Psychology of Language

4 Learning syntax (and morphology)

Fall 2023
Tues/Thur 5:00-6:15pm
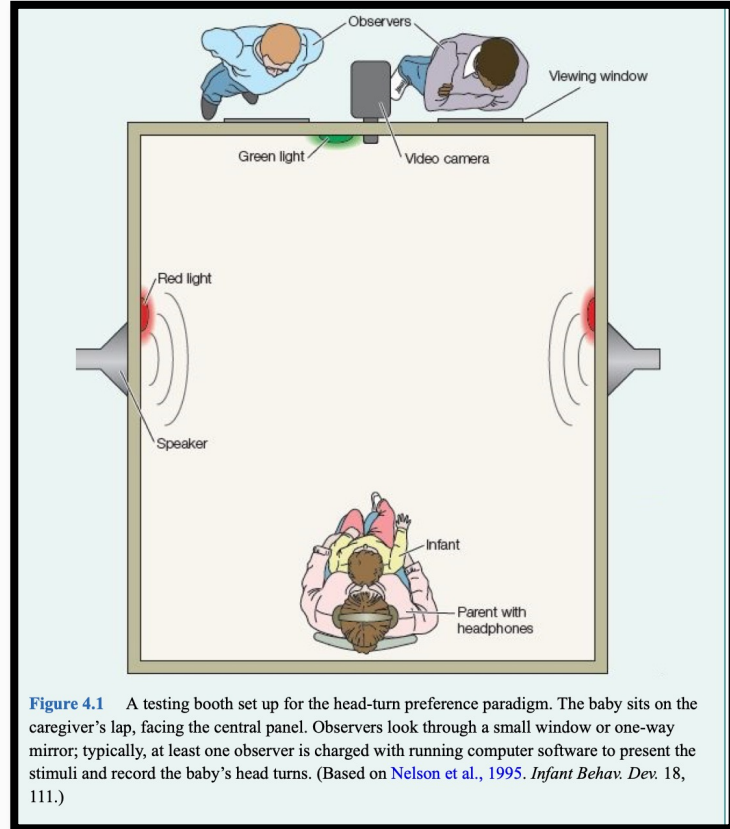
Emma Wing
Drop-in hours:
Email me to meet!

Road map

- Wrapping up & Review from **4 Learning words**
- Unit 1: Development of Language

  5 Learning syntax (and morphology)

Syntactic bootstrapping

The structure of a sentence affects a child's interpretation of a novel verb

Figure 4.1 A testing booth set up for the head-turn preference paradigm. The baby sits on the caregiver's lap, facing the central panel. Observers look through a small window or one-way mirror; typically, at least one observer is charged with running computer software to present the stimuli and record the baby's head turns. (Based on Nelson et al., 1995. *Infant Behav. Dev.* 18, 111.)
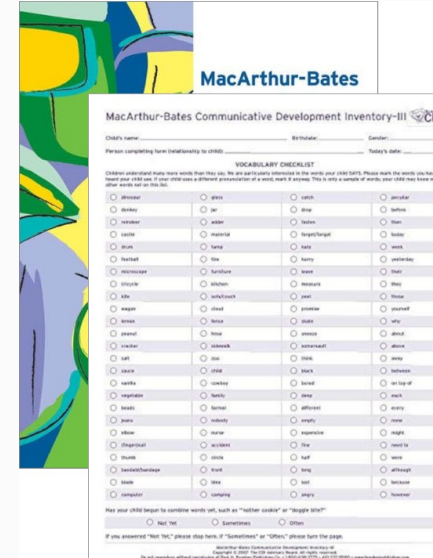
A. The rabbit is gorping the duck.
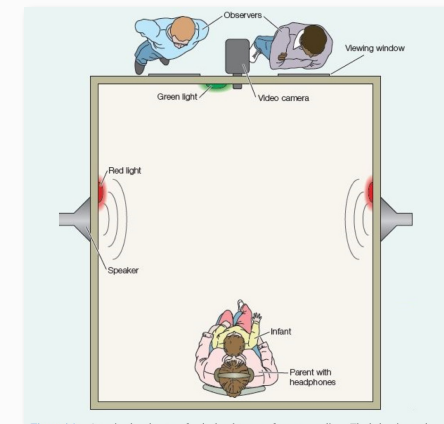
B. The rabbit and the duck are gorping.

Results:

- Children who heard the transitive sentence (A) looked toward a video of the rabbit pushing the duck.

