

# Sign Language Semantics Day 1: Overview: visibility and iconicity

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# Who am I?

## Jeremy Kuhn

- ▶ Postdoctoral researcher at the Ecole Normale Supérieure in Paris, France
- ▶ PhD 2015 from NYU
- ▶ Learned ASL as an undergraduate at Brown University
- ▶ Learned LSF from Deaf roommates in Paris in 2014

# Who are you?



## Section 1

# Sign language basics

# Two modalities of language

## Spoken language



**Articulators:** Mouth/tongue

**Signal:** Linear, acoustic waveform

**Perception:** Auditory (ears)

## Sign language



Hands/face

Multi-dimensional image

Visual system (eyes)

# Some myths about sign language

- ▶ **Myth 1:** Sign language is mime.
- ▶ Sign languages can talk about non-tangible things: ideas, philosophy, mathematics, ...
- ▶ Words are arbitrary:



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American Sign Language: 'where'

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American Sign Language: 'where'

French Sign Language: 'not'



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American Sign Language: 'where'

French Sign Language: 'not'

Israeli Sign Language: 'who'

# Some myths about sign language

- ▶ Myth 2: There is one sign language.



Dr. Peter Hauser (right) presenting in ASL at TISLR 11, simultaneously being translated into English, British Sign Language (left), and various other sign languages (across the bottom of the stage).

# Some myths about sign language

From airbnb.com:

### Spoken Languages ✕

What languages can you speak fluently? We have many international travelers who appreciate hosts who can speak their language.

<input type="checkbox"/>	Bahasa Indonesia	<input checked="" type="checkbox"/>	Sign Language
<input type="checkbox"/>	Bahasa Malaysia	<input type="checkbox"/>	Suomi
<input type="checkbox"/>	Bengali	<input type="checkbox"/>	Svenska
<input type="checkbox"/>	Dansk	<input type="checkbox"/>	Tagalog
<input type="checkbox"/>	Deutsch	<input type="checkbox"/>	Türkçe
<input checked="" type="checkbox"/>	English	<input type="checkbox"/>	Čeština
<input type="checkbox"/>	Español	<input type="checkbox"/>	Ελληνικά
<input checked="" type="checkbox"/>	Français	<input type="checkbox"/>	Русский
<input type="checkbox"/>	Hindi	<input type="checkbox"/>	українська
<input type="checkbox"/>	Italiano	<input type="checkbox"/>	עברית
<input type="checkbox"/>	Magyar	<input type="checkbox"/>	العربية
<input type="checkbox"/>	Nederlands	<input type="checkbox"/>	ภาษาไทย
<input type="checkbox"/>	Norsk	<input type="checkbox"/>	中文
<input type="checkbox"/>	Polski	<input type="checkbox"/>	日本語
<input type="checkbox"/>	Português	<input type="checkbox"/>	한국어
<input type="checkbox"/>	Punjabi		

# Some myths about sign language

- ▶ **Myth 3:** ASL is signed English.
- ▶ Sign languages have their own grammar and history.
- ▶ In fact...
  - ▶ ASL and BSL (British SL) are different languages!
  - ▶ ASL is descended from LSF (French SL).
  - ▶ So: it would be easier for an American signer to understand a French signer than a British signer!

## In short...

- ▶ Sign language is a **natural human language**.
- ▶ The same patterns as in spoken language.
  - ▶ Syntax, semantics, morphology, .... even phonology!
  - ▶ Acquisition, processing, neural signatures, variation.
- ▶ **Conclusion:** the same underlying cognitive system.

## Section 2

**What can sign language inform us about natural language?**

# Why study sign languages generally?

1. We want to understand general language faculty.
  - ▶ Sign languages are an understudied example.
2. Sign languages are often learned differently, as a late first language.
  - ▶ What does this tell us about acquisition?
3. Sign languages occur in a different modality: they are manual/visual instead of oral/auditory
  - ▶ Allows us to abstract away from the oral/auditory mode.
  - ▶ When does 'modality matter'?

(This is the focus of this class.)

# Why study sign language semantics?

Several properties that provide unique perspectives:

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

(Schlenker 2016)

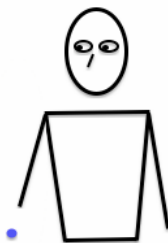


# Visibility

- ▶ **Visibility:** making overt some linguistic mechanisms hypothesized but covert in spoken language.

