Language & the Mind
LING240
Summer Session II 2005

Lecture 4

Sentence Interpretation, Language Learning, & Universals

A Constraint on Interpretation

Hoggle thinks that he is a great spy

He thinks that Hoggle is a great spy

A Constraint on Interpretation

- When can a *pronoun* and a *name* refer to the same person?

  i.e. when can they *corefer*?

A Constraint on Interpretation

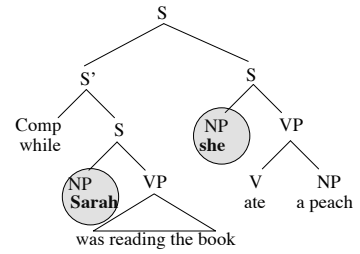
a. While Sarah was reading the book, she ate a peach.

b. While she was reading the book, Sarah ate a peach.

c. Sarah ate a peach while she was reading the book.

d. *She ate a peach while Sarah was reading the book.

A Constraint on Interpretation



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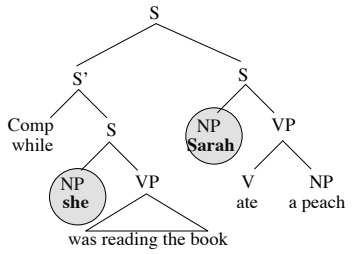

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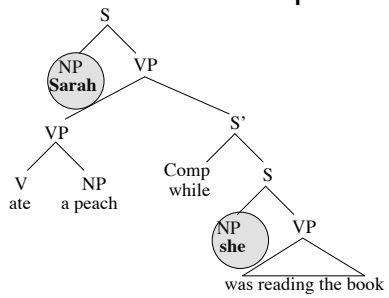

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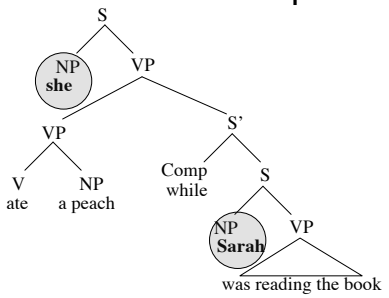
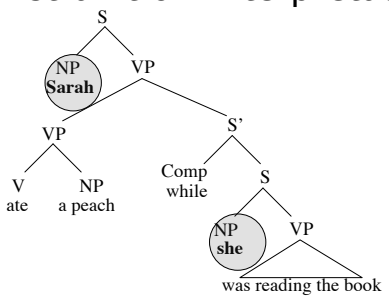


She ate a peach while Sarah was reading the book

A Constraint on Interpretation

- **A pronoun can't c-command a name that co-refers with it**
- 'Principle C' (Chomsky 1981)

A Constraint on Interpretation



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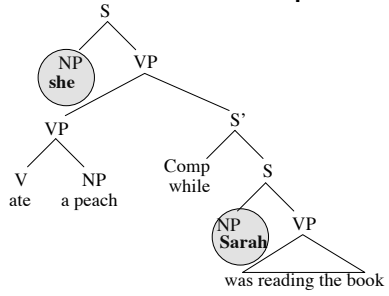
A Constraint on Interpretation



She ate a peach while Sarah was reading the book

Principle C in Other Languages

a. While **he** was reading the book, **Pooh** ate an apple
b. ***He** ate an apple while **Pooh** was reading the book

But is this true in other languages like…
- French?
- Italian?
- Russian?
- Greek, Amharic, Gujrati, Hebrew, Spanish, etc.?

Principle C in Other Languages

Mohawk
Native American language, Quebec & upstate New York

- Free Word Order
  Sak ra-núhwe'-s ako-[a]tyá'tawi
  Sak MsS-like-hab FsP-dress
  'Sak likes her dress.'
- Ra-núhwe'-s Sak ako-[a]tyá'tawi
- Sak ako-[a]tyá'tawi ra-núhwe'-s
- Ra-núhwe'-s ako-[a]tyá'tawi Sak
- Ako-[a]tyá'tawi ra-núhwe'-s Sak
- Ako-[a]tyá'tawi Sak ra-núhwe'-s

Principle C in Other Languages

Mohawk
Native American language, Quebec & upstate New York

- Omission of arguments

  Ra-núhwe'-s
  MsS-like-hab
  'He likes it.'

Principle C in Other Languages

Mohawk
Native American language, Quebec & upstate New York

- Discontinuous constituents

  Ne kíke wa-hi-yéna-' ne kwéskwes
  ne this fact-1sS/MsO-catch-punc ne pig
  'I caught this pig.'

Principle C in Other Languages

Mohawk
Native American language, Quebec & upstate New York

Condition C Effects

- Wa-ho-nakuni-' tsi Sak wa-hi-hrewaht-e'
  fact-NsS/MsO-anger-punc that Sak fact-1sS/MsO-punish-punc
  'That I punished Sak_i made him_i mad.' (coreference possible)
- Wa-shako-hrori-' tsi Sak wa-hi-hrewaht-e'
  fact-MsS/FsO-tell-punc that Sak fact-1sS/MsO-punish-punc
  'He_i told her that I punished Sak_i.' (coreference impossible)

Language Acquisition

a. While **he** was reading the book, **Pooh** ate an apple
b. ***He** ate an apple while **Pooh** was reading the book

- How could a child ever learn that Principle C applies?
- In a language like Mohawk, its effects are quite obscure…
- Why does Principle C seem to apply in *every language*?