- Children who heard the intransitive sentence (B) looked at the video of the duck and the rabbit waving their arms

Naigles (1990)

Testing children's word learning

1. Experimental comprehension
   - **Example**: preferential looking paradigm, head-turn preference paradigm

2. Experimental production
   - **Example**: watch a novel action and elicit production of sentence

3. Parent report
   - **Example**: Communicative Development Inventory (checklists of words that parents complete)

4. Language sample analysis
   - **Example**: Recorded play session with parent and child which is then transcribed and tagged

benefits and limitations of these?

Wrapping up word learning

- Infants are learning about prosody which helps segment syllables
- Syllables help segment speech sounds
- Speech sounds help learn phonotactic constraints
- Segmenting a handful of words (your name, "mom", etc.) helps learn where syllables are
- Knowing about syntax helps learn word meanings

…it's all connected!

Key concepts

✓Statistical learning

✓Lexical learning principles
   ✓Mutual exclusivity assumption
   ✓Whole object assumption
   ✓Shape bias
   ✓Extendability

✓Noun bias

✓Syntactic-bootstrapping

✓Methods for testing children's word learning
   ✓Experiment (comprehension, production); parent report; language sample

Next…

- After the one-word stage comes the two-word stage!
- How do children learn the rules of their language?

Unit 1: Development of Language

Learning morphology & syntax

Ascent of Babel, Chapter 4, pp. 41-53

Learning syntax & morphology

- Learning objectives
  - Define morphology, syntax, and semantics
  - Say what a morpheme is and identify the different types
    - Derivational vs. inflectional
  - State the difference between errors of omission and commission
  - Brown's (1973) morpheme acquisition order
  - Describe the famous *wug* test
  - Define overregularization
  - Identify example sentences that show rules are structure-dependent
  - Name 2+ sources of evidence that all children go through similar stages of morpheme acquisition

Morphology

- What is morphology?
  - The study of the individual units of meaning in language

- **Morpheme**
  - the smallest units of meaning in language
    - Uncomfortable
      - comfort
      - un-
      - -able

Morphology

Types of morphemes

-ing	flower	-able	dis-
sad	un-	pot	believe
do	-ed	-s	-ness

Morphology

Types of morphemes

-ing	flower	-able	dis-
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Free morphemes can stand on their own as words

Morphology

Types of morphemes

-ing	flower	-able	dis-
sad	un-	pot	believe
do	-ed	-s	-ness

Bound morphemes need to be attached to another word (there are 2 kinds)

Morphology

Types of morphemes

-ing	flower	-able	dis-
sad	un-	pot	believe
do	-ed	-s	-ness

Bound Morpheme #1:
Derivational: change the meaning or the type of word

Morphology

Types of morphemes

-ing	flower	-able	dis-
sad	un-	pot	believe
do	-ed	-s	-ness

Bound Morpheme #2:
Inflectional: change a grammatical property of the word (e.g., tense)

~~Two-word stage~~ MLU

- MLU: **Mean length of utterance**
  - a useful index of language development (until about MLU 4.5)
  - computed by adding the bound and free morphemes in a language sample and dividing by the number of utterances.
  - MLU increases with age
    - working memory capacity increases (temporary memory storage)
    - child is acquiring more bound morphemes and function words.
- Kids are missing many function words and bound morphemes at first, but they are sensitive to them in speech of others
  - **Function morphemes/words**: grammatical
  - **Content morphemes/words**: words with non-grammatical meanings

Roger Brown's stages

Stage	Age in months	Overall MLU	Morphemes present	Examples
I	15-30	1.75	Content words only	- *More juice* - *Bird fly.*

Brown (1973), Sedivy (2019)

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IV	40-46	3.5	Articles Regular past tense Third person singular (reg)	- *This is the mommy.* - *I holded it.* - *He likes me.*
V	42-52+	4.0	Third person singular (irreg) Contracted *to be*	- *She does it fast.* - *He's swimming*

How do we know it's a productive rule?

THIS IS A WUG.

NOW THERE IS ANOTHER ONE.

THERE ARE TWO OF THEM.