# Visibility

- ▶ **Dynamic semantics:** Noun phrases are associated with discourse referents; covert syntactic indexes postulated.
  - (1) John<sub>i</sub> told Bill<sub>j</sub> that he<sub>{i/j}</sub> would win.
- ▶ Lillo-Martin and Klima 1990: overt in sign language!



# Visibility

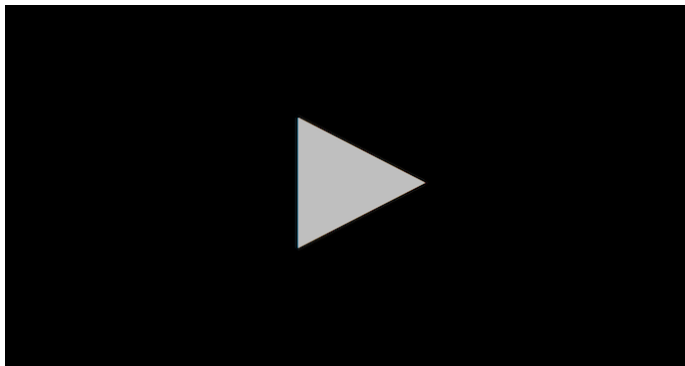
- ▶ Covert structure often results in structural ambiguity.
- ▶ So, if more structure is overt, there is less ambiguity.<sup>1</sup>

(2) IX-a JOHN TELL IX-b BILL IX-a WILL WIN.  
'John told Bill that he (John) would win.'

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<sup>1</sup>Glossing conventions: signs indicated in small caps of closest English translation. IX is a personal pronoun, realized with a pointing gesture. Lowercase letters indicate locations in space.

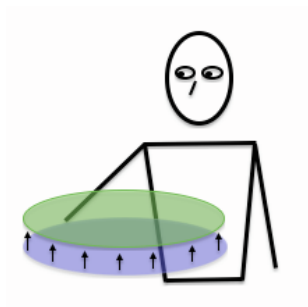
# Visibility



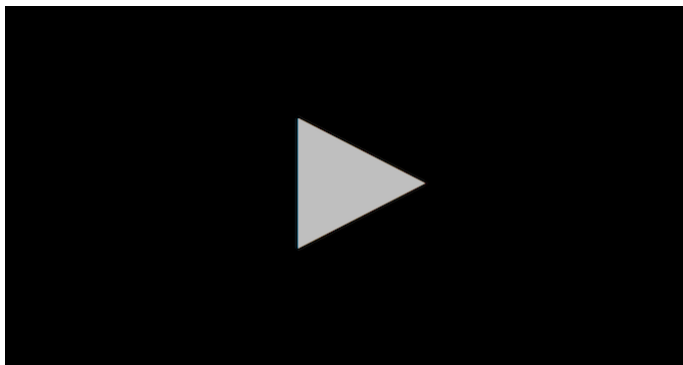
- (3) IX-a JOHN TELL IX-b BILL {IX-a/IX-b} WILL WIN.  
'John<sub>i</sub> told Bill<sub>j</sub> that he<sub>{i/j}</sub> would win.'

# Visibility

- ▶ The second wave of dynamic semantics: **functional reference**
  - (4) Every boy read a different book.  
=the function from boys to books is injective
- ▶ These, too, overt in sign language:



# Visibility



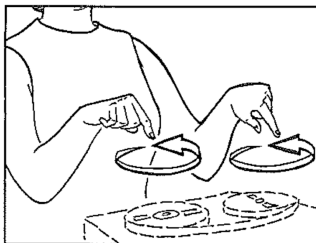
- (5) BOY IX-arc READ ONE-arc BOOK.  
'Each boy read a (potentially different) book.'

# Iconicity

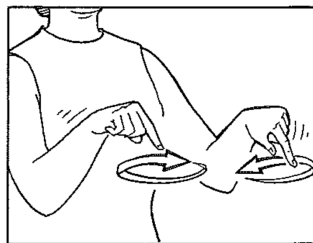
- ▶ **Iconicity:** form-meaning mapping is non-arbitrary and structure preserving.

