for each boy *x*, check that *x* saw *y*
- ▶ check that the cats vary with *x* and that there is one cat per *x*.



# Licensing by each

(61) Each<sup>x</sup> boy saw one-one<sup>y</sup> cat.

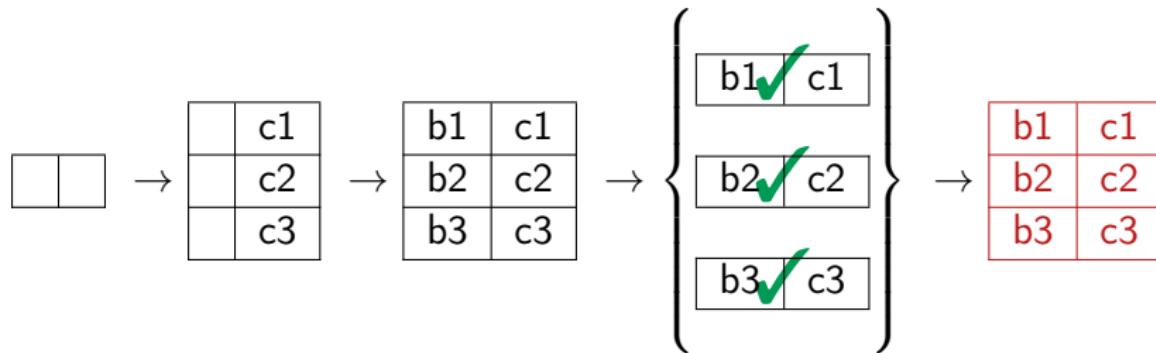
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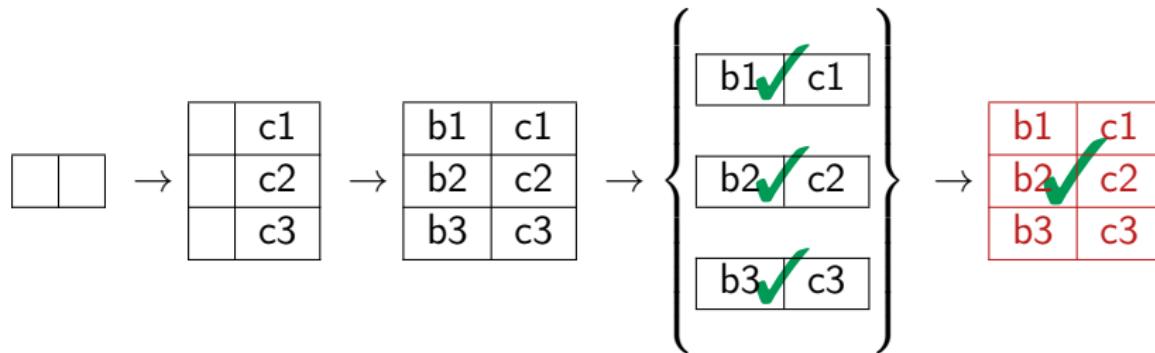
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- ▶ check that the cats vary with  $x$  and that there is one cat per  $x$ .



# Summary: nominal plurality

- ▶ Dependent constructions in ASL fit into a broader typology:
  - ▶ interpretation
  - ▶ licensing conditions
- ▶ Additionally, the ASL pattern employs the use of space.
  - ▶ Overt representation of the relation between a dependent form and its licensor.
- ▶ This led us to a solution to the licensing puzzle.

## Section 4

### General Conclusion

# Conclusion

- ▶ We started with an empirical puzzle, compositionally 'hard.'
- ▶ A large number theoretical choice points.
  - ▶ Depending on your answers, you can paint very different pictures of the way that natural language assembles meaning.
- ▶ Here, new data from sign language forced our hand.
- ▶ Final picture: scope + dynamics.

# Conclusion

- ▶ Along the way, several striking properties of sign language.
  - ▶ Iconicity
  - ▶ Space

# Iconicity in the grammar

- ▶ In Part 1, an iconic predicate in the combinatorial grammar.