THERE ARE TWO _____.
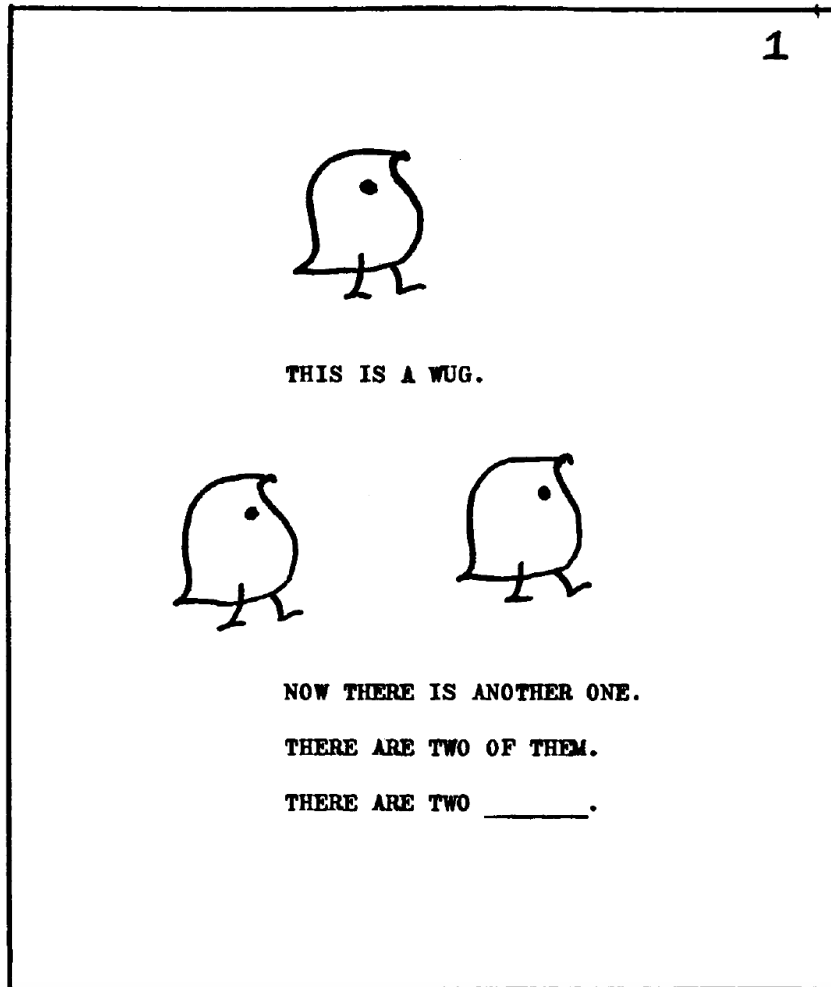
Preschool age children can apply the plural rule to novel words

Berko Gleason (1958)

"Two-word stage"

- English speaking children follow word order, which is important in English
  1. Mommy push
  2. pull car
  3. that kitty

- Bilingual children follow the correct word order in each language

Meisel (1989)

Syntax

- ## What is **syntax**?
  - a set of rules or constraints for how linguistic units can be put together
  - It's connected to **semantics**: the study of the rules that determine the meaning of linguistic units when they are put together or combined

    - **Compositionality:** there are fixed rules for combining units of language in terms of their form that result in fixed meaning relationships between the words that are joined together

    1. Oliver loves Jazzy.
    2. Jazzy loves Oliver.

Let's see what this means exactly.

Acceptability judgements

1. The fox jumped over the fence.
2. This is fun class.
3. Dog Kaya's ate potato the.
4. What did Pasha leave his book about on the table?
5. What do you believe the claim that Oliver bought?
6. The cookie that the child is eating is disappearing fast.
7. Is the cookie that the child eating is disappearing fast?
8. Colorless green ideas sleep furiously.

Acceptability judgements (cont.)

Syntax can be studied separately from semantics

Exhausted little children sleep peacefully.

Acceptability judgements (cont.)

Syntax can be studied separately from semantics

adj.	adj.	noun	verb	adverb
Exhausted	little	children	sleep	peacefully.

Acceptability judgements (cont.)

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Acceptability judgements (cont.)

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sensical

nonsensical

Competence vs. performance

Knowledge of language rules can be separated from when you implement those rules in real time

Competence: knowledge of the rules of language
Performance: use of that knowledge in practice (subject to lapses in memory and attention)

1. The cheese smelled good.
2. The cheese **that the mouse ate** smelled good.
3. The cheese that the mouse **that the cat chased** ate smelled good.

Acceptability judgements (cont.)

Syntax tells us what we can say and also what we cannot say.

Pasha left his book about snails on the table.

Acceptability judgements (cont.)

Syntax tells us what we can say and also what we cannot say.

Pasha left his book about **snails** on the table.

Acceptability judgements (cont.)

Syntax tells us what we can say and also what we cannot say.

Pasha left his book about *what?* on the table.