# Iconicity

- ▶ Many lexical items in sign language have iconic roots.
- ▶ But: not clearly active in the synchronic grammar.
  - ▶ TREE in ASL, Chinese SL; BIRD in ASL, Israeli SL
- ▶ Signs evolve to conform to phonology



(a) Initial invention for  
'videotape recorder'

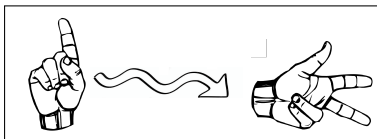


(b) Evolved sign form  
VIDEOTAPE-RECORDER

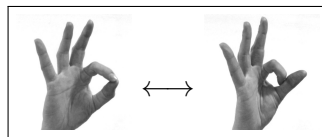


# Iconicity

- ▶ In other cases, iconic meaning synchronically available.
- ▶ Iconicity as a structure preserving mapping between the form and the meaning.



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



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

# Connection between iconicity and visibility?

- ▶ **Question:** why is abstract structure sometimes visibly overt in sign language?
- ▶ **Hypothesis:** visibility has its roots in iconicity.

# Connection between iconicity and visibility?

## For example:

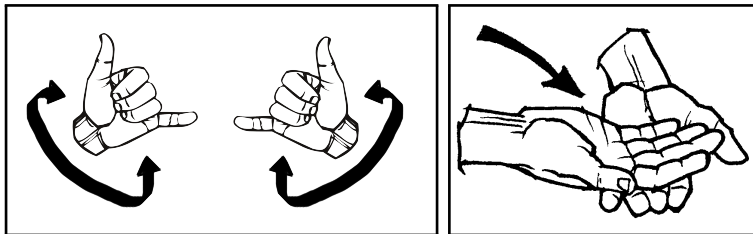
- ▶ In cases of unbound pronouns, use of space amounts to an iconic mapping that preserves identity and mereology.
- ▶ But the pronominal system is broader than just free pronouns (e.g. 'no boy likes his mother'),
- ▶ The use of space across the full system can be thought of as an **embedding** of the iconic mapping into the richer pronominal system.
- ▶ To be continued tomorrow...!

## Section 3

### Case study: Telicity and iconic scales

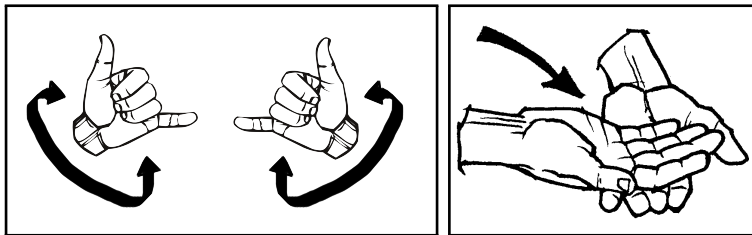
**Let's play a game!**

Match the sign with its meaning!

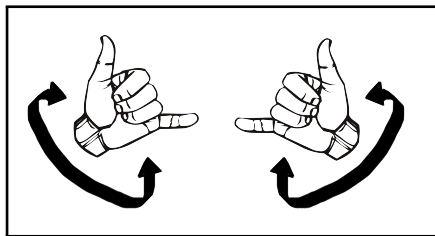


- a. decide
- b. ponder

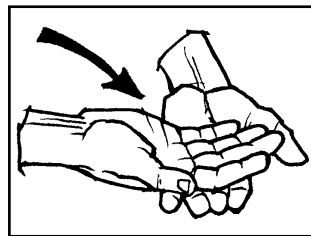
I have a confession to make...



I have a confession to make...



play



arrive



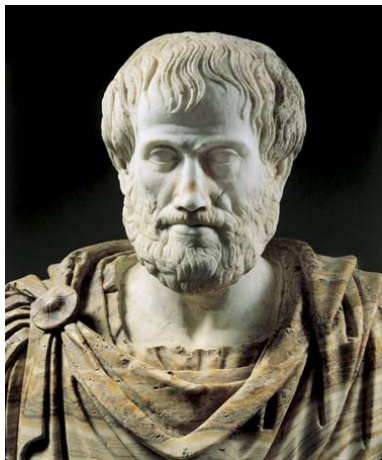
► Something in common?

play		arrive
	vs.	
ponder		decide

- ▶ 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!