Language Acquisition

a. While **he** was reading the book, **Pooh** ate an apple
b. ***He** ate an apple while **Pooh** was reading the book

- *Universal Principles* may not need to be learned - they may be part of the child's innate knowledge of language
- This would explain why the principle is universal
- It would also set aside the language acquisition problem
- **…but it also predicts that young children should know constraints like Principle C**

Language Acquisition

a. While Sarah was reading the book, she ate a peach.

b. While she was reading the book, Sarah ate a peach.

c. Sarah ate a peach while she was reading the book.

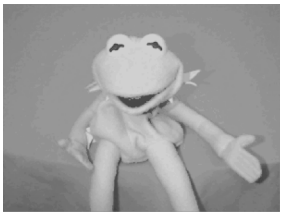
d. *She ate a peach while Sarah was reading the book.

- Young children never *say* sentences like this, and probably almost never *hear* them
- Question is: what meanings do children allow?

Language Acquisition

- Strategy: set up a situation in which the relevant meaning is present -- can a child associate that meaning with the relevant sentence?
- **Truth Value Judgment Task**

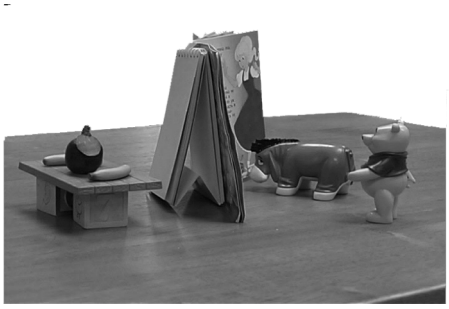
Truth Value Judgment Task



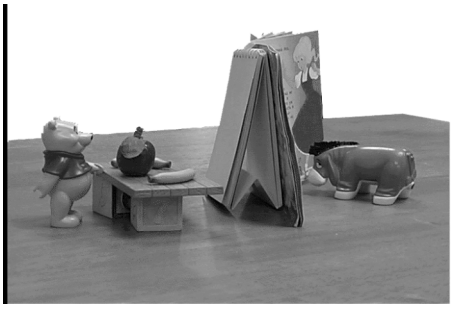
"I know what happened in this story…"

Truth Value Judgment Task

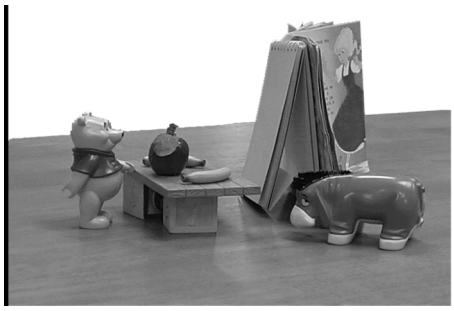
Principle C in children:
English - Crain & McKee (1985)
Russian - Kazanina & Phillips (2001), etc.



"Hello, Eeyore! I see that you're reading a book."



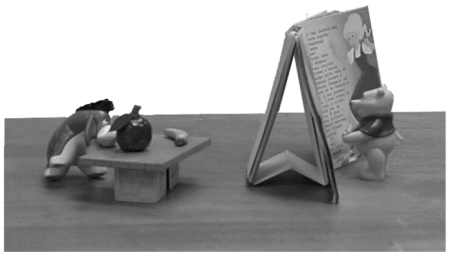
"What a fine-looking apple."



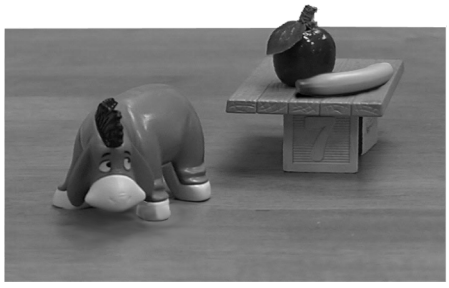
"No, Pooh. You can't eat the apple - that's *my* apple."

"Ok, I'll have to eat a banana instead."

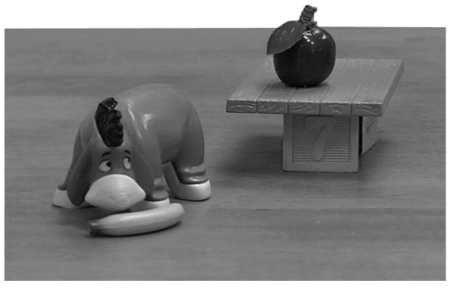
"Ok, Pooh. I've finished reading. Now you can read the book."



"Great. Now that Pooh is reading the book, I can eat this delicious apple."

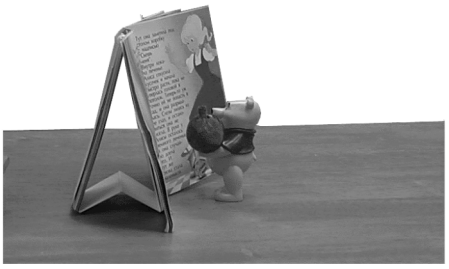


"I shouldn't be such a greedy donkey -
I should let Pooh eat the apple."