Acceptability judgements (cont.)

Syntax tells us what we can say and also what we cannot say.

Pasha left his book about *what* on the table.
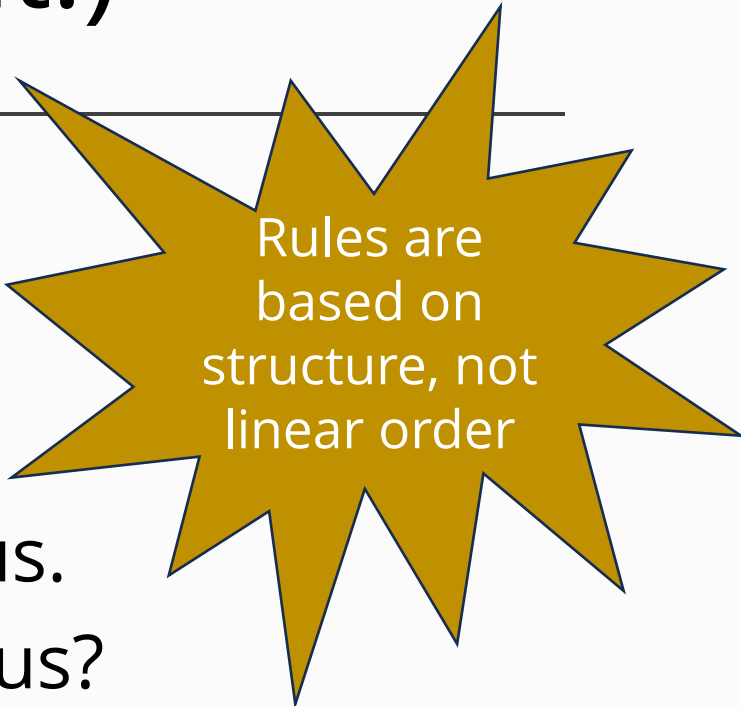
Acceptability judgements (cont.)

Syntax tells us what we can say and what we cannot say.

*What did Pasha leave his book about on the table?

Acceptability judgements (cont.)

1. The cookie **is** delicious.
2. **Is** the cookie delicious?

3. The cookie that the child **is** eating is delicious.
4. *Is the cookie that the child eating is delicious?

5. The cookie [that the child is eating] **is** delicious.
6. **Is** the cookie that the child is eating delicious?

Rules are based on structure, not linear order
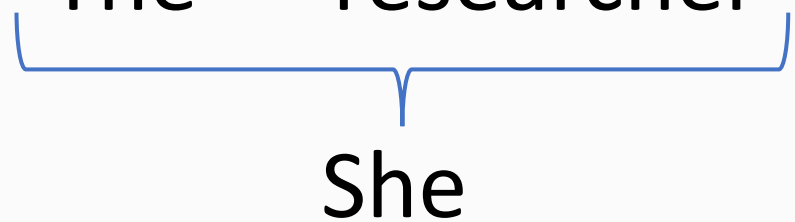
Hierarchical structure

Hierarchical structure: words group together into constituents, which in turn can group together with other words or constituents to form larger constituents

The researcher writes the abstract.

one test of constituency is to try to replace chunks of language with other things while maintaining the same structure in the sentence

The researcher writes the abstract.

She

for example, we can replace "The researcher" with "she,"
so this is a constituent

The   researcher   writes   the   abstract.

???

we **cannot** replace "researcher writes the" with anything and still maintain the structure of the sentence, so this is *not* a constituent

The researcher writes the abstract.

She

it

we can replace "the abstract" with "it"

The researcher writes the abstract.