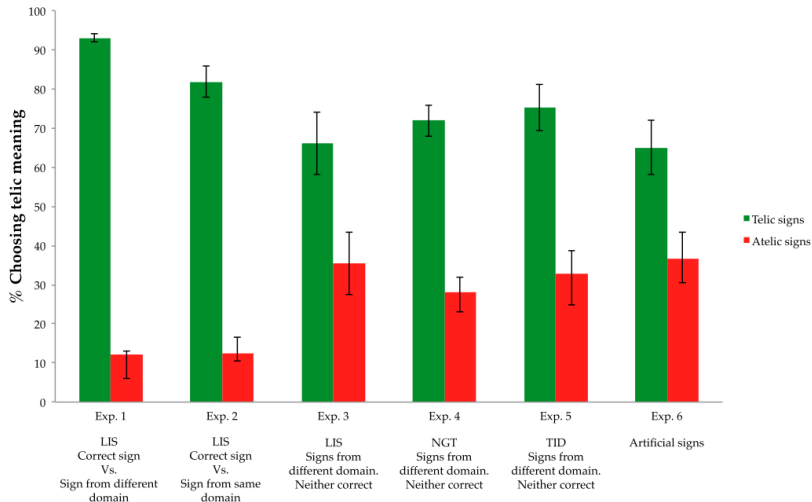
- ▶ **Ronnie Wilbur (2003, 2008, 2009):**  
Many sign languages systematically distinguish telicity in the phonological movement of a verb.
  - ▶ Telic verbs stop sharply, often with contact.
  - ▶ Atelic verbs have a continuous, extendable movement.
  
- ▶ More examples:
  - (6) **Atelic:** WALK, DISCUSS, WAIT, EXPLAIN
  - (7) **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





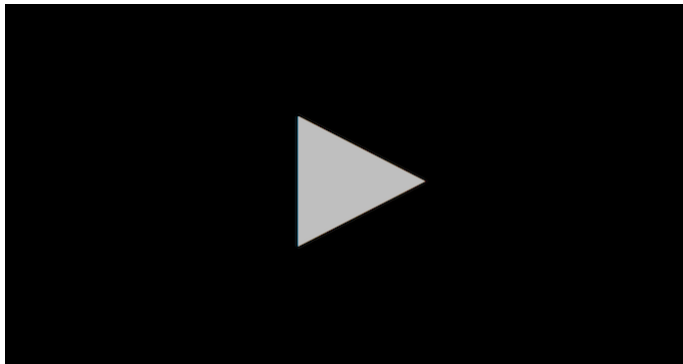
## Strickland et al. 2015:

- ▶ 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

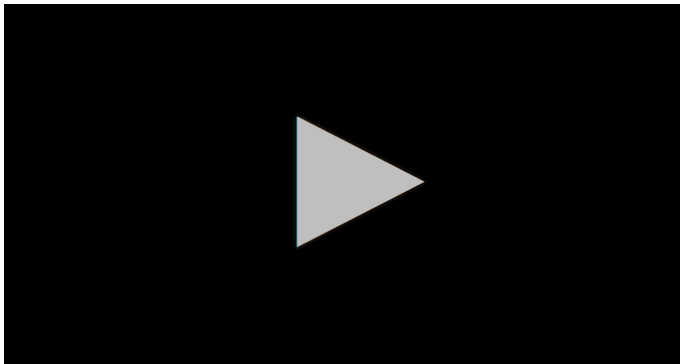
- ▶ **Observation:** In ASL, Wilbur shows that the phonetic form of a verb may be manipulated with semantic effect.
- ▶ **Slow action**
  - ▶ DIE signed slowly  $\approx$  'slowly die.'
- ▶ **Incomplete action**
  - ▶ SIT-DOWN ends with contact between the signer's two hands; SIT-DOWN without contact  $\approx$  'almost sit down.'