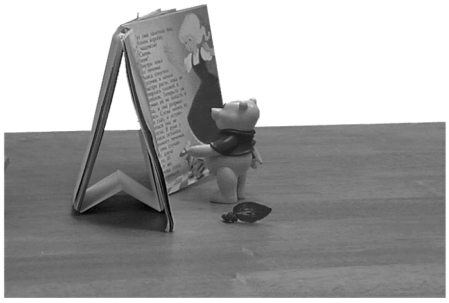


"I suppose I have to eat a banana instead."

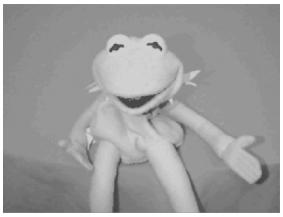
"Here you are, Pooh. You can have the apple."



"Oh, I'm such a lucky bear! I can read the book, and I can eat the apple, at the same time."

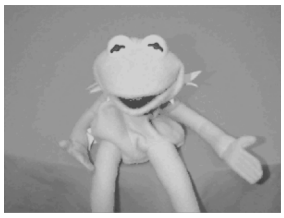


[Apple is eaten up]



OK, that was a story about Eeyore and Winnie-the-Pooh. First Eeyore was reading the book and then Winnie-the-Pooh was reading the book. I know one thing that happened...

While Pooh was reading the book, he ate the apple.



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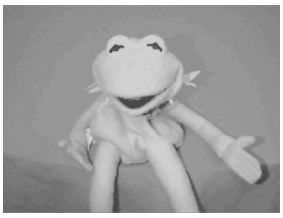

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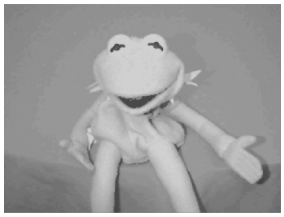

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He ate the apple while Pooh was reading the book.

How 3-4 year olds do

a. While Pooh was reading the book, he ate an apple — yes!

b. While he was reading the book, Pooh ate an apple — yes!

c. Pooh ate an apple while he was reading the book — yes!

d. *He ate an apple while Pooh was reading the book — no!

Works for English, Italian, Russian etc.

How the Task Works

- Child is not being judged
- Identical story for all test sentences
- Avoids child's 'yes' bias - child shows knowledge by answering "no"
- Story favors the ungrammatical meaning
- Story is set up to make "no" answer felicitous

How the Task Works

- Child is not being judged
  - child understands that (s)he is helping the experimenter to test a puppet (e.g. Kermit)
  - child does not feel that (s)he is being tested, and so feels under less pressure
  - child's response is very simple yes/no

How the Task Works

- Identical story for all test sentences
  - only difference is in the final sentence that Kermit utters
  - if children respond differently to the different test sentences, this can't be due to any differences in the stories

How the Task Works

- Child is not being judged
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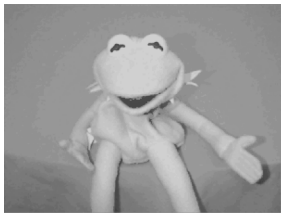

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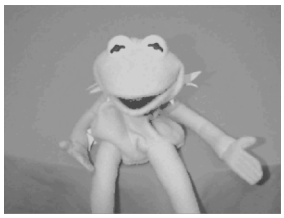

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- Child is not being judged
- Identical story for all test sentences
- Avoids child's 'yes' bias - child shows knowledge by answering "no"
- Story favors the ungrammatical meaning
- Story is set up to make "no" answer felicitous (plausible denial)

Plausible Denial

He ate the apple while Pooh was reading the book.

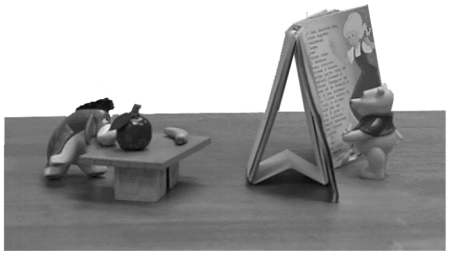
TRUE - but ungrammatical

He ate the apple while Pooh was reading the book.

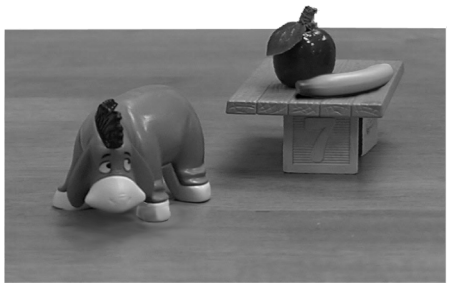
Eeyore

Grammatical - but FALSE

clearly FALSE, since it *almost* happened, but then didn't



"Great. Now that Pooh is reading the book, I can eat this delicious apple."