She does it

we can replace "writes" with "does"
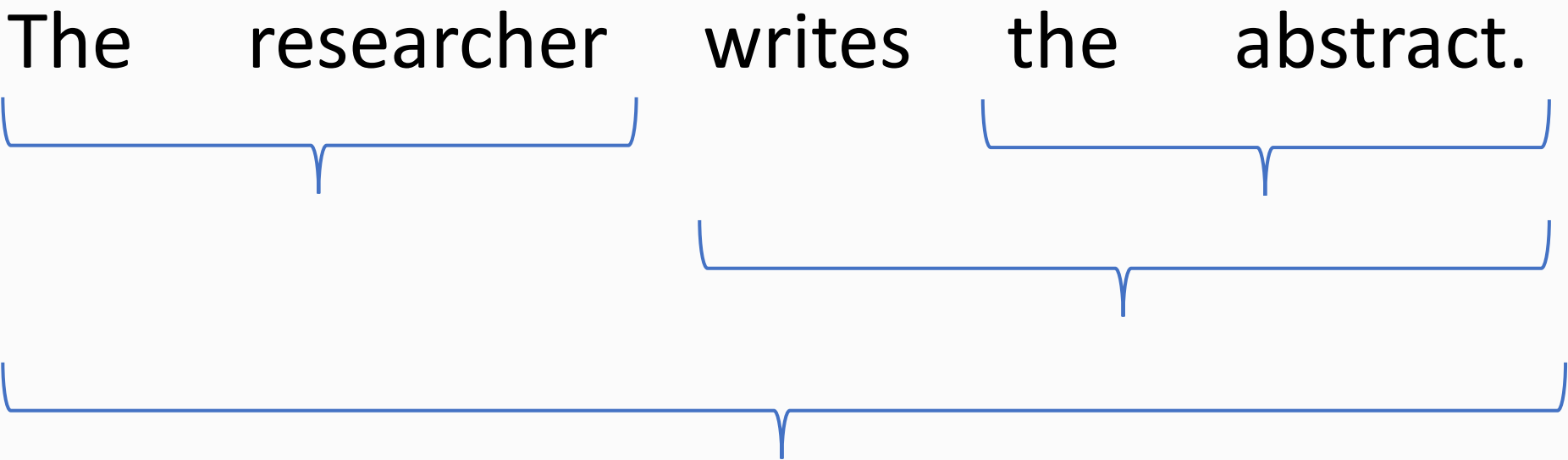(e.g., in response to "Who writes the abstract?")

The researcher writes the abstract.

She does
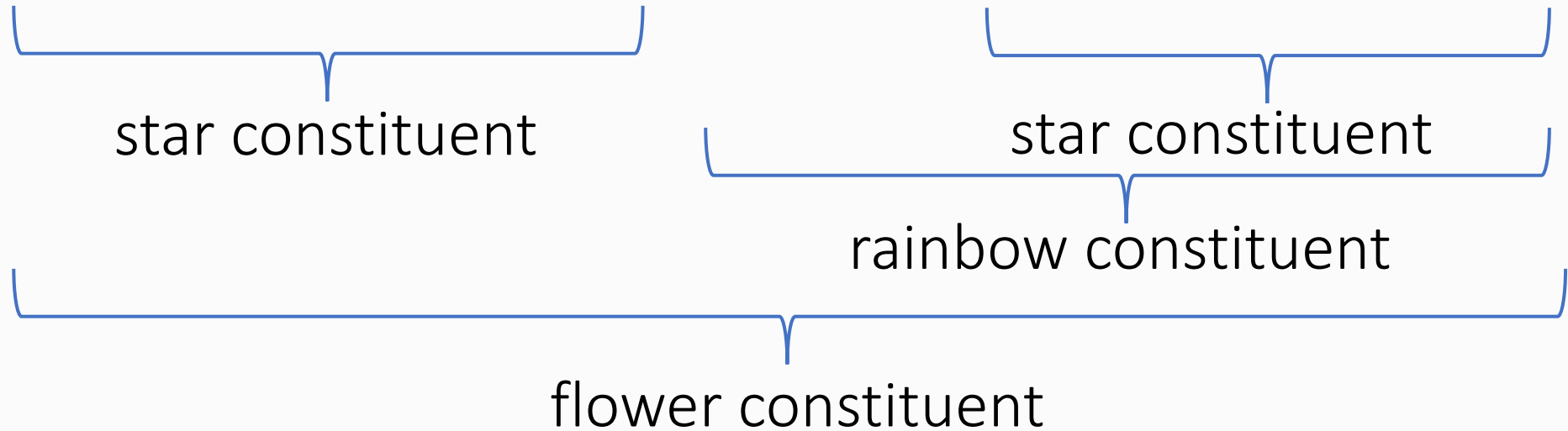
we can even replace "writes the abstract" with "does"!
(e.g., in response to "Who writes the abstract?")