# Phonetic manipulations



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

# Phonetic manipulations



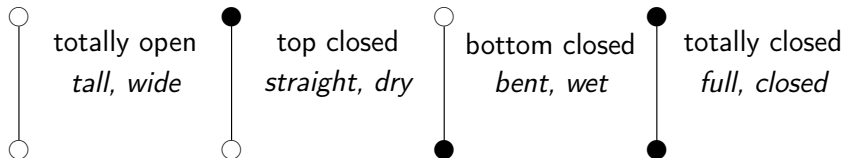
- (9) a. I SIT.  
      'I sat down.'
- b. I SIT-incomplete FIGHT.  
          'I was sitting down when a fight broke out.'

# 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:



- ▶ 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!**

(10) Verbs based on closed scales have variable telicity.

- a. The towel dried for an hour.
- b. The towel dried in an hour.

(11) 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:

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

(13) widen =  $\text{pos}_V(\text{width}_\Delta)$   
 = True of an individual  $x$  and an 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  $e$ .



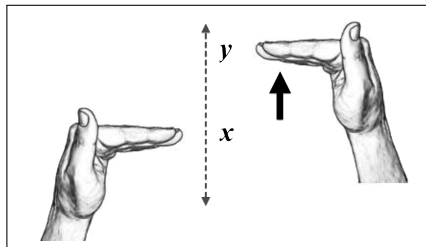
## Scales in sign language

- ▶ 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.

(14) MARIA TALL- $x$  GIANNI TALL-scale-more- $y$ .

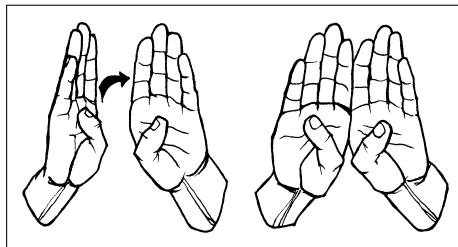
'Gianni is taller than Maria.'

(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,
  - (a) the time elapsed after the onset of the sign is proportional to the time elapsed after the start of event
  - (b) 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 finally,
  - (c) When a phonetic form reaches a maximal distance (perhaps due to body contact), the event reaches a maximal degree.

# 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.'
- ▶ This is only defined for verbs that receive telic meanings.

# Visibility and iconicity

- ▶ This example displays both 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**<sup>Φ</sup> must be integrated to the same degree as the adjective *almost*, as in the English, ‘*she almost died.*’

## Section 4

**The rest of the week**

# Schedule

**Day 1** General introduction to modality and meaning (+telicity)

**Day 2** Pronouns: variables, features, or pictures?

**Day 3** Plurality and dependency part I: Verbs

**Day 3** Plurality and dependency part II: Nouns

**Day 5** Iconicity, classifier predicates, and quotations



# Thematic questions

## Addressing old questions:

- ▶ Debates about pronouns
- ▶ Debates about plurality and licensing

## Introducing new questions:

- ▶ How does iconicity interface with the formal grammar?
- ▶ To what extent does spoken language have analogous iconic phenomena?

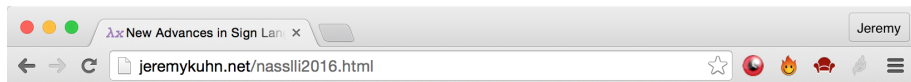
# Expressiveness in sign/spoken language

- ▶ **Then:** underestimating sign languages
  - ▶ Less expressive than spoken language/mostly iconic – Wrong!
- ▶ **Now:** underestimating spoken languages?
  - ▶ Sign languages more expressive than spoken languages?  
or
  - ▶ Sign language = spoken language + gesture?

# Contact

Don't hesitate to get in touch with me if you have any questions throughout the institute:

[jeremy.d.kuhn@gmail.com](mailto:jeremy.d.kuhn@gmail.com)



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## New advances in sign language semantics

**Course at NASSLLI 2016:** [nasslli2016.rutgers.edu](http://nasslli2016.rutgers.edu)

**Instructor:** Jeremy Kuhn ([www.jeremykuhn.net](http://www.jeremykuhn.net))

### COURSE DESCRIPTION

Extending a formal theory of natural language semantics to sign languages has provided insights into a variety of phenomena at the intersection of natural language and logic. In the last 5 years, there has been rapid progress in the study of sign language semantics, especially in how representations of space can be incorporated into a formal system. This class will cover significant recent advances, including the use of space to represent telicity, discourse referents, and nominal and verbal plurality, as well as the relationship between iconicity, gesture, and quotation.

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