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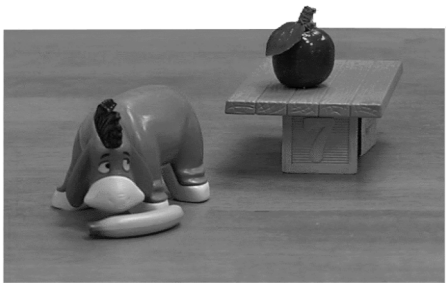
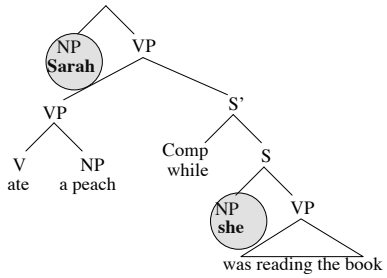


"I suppose I have to eat a banana instead."

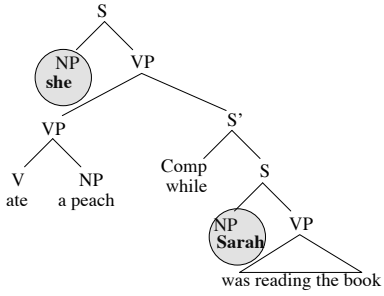
A Constraint on Interpretation

Hoggle thinks that he is a great spy

He thinks that Hoggle is a great spy

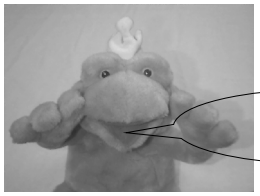


Sarah ate a peach while she was reading the book



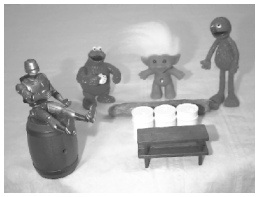
Sarah ate a peach while she was reading the book

"Jumping Contest" Story



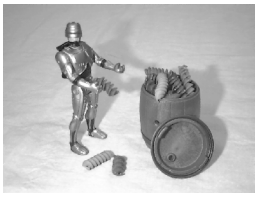
He said that the Troll is the best jumper

The Jumping Competition



The characters and the set-up are introduced to the child and the puppet

The Prize for the Best Jumper



The judge, Robocop, introduces the prize: colored pasta!

The Contestants Get Ready at the Start

Robocop: Line up everyone! Get ready to jump over these three obstacles.

The First Contestant: Cookie Monster

Robocop: You go first, Cookie Monster.
Cookie Monster: OK, here I go. I made the log! Oh no, I crashed into the barrels… Now let me try the benches….

The Second Contestant: The Troll

The troll clears the course successfully

Robocop: Your turn next, Troll.
Troll: OK, I'm a good jumper. This should be easy for me. Over the log I go! Yeah! Now the barrels. All right! Now the benches. Good, I didn't knock anything over.

The Final Competitor

Grover clears the obstacles cleanly, in record time

Robocop: OK, Grover. Your turn.
Grover: I'm a good jumper. Watch me! See how easily I could jump over the log? Now I'll jump over the barrels and benches. Great. I didn't smash into anything, and I was really fast.

Judging The Competition

Robocop: Line up, guys! I'm ready to judge the competition. Let's see who wins the colored pasta.

Cookie Monster's Performance is Judged

Robocop: Cookie Monster, I'm afraid you aren't the winner. You crashed into the barrels. I think you've been eating too many cookies. Lose some weight, and you will be a better jumper.

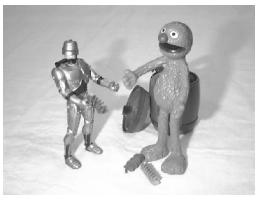
The Troll's Performance is Judged

Possible Outcome: The troll could be the best jumper
At this point, it is plausible that the assertion is true.

Robocop: Troll, you jumped very well. You didn't crash into anything. You could be the winner. But let me judge Grover before I decide...

Grover's Performance is Judged

The actual outcome unfolds



Robocop: Grover, your jumps were very good. You didn't knock anything over, and you were very fast. I think you win the prize. Great job, Grover!

The Troll Contests the Judge's Decision

The meaning ruled out by Principle C is presented

Troll: It's not fair, Robocop! I think I should get the prize. I think I was the best jumper. I'm going to take some colored pasta for myself.

The Story Ends

The props are placed alongside the characters, to provide a reminder of the events that took place.

Kermit the Frog describes the Story

Kermit's Lead-in: That was a story about a jumping contest. Robocop was the judge, and there was Cookie Monster, and Grover, and the Troll. I know one thing that happened. He said that the Troll was the best jumper.

Control Condition

Kermit: The Troll said that he was the best jumper.

Child: "Yes."

The Child Tells Kermit if he was Right or Wrong

Notice the child thinks Kermit is the one who is being judged….

Kermit: He said that the Troll was the best jumper.

Child: No!
Kermit: I didn't say the right thing? What really happened?

The Child Tells Kermit if he was Right or Wrong

Notice the child thinks Kermit is the one who is being judged….

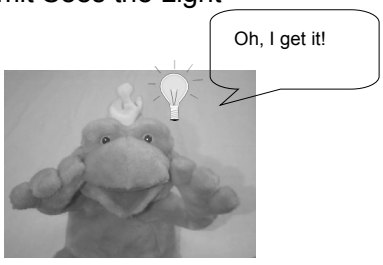
Kermit: What really happened?
Child: He said that Grover was the best jumper.
(*the child should indicate the actual outcome*)

The Child's Explanation of the Events

This informs the experimenter if the child is saying "No" for the right reason

Kermit: What about the Troll? He has some pasta.
Child: The Troll said that he was the best jumper, but Robocop didn't think so.