Constituents within constituents
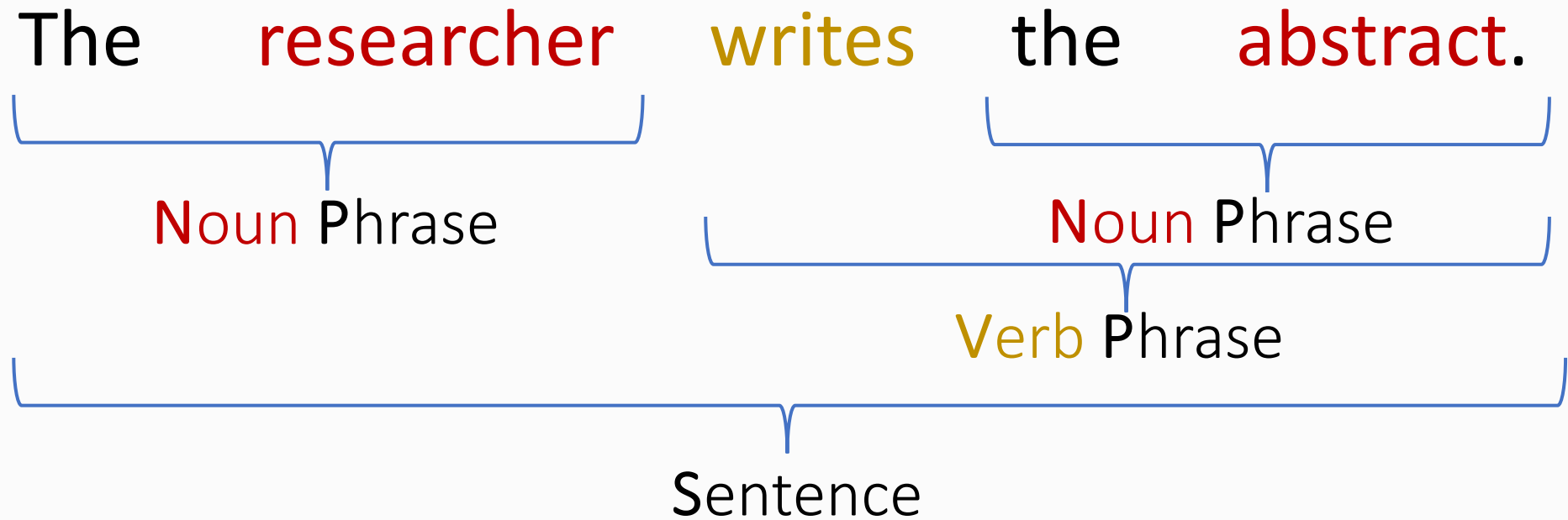
The researcher writes the abstract.

we can draw these constituents inside each other

The researcher writes the abstract.

star constituent

star constituent

rainbow constituent

flower constituent

and label them with names

The researcher writes the abstract.