A number of questions:

- ▶ Are there principled ways in which these *multidimensional meanings* interact?
- ▶ Anything similar in spoken language?
  - ▶ Co-speech gesture?

# The status of space

- ▶ In Part 2, the arrangement of discourse referents in space.

What's so special about space?

- ▶ Spatial agreement led us to a solution to the licensing puzzle.
  - ▶ But, the use of space played a purely heuristic role.
  - ▶ It *led us* to a solution, but the solution didn't fundamentally depend on sign language. (e.g., see Henderson 2014)

# The use of space

A more interesting possibility:

- ▶ Not just chance; not just heuristic.
- ▶ The use of space reflects a cognitively natural way of visually representing certain data structures.
- ▶ The visual mapping can thus provide a window into the cognitive representations of these linguistic forms.

## To conclude...

- ▶ In addition to providing new tools to get leverage into traditional puzzles...
- ▶ the visuo-spatial modality also opens new possible avenues into the connection between language and cognition.

# Further reading

- ▶ Kuhn and Aristodemo (to appear). Pluractionality, iconicity, and scope in French Sign Language. *Semantics and Pragmatics*.
- ▶ Kuhn (to appear). Dependent indefinites – the view from sign language. *Journal of Semantics*.
- ▶ Kuhn (2015). Cross-categorial singular and plural reference in sign language. New York University PhD dissertation.

...all available on [www.jeremykuhn.net](http://www.jeremykuhn.net)

# Thanks!

Thanks to Thomas Levêque, Ludovic Ducasse, Laurène Loctin, and Jonathan Lamberton. Thanks to Philippe Schlenker and audiences at NYU, Institut Jean Nicod, Harvard, Penn, Utrecht, Paris co-distributivity workshop, ESSLLI 2015, GLOW 38, and MACSIM 4, the *LSA 89* and *SuB 20*.

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# Etc.

[at-issue](#)[looong](#)[conjunction](#)[islands](#)[anaphoricity](#)[pointing](#)

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## At-issue iconicity

- ▶ Iconic meanings may scope under negation.

(54) MIRKO BOOK GIVE-rep-speeding-up NOT. IX BOOK  
give-rep-slowng-down DOWN.

'Mirko didn't give books at an accelerating rate. He gave books at a decelerating rate.'

- ▶ Iconic meanings may scope low in the antecedent of a conditional.

(55) IF MIRKO PAPERS GIVE-rep-speeding-up, IX SECRETARY  
HAPPY.

'If Mirko gives papers at an accelerating rate, the secretary will be happy.'

# At-issue iconicity

- ▶ Iconic meanings may scope under distributive operators.

## (56) ASL

EACH WORKER SECRETARY PAPER GIVE-rep-slow.  
BUT, MANY WORKER NUMEROUS, ONE SECRETARY.  
SO SECRETARY RECEIVE-alt-fast FAST.

'Each worker gave the secretary papers *at a slow rate*. But there are many workers and one secretary. So the secretary received papers *at a fast rate*.'



# Iconicity beyond sign language

- (57) That was a loooong meeting.
- (58) John coughed and coughed (and coughed).
- (59) 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

# A problem for Option 1

(Option 1 = plural licensors require a covert distributivity operator)

- ▶ Distributive operators generally assumed to appear over VP.
- ▶ However, dependent indefinites may be conjoined with plain indefinites that are interpreted cumulatively.

(60) **Hungarian** (p.c. Dániel Szeredi)

A diákok két előételt és **egy-egy** főételt rendeltek.  
The students two appetizers and one-one main-dish ordered.

'The students ordered two appetizers in total, and N main dishes  
where N is the number of students'

- ▶ If the dependent indefinite scopes under a covert distributive operator, the plain indefinite must do so, too, incorrectly entailing twice as many appetizers as students.

# Island-sensitivity of dependent indefinites

- ▶ Islands indicated with angled brackets – ⟨·⟩.