Kermit Sees the Light

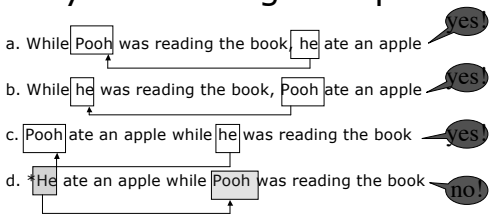


Kermit: OK, I see. I don't get the watermelon this time. Oh well, I'll get some cherries. I'll pay closer attention next time, so I can eat the watermelon.

Interim Conclusions

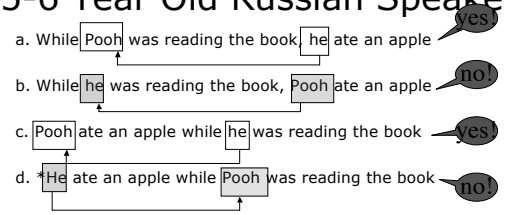
- Structural relations such as *c-command* can explain a variety of syntactic constraints
- …including some constraints which may apply across all languages of the world
- *Universal* constraints may not need to be learned
- Children know 'Principle C' before age 3, i.e. as early as it has been possible to test

3-4 year old English Speakers



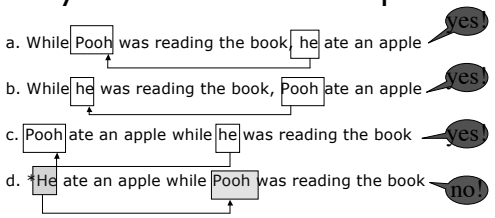
Works for English, Italian, Russian etc.

5-6 Year Old Russian Speakers



(Kazanina & Phillips 2001)

3-4 year old Russian Speakers



(Kazanina & Phillips 2001)

English vs. Russian

- Russian shows two constraints that look very similar on the surface - they prevent a pronoun from coreferring with a later NP
- One is universal…
  One is specific to Russian (and a few others)
- At age 3, Russian children know the Universal constraint, but not the Russian-specific constraint
- At age 3, Russian and English children behave alike!

(Kazanina & Phillips 2001)

Recall Our Interim Conclusions…

- Structural relations such as *c-command* can explain a variety of syntactic constraints
- …including some constraints which may apply across all languages of the world
- *Universal* constraints may not need to be learned
- Children know 'Principle C' before age 3, i.e. as early as it has been possible to test

How well does this generalize?

- 'Principle C' is clearly just one example of a syntactic constraint that a child must master
- The logic of this case should apply to other Universals
- Many questions remain about whether this expectation is confirmed: task involves
  - (i) identifying universals
  - (ii) verifying early mastery
- Truth Value Judgment Task is suitable for testing some, but by no means all aspects of syntactic knowledge
  - best for testing constraints on interpretation

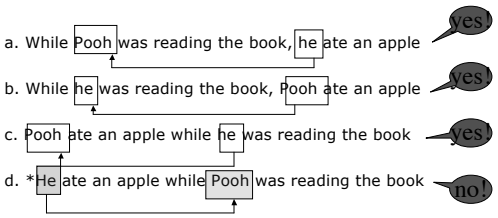
What Children *Must* Learn

- Children must learn things that differ across languages
  - word order (SVO, SOV, etc.)
  - morphology
  - Preposition-stranding
    - English: Who did he talk with __?
    - French: *Qui a-t-il parlé avec __?
    - Spanish: *Quien ha hablado con __?

Easy vs. Hard to Observe

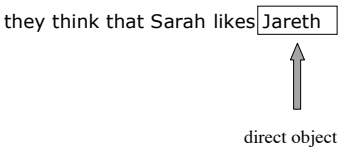
- Not all aspects of syntax are equally easy to observe
- Some constructions occur more frequently than others
- It is easier to notice that something *does* occur, than to notice that it *does not* occur
- Need to guarantee that all children will successfully master their language!

Definitely Hard to Observe!

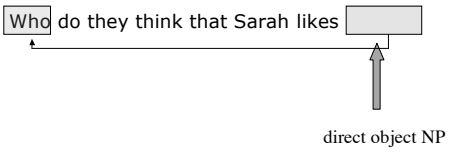


It's a good thing that it's a Universal constraint!

Probably Hard to Observe



Probably Hard to Observe



Probably Hard to Observe

Who do they think that Sarah likes ☐

they think Sarah likes who

Probably Hard to Observe

Who do they think that Sarah likes ☐

Complementizer *that* is optional

Who do they think Sarah likes ☐

Probably Hard to Observe

Who do they think that Sarah likes ☐

Complementizer *that* is optional

Who do they think Sarah likes ☐

they think Sarah likes Jareth

subject NP

Probably Hard to Observe

Who do they think that Sarah likes ☐

Complementizer *that* is optional

Who do they think Sarah likes ☐

Who do they think ☐ likes Jareth

subject NP

Probably Hard to Observe

Who do they think that Sarah likes ☐

they think that Sarah likes Jareth

subject NP

Complementizer *that* is optional

Who do they think Sarah likes ☐

Who do they think ☐ likes Jareth

Probably Hard to Observe

Who do they think that Sarah likes ☐

Who do they think that ☐ likes Jareth

Complementizer *that* is optional

not

Who do they think Sarah likes ☐

Who do they think ☐ likes Jareth

***that-gap* sequences are impossible in some languages**

that-gap Constraint

- Who do they think that likes Jareth?