Noun Phrase

Noun Phrase

Verb Phrase

Sentence

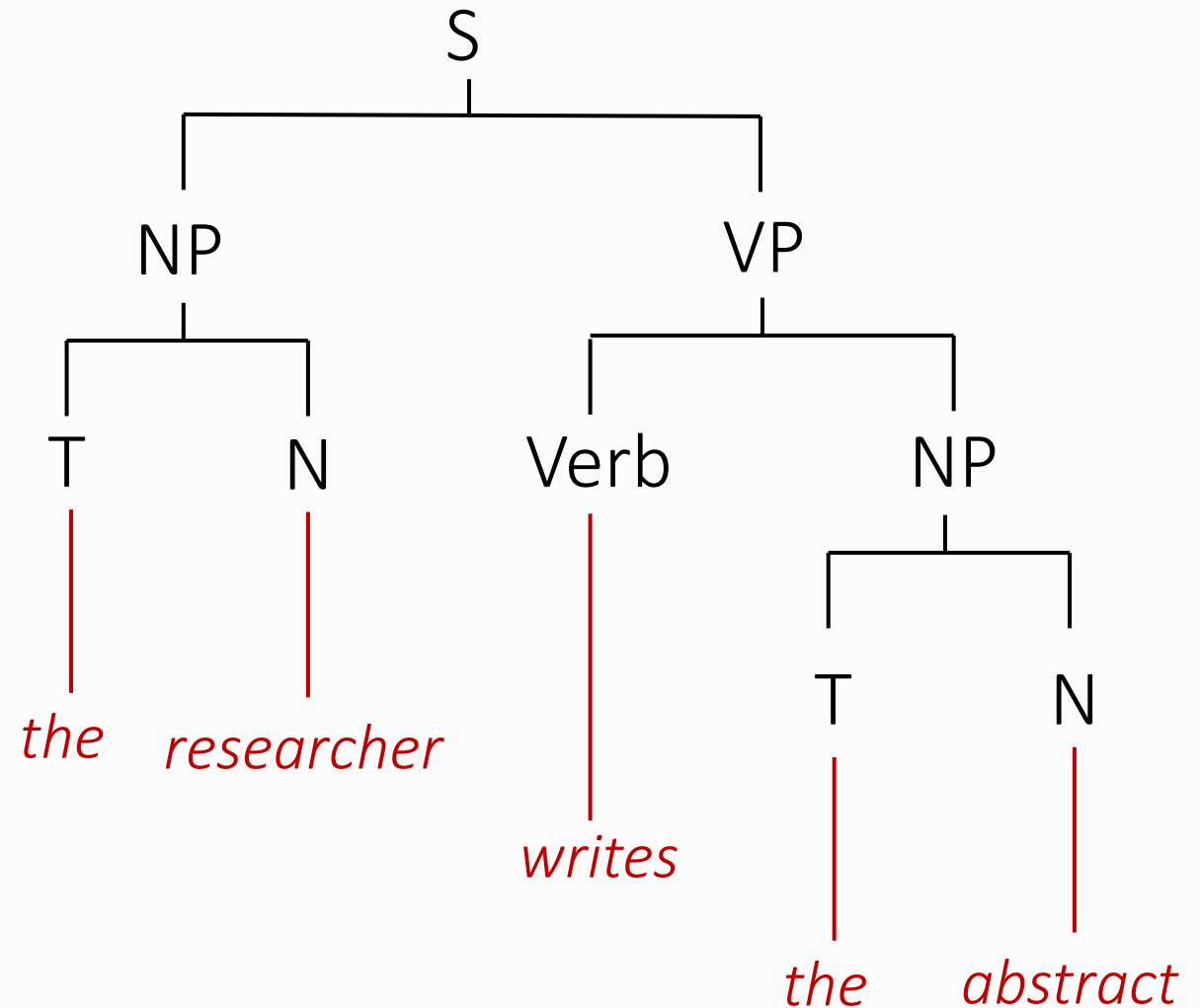…or how about some more helpful labels
that reflect the most important word
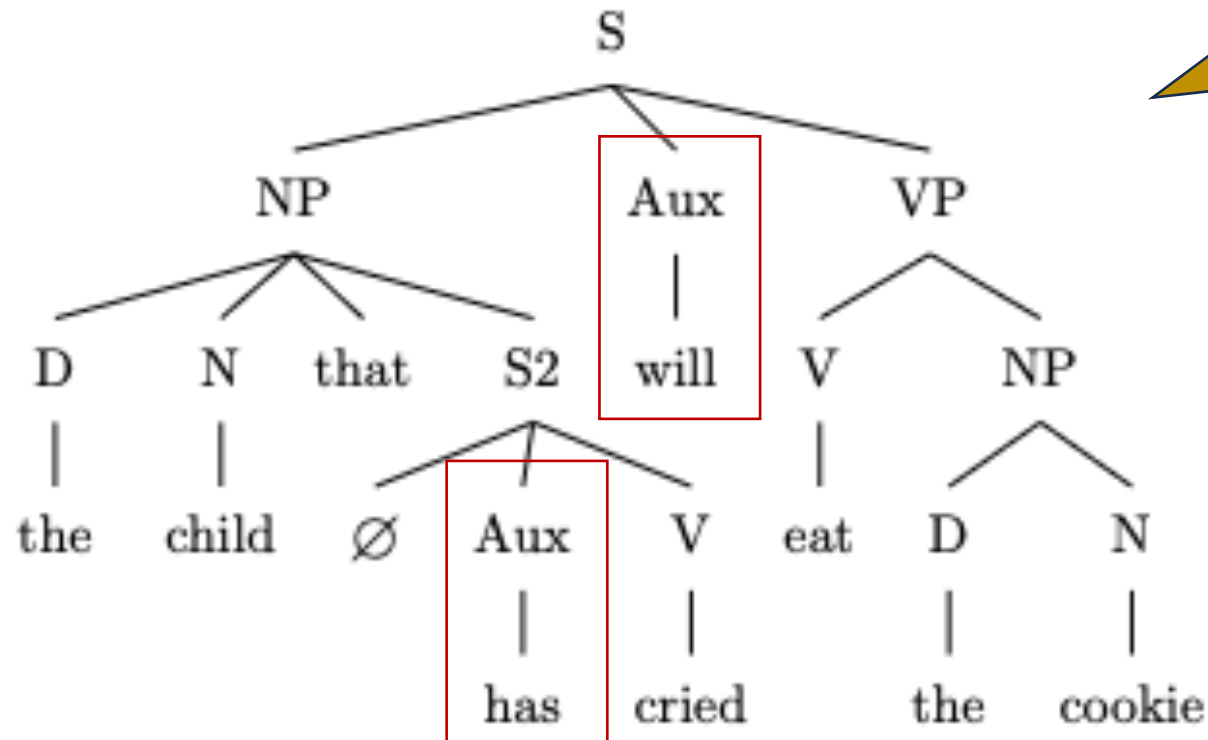in the constituent?