**Hungarian** (p.c. Márta Abrusán, two speakers)

- (61) Minden professzor két-két diákról mondta, hogy every professor two-two students-of said that meglepné ha ⟨diplomát szereznének⟩.  
surprised if diploma receive  
'Every professor said of two students (each) that he would be surprised if they graduated.'
- (62) \* Minden professzor azt mondta, hogy meglepné, ha every professor DEM said that surprised if ⟨két-két diák diplomát szerezne⟩.  
two-two student diploma receive  
'Every professor said that he would be surprised if two students (each) graduated.'

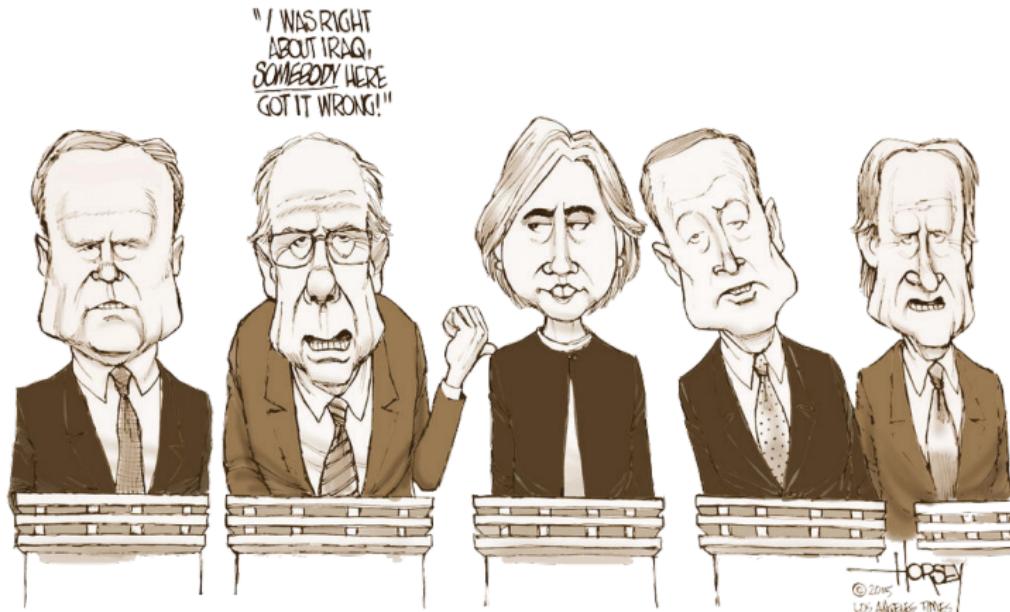
# Theoretical import

- ▶ Debate in the literature: what is the relation between a dependent term and its licensor?
- ▶ Two sides:

Anaphoric link (like pronouns)	Indirect relation (like NPIs)
Brasoveanu & Farkas 2011	Balusu 2006
Brasoveanu 2011 ( <i>different</i> )	Henderson 2014
Barker 2007 ( <i>same</i> )	Cable 2014

- ▶ New conclusion: the ASL data is overtly anaphoric.

# Pointing (Anvari 2016)



# Cross-modality pointing

Carson incorrectly believes that the pyramids were used to store grain.

Ben Carson: Egyptian pyramids were grain stores, not pharaohs' tombs

Republican presidential hopeful stands by remarks made in 1998, but criticised 'scientists' who he said claimed pyramids were built by 'alien beings'



Republican presidential candidate Dr Ben Carson stands by belief that pyramids were built by Joseph

Egypt's pyramids were built by the biblical Joseph to store grain and were not, as archaeologists believe, tombs for pharaohs, Republican presidential hopeful Ben Carson has said.

# Cross-modal pointing

Carson incorrectly believes that the pyramids were used to store grain.

Egypt to Ben Carson: no, the pyramids  
were not for storing grain

Antiquities minister says presidential hopeful's claim doesn't deserve response,  
while another official points out that 'this man is not an archaeologist'



0:00 / 0:42

Republican presidential hopeful Ben Carson delivers a speech in 1998 in which he says the pyramids in Egypt  
were built to store grain

Egyptian antiquities officials have scoffed at claims by the Republican presidential candidate Ben Carson that Egypt's ancient pyramids were not built as pharaonic tombs but used to store grain.