English	*
French	*
Italian	ok
Spanish	ok
Levantine Arabic	*
Beni-Hassan Arabic	ok

Parameters

- Life is easier for the learner if hard-to-observe properties can be linked to easy-to-observe properties
- This leads to a search for groups of syntactic properties that always occur together in a language…

Parameters

Subject Positions

- *that-gap* sequences

English	no
French	no
Italian	yes
Spanish	yes
Levantine Ar.	no
Beni-Hassan Ar.	yes

- post-verbal subject

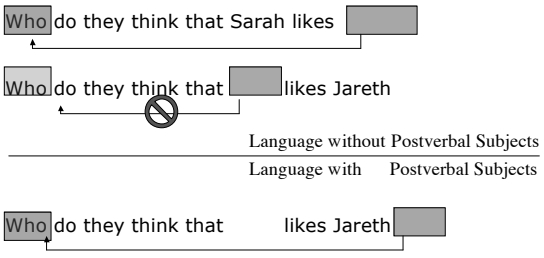
English	no
French	no
Italian	yes
Spanish	yes
Levantine Ar.	no
Beni-Hassan Ar.	yes

*Who did they say that likes Jareth? *Has given up Sarah

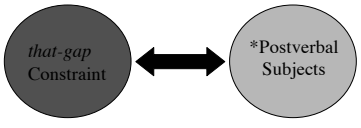
Subject Positions

- If a language allows post-verbal subjects, then it also allows *that-gap* sequences
- Post-verbal subjects are easy-to-observe
- Good news for the learner!

Why the Connection?



Why the Connection?

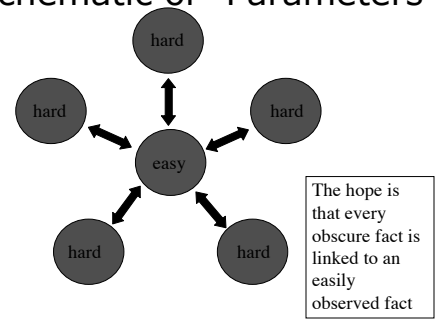


IF the learner knows the connection, then (s)he can use the easy-to-observe fact to learn the hard-to-observe fact.

Principles & Parameters

- An attempt to *minimize* the amount that a child must learn
- Principles (i.e. Universals) --> Innate
- Parameters (i.e. sets of properties which vary together) --> Only one property per set to learn
- Note: Remains to be confirmed

Schematic of "Parameters"



Learning Verb Syntax

- "Locative Verbs"
- Verbs which refer to an action in which a substance moves to a particular location
- pour, spill, stuff, pile, fill, load, cover, decorate, spray, bandage, soak, sprinkle, spread, etc.
- Presents interesting learning puzzles...

Learning Verb Syntax

- "Locative Verbs"
- Hoggle poured the beer into the glass.
  *Hoggle poured the glass with beer.
- *Hoggle filled the beer into the glass.
  Hoggle filled the glass with beer.
- Hoggle loaded the boxes into the wagon.
  Hoggle loaded the wagon with boxes.

Terminology

Hoggle poured the beer into the glass

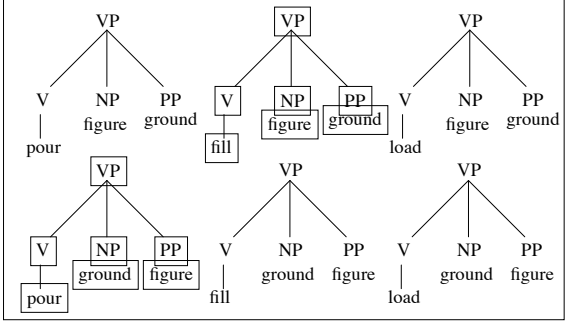
Figure Frame

moving object FIGURE — location GROUND

Hoggle filled the glass with the beer

location GROUND — moving object FIGURE

Trees for Verbs



Learning Verb Syntax

- "Locative Verbs"
- Why do different verbs allow different V NP PP structures?
- How consistent are these patterns across languages?
- Evidence for Principles & Parameters in this domain
- What children know

Classes of Verbs

- Verbs with syntax like *pour*
  - *dribble, drip, spill, shake, spin, spew, slop,* etc.
- Verbs with syntax like *fill*
  - *cover, decorate, bandage, blanket, soak, drench, adorn,* etc.
- Verbs with syntax like *load*
  - *stuff, cram, jam, spray, sow, heap, spread, rub, dab, plaster,* etc.

How could this be learned?

- How could a child figure out which structures are possible for which verbs?
- "Conservative" strategy - only allow verbs with structures heard in input
- "Do not generalize!"