Hierarchical structure

This is how these structures are typically depicted!

(tree structure)

Hierarchical structure

The child that has cried will eat the cookie.
Will the child that has cried   eat the cookie?

The point: Rules are based on structure

Learning that language is structured

- Kids learn the structure without being taught explicitly.
- Not only do they produce correct sentences, they do not produce incorrect sentences
  - In other words: knowledge of syntax is not only being able to generate sentences that are allowed in your language but also knowledge of what you cannot say
- They hardly make any errors!
  - We would expect **errors of commission** (saying something wrong)
  - The majority of errors are **errors of omission** (leaving something out)

Errors in child speech: omission

1. No Hannah mess.
2. No Daddy mess.
3. Where go, Mom?
4. Mom, talk phone.
5. Mommy like it.
6. Want juice.
7. More cracker.
8. Daddy push in swing.
9. Go subby [subway].

Types of evidence

- What happens when adults try to correct children?

  - **Positive evidence**: evidence of what is grammatical
  - **Negative evidence**: evidence about what is *not* grammatical
    - Extremely rare
    - Typically targets semantics, not syntax
    - Typically does not affect the child's linguistic behavior

    And errors typically show the state of the grammar in the child's head!
    (errors appear systematic)

Types of evidence

Child: My teacher holded the baby rabbits and we patted them.
Mother: Did you say your teacher held the baby rabbits?
Child: Yes.
Mother: What did you say she did?
Child: She holded the baby rabbits and we patted them.
Mother: Did you say she held them tightly?
Child: No, she holded them loosely.

Types of evidence

Child: Want other one spoon, Daddy.
Parent: You mean you want the other spoon
Child: Yes, I want other one spoon, please, Daddy.
Parent: Can you say "the other spoon"?
Child: Other ... one ... spoon.
Parent: Say "other."
Child: Other.
Parent: Spoon.
Child: Spoon.
Parent: Other spoon.
Child: Other ... spoon. Now give me other one spoon?

Stages of past tense acquisition

Stage 1: Children around 18 months old begin to use both regular (*talked, finished*) and irregular (*did, went, sang, held*) past tense forms

Stage 2: Children start to overregularize (*goed, singed, holded*)

Stage 3: Children return to using correct irregular forms

Why does this happen? What is going on?

Stages of past tense acquisition

What happens:
> Kids use *Lexical Learning*, then they use *Rule learning*.

Marcus et al. on *why* overregularization happens:
> "We propose a simple explanation. Children, like adults, mark tense using memory (for irregulars) and an affixation rule that can generate a regular past tense form for any verb. Retrieval of an irregular blocks the rule, but children's memory traces are not strong enough to guarantee perfect retrieval. When retrieval fails, the rule is applied, and overregularization results." (abstract, 1992)

Big debate: Innate or learned?

How on earth could children learn all of this stuff, in the same order, without making (a lot of) errors, and without explicit instruction?
- Language Acquisition Device? (innate)
  - Innate knowledge combined with input
  - Poverty of the stimulus
- Statistical learning? (learned)
  - Distributional evidence

Review

- What is a morpheme? What kinds of morphemes are there?
  - Give an example of each kind
- What is MLU and why is it important?
- What is syntax?
- What is semantics?
- What are errors of omission and commission?
- What is positive and negative evidence?
- What is an experiment we can use to study the acquisition of inflectional morphemes?

Key concepts

✓Morphology

✓Morphemes and types of them
- ✓Free & bound (derivational & inflectional)

✓Mean length of utterance (MLU)

✓Content vs. function morphemes

✓Evidence for stages of morpheme acquisition

✓Types of errors and which children make more of
- ✓Commission and omission

✓Positive and negative evidence

✓Syntax (rules are productive and hierarchical)

✓Semantics (compositional, separable from syntax)

✓An experiment to test whether a child has learned a productive rule

Next…

- Is syntactic knowledge innate?
- Why does learning a new language get harder as we grow up?
- How do languages even begin?
- What do younger generations do when the language input they receive is impoverished (not fully rule-governed, or lacking rules)?