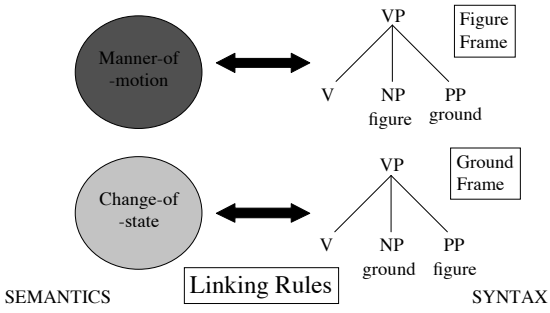
But...

- Children make errors - they *overgeneralize*
  "I'm going to cover a screen over me."
  "Can I fill some salt in the bear?"
- Adults have clear intuitions about novel verbs:
  e.g. ladle, scoop
- Hearing 'errors' doesn't obviously change our judgments
  e.g. "John decorated the lights onto the tree."
- Not clear that all possible syntactic forms are well-represented in the input to learners
- Conservative learning doesn't seem to do the trick

Classes of Verbs

- Verbs with syntax like *pour* — manner-of-motion
  - *dribble, drip, spill, shake, spin, spew, slop,* etc.
- Verbs with syntax like *fill* — change-of-state
  - *cover, decorate, bandage, blanket, soak, drench, adorn,* etc.
- Verbs with syntax like *load* — manner-of-motion & change-of-state
  - *stuff, cram, jam, spray, sow, heap, spread, rub, dab, plaster,* etc.

Learning Syntax from Semantics



Learning Syntax from Semantics

- Appropriate verb syntax can be learned if the Syntax-Semantics Linking Rules are
  - consistent across languages (i.e. verbs with same meaning should have same syntax across all languages)
  - innate (i.e. children know the connections from the outset)

Learning Syntax from Semantics

- Adults have clear intuitions about novel verbs:
  e.g. ladle, scoop
- Hearing 'errors' doesn't obviously change our judgments
  e.g. "John decorated the lights onto the tree."
- Not clear that all possible syntactic forms are well-represented in the input to learners
- Children taught just the *meaning* of a verb choose appropriate syntactic frames ("this is *moaking*")
- Children make errors - they *overgeneralize*
  "I'm going to cover a screen over me."
  "Can I fill some salt in the bear?"

But Languages Vary

- English
  *John decorated the flowers in the room.
  John decorated the room with flowers.

Change-of-state --> Ground Frame

- Korean
  Yumi-ka ccoch-ul pang-ey cangsikha-yess-ta
  Nom flowers-Acc room-Loc decorate-Past-Dec
  'John decorated the flowers in the room.'
  Yumi-ka pang-ul ccoch-ulo cangsikha-yess-ta
  Nom room-Acc flowers-with decorate-Past-Dec
  'John decorated the room with flowers.'

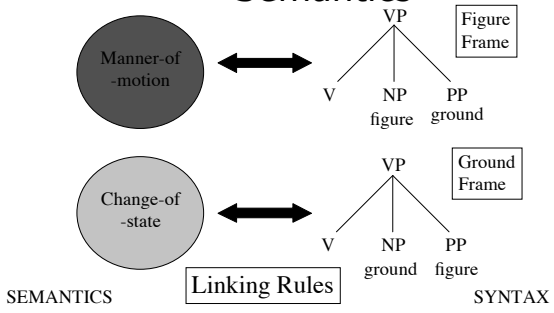
Korean is more liberal than English

But Languages Vary

- English
  John piled the books on the shelf.
  John piled the shelf with books.
- Korean
  Yumi-ka chaek-lul chaeksang-ey ssa-ass-ta.
  Nombook-Acc table-Loc pile-Past-Dec
  'Yumi piled books on the table.'
  *Yumi-ka chaeksang-lul chaek-elo ssa-ass-ta.
  Nom table-Acc books-with pile-Past-Dec
  'Yumi piled the table with books.'

Korean is more restrictive than English

Learning Syntax from Semantics



Learning Syntax from Semantics

- Appropriate verb syntax can be learned if the Syntax-Semantics Linking Rules are
  - consistent across languages (i.e. verbs with same meaning should have same syntax across all languages)
  - innate (i.e. children know the connections from the outset)

A Problem for Learners?

- If syntax-semantics Linking Rules are not uniform across languages, then how can they help learners?
- If each language had different Linking Rules, would this be any use to a child?

Reevaluating Variation

- Survey of 20+ languages
  English, Spanish, French, Malay, Arabic, Hebrew, Korean, Japanese, Chinese, Turkish, Thai, Hindi, Luganda, Ewe, Portuguese, Polish, etc.
- How much cross-language variation is there?

A Universal

- English
  John poured the water into the glass.
  *John poured the glass with water.
- Spanish
  Juan vertí agua en el vaso.
  John poured water into the glass
  *Juan vertí el vaso con agua.
  John poured the glass with water

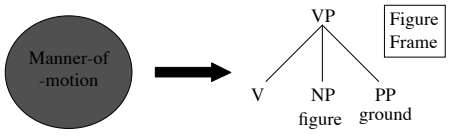
A Universal

- English
  John poured the water into the glass.
  *John poured the glass with water.
- Hebrew
  Danny shafax mayim letox ha-kos.
  John poured water into the glass
  'John poured water into the glass.'
  *Danny shafax et ha-kos be-mayin.
  John poured Acc the glass with water
  '*John poured the glass with water.'

A Universal

- English
  John poured the water into the glass.
  *John poured the glass with water.
- Japanese
  Taro-ga mizu-o baketu-ni sosoi-da.
  Nom water-Acc bucket-Loc pour-Past
  'Taro poured water into a bucket.'
  *Taro-ga baketu-o mizu-de sosoi-da.
  Nom bucket-Acc water-with pour-Past
  '*Taro poured a bucket with water.'

A Universal



Good news for learners!

SEMANTICS SYNTAX

A Two-way Split

English	Korean
*He decorated lights on the tree	He decorated lights on the tree
He decorated the tree with lights	He decorated the tree with lights
French	Chinese
Spanish	Japanese
Malay	Thai
Arabic	Turkish
Hebrew	Hindi
	Luganda

'Serial Verbs' (Verb Compounds)

- Japanese
  John-ga Bill-o osi-taosi-ta.
  Nom Acc push-topple-Past
  'John pushed Bill down.'
- Igbo (W. Africa)
  Adha si-ri anu ri-e
  Ada cook-asp meat eat-asp
  'Ada cooked the meat and ate it.' (Igbo)

Easy to Observe

A Parameter

English	Korean
*He decorated lights on the tree	He decorated lights on the tree
He decorated the tree with lights	He decorated the tree with lights
French	Chinese
Spanish	Japanese
Malay	Thai
Arabic	Turkish
Hebrew	Hindi
	Luganda

A Parameter

English
*He decorated lights on the tree
He decorated the tree with lights

French
Spanish
Malay
Arabic
Hebrew

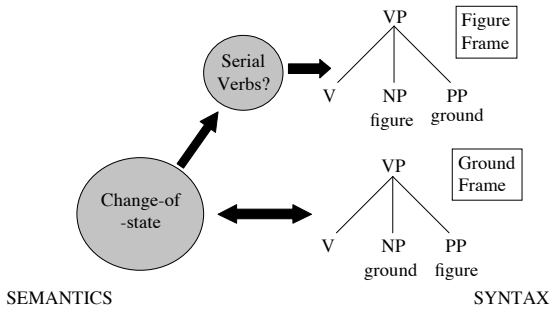
Don't Allow Serial Verbs

Korean
He decorated lights on the tree
He decorated the tree with lights

Chinese
Japanese
Thai
Turkish
Hindi
Luganda

Allow Serial Verbs

A Parameter



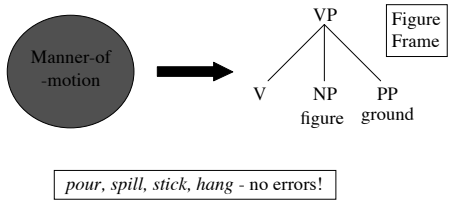
Some Verbs More Varied

- *e.g. stuff, spray, load, pile, etc.*

What do Children Know?

- 3 year olds, learning English or Korean
- Ask to describe a videotaped scene
  e.g. *filling a glass with juice*
- To get full sentences - show *contrasting* event
  e.g. *filling a bowl with water*

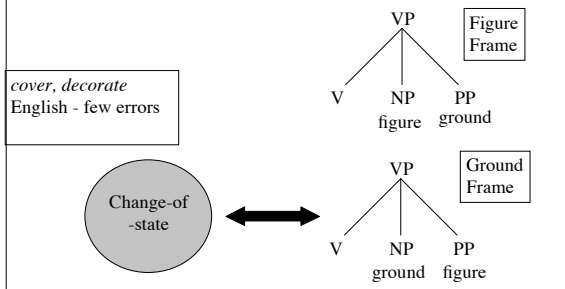
Results



pour, spill, stick, hang - no errors!

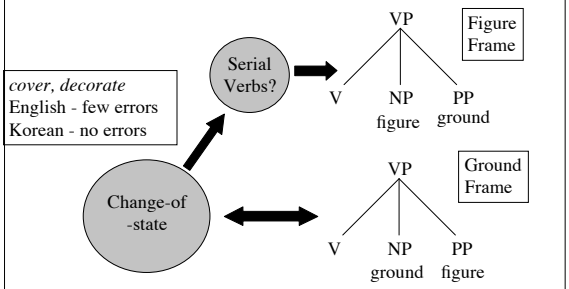
SEMANTICS SYNTAX

Results



SEMANTICS SYNTAX

Results



SEMANTICS SYNTAX

Results

- Many errors with *fill*
- ~90% ungrammatical,
  e.g. *fill the juice into the glass*
- Adults also tested
  0% errors
- Why the errors with *fill*?

Summary

- Syntax-semantics mappings vary across languages, threatening to undermine an attractive account of learning
- However, the variation is both limited and systematic
- Predictable patterns mastered early
- Less predictable patterns mastered later

Outlook

- Study of language structure and language learning are closely related … obviously
- Our unconscious knowledge of syntax can appear dauntingly complex
  … hence hard to learn
- The learner's task can look rather different once we consider cross-language uniformity & variation
- Universals may not need to be learned at all
- Where complex/obscure properties are systematically linked to easy-to-observe properties, learning gets easier
- **…this is *work in progress*…**