Today's topics:

- **Morphology — Word structure**
- **Syntax — Sentence structure**

Background (provided in today's class):

- Swahili translation puzzle
- Ingrid and the Martian video

0. Key points today

- Review / check-in: Language, sounds, and spelling
- Morphology and its relevance to reading
  - Morphological awareness
- Syntax and its relevance to reading
  - Structural ambiguity as evidence for hierarchical structure in sentences
  - “Garden-path” sentences

1. Language, sounds, and spelling

Review and summary of key ideas so far

- Humans are “hard-wired” for **spoken** language
  - Young children naturally **acquire** a systematic and unconscious **mental grammar** from exposure to the language of their community
  - Every language variety has a systematic mental grammar, although some may differ from the “standard” / “mainstream” / “classroom” variety
- **Reading** and **writing** are cultural innovations, and must be explicitly **learned**
  - Written language is not the “core” of language

1. Language, sounds, and spelling

Review and summary of some key ideas so far

- We can analyze the **sounds** of a spoken language like English, as a precursor to looking at their **role** in reading
  - **Phonetics**: How each individual consonant or vowel sound is articulated (and perceived)
  - **Phonology**: How the mental grammar represents, organizes, and manipulates sounds
    - **Phoneme** = distinct mental sound category
    - **Syllable** = mental-grammar unit that groups sounds
  - **Phonological awareness**: Conscious awareness of, and ability to manipulate, aspects of phonological structure
  - **Phonics**: An instructional method that explicitly teaches letter/sound relationships

1. Language, sounds, and spelling

- Any questions about topics we have covered so far?

2. Structure of words and phrases/sentences

- In this first part of the course, we are looking at aspects of (spoken) **language structure**, and beginning to consider their relevance to reading
- So far, we have looked at
  - **Phonetics** — **physical sounds** of speech
  - **Phonology** — **mental** organization of speech **sounds**
- Today, we will look at
  - **Morphology** — **words** and their meaningful **parts**
  - **Syntax** — the structure of **phrases** and **sentences**

3. Morphology: Words and meaningful parts

Discussion

- Swahili verbs translation puzzle
  - What are the answers to the translation puzzles?
  - ***How*** did you figure out the translations?

3. Morphology: Words and meaningful parts

- Swahili verbs translation puzzle
- ***How*** did you figure out the translations?
  - Each piece of **meaning corresponds** to a piece of the word's **sound shape**

  → ***Compare*** all the words that **share** a piece of meaning and figure out what is the same in their sound shape

  → ***Compare*** words that are **minimally different** in meaning and figure out what distinguishes their sound shape

3. Morphology: Words and meaningful parts

- These word pieces are **morphemes**
- **Morpheme** = minimal unit of sound-meaning correspondence
  - Cannot be divided without losing meaning
- How many morphemes are in these English words?
  - *cat*
  - *cats*
  - *category*
  - *catlikeness*

  Hint: Look for sound-meaning correspondences
  - A morpheme should **recur** in other words (and contribute the same meaning)

3. Morphology: Words and meaningful parts

- These word pieces are **morphemes**
- **Morpheme** = minimal unit of sound-meaning correspondence
  - Cannot be divided without losing meaning
- How many morphemes are in these English words?
  - *cat* |1
  - *cat+s* |2
  - *category* |1
  - *cat+like+ness* |3

  Hint: Look for sound-meaning correspondences
  - A morpheme should **recur** in other words (and contribute the same meaning)

3. Morphology: Words and meaningful parts

How many of these terms do you already know?

- **root**

- **affix**

  - **inflectional** affix

  - **derivational** affix

- What can we find in: *cat* *cat*+*s* *cat*+*like*+*ness*

3. Morphology: Words and meaningful parts

- **root** — the core meaning of a word
  - Every word has at least one root
  - More than one root → compound word
- **affix** — prefix, suffix, etc., added to a **base** (a root, or a prior combination of morphemes)
  - **inflectional** affix — adds grammatical information (number, gender, person, tense, ...)
  - **derivational** affix — derives a new word with a different meaning
- What can we find in: *cat* *cat*+*s* *cat*+*like*+*ness*

3. Morphology: Words and meaningful parts

Discussion

- Which of these pairs of words share a **morpheme**? (Hint: What does the morpheme mean?)
  - *higher, silver*
  - *rewrite, remake*
  - *smaller, singer*
  - *unhappy, untie*

3. Morphology: Words and meaningful parts

Discussion

- Which of these pairs of words share a morpheme? (Hint: What does the morpheme mean?)
  - *high**er**, silv**er*** | no
  - ***re**write, **re**make* | yes! — meaning?
  - *small**er**, sing**er*** | no…but check *high**er**/small**er***
  - ***un**happy, **un**tie* | no

- Note that the **category** (noun, verb, etc.) an affix **attaches** to, and the category it **creates**, can also be used to distinguish morphemes

4. Morphology and reading

Discussion

- Remember *knotting* and *nodding*?
  - They both have [ɾ] (“flap”) in the middle
  - **Why** are the two flaps spelled differently?
- Another example: Is the regular plural morpheme always pronounced the same way in English? Does the spelling match the pronunciation? **Why**?
  - *cats , parks, cliffs*
  - *dogs, birds, loves*

4. Morphology and reading

- Remember *knotting* and *nodding*?
  - They both have [ɾ] (“flap”) in the middle
  - **Why** are they spelled differently?
- Another example: Is the regular plural morpheme always pronounced the same way in English? Does the spelling match the pronunciation? **Why**?
  - *cats , parks, cliffs* [s]
  - *dogs, birds, loves* [z]
- **Some** cases of sound/spelling mismatch are due to **spelling** a **morpheme** consistently

4. Morphology and reading

- Reminder: We discussed **phonological awareness** earlier in the course
  - Conscious awareness of, & ability to manipulate, phonological units like phonemes and syllables

Discussion

- Based on the above, what do you think **morphological awareness** would be?
- How do you think morphological awareness might be relevant in **reading** or **reading education**?

5. Structural ambiguity: Evidence for syntax

- When we imagine speaking (or writing) a sentence, we may imagine lining up words one after the other
- In the mental grammar, does a sentence consist of words lined up like beads on a string?

5. Structural ambiguity: Evidence for syntax

- When we imagine speaking (or writing) a sentence, we may imagine lining up words one after the other
- In the mental grammar, does a sentence consist of words lined up like beads on a string?
  - **No!** There is evidence that the mental grammar **groups words** into smaller phrases, which are then grouped into larger phrases and sentences
  - One source of evidence: **Structural ambiguity**

5. Structural ambiguity: Evidence for syntax

- Quick context check-in:
  - What are the Falkland Islands?
  - Why were they in the news in the 1980s?

5. Structural ambiguity: Evidence for syntax

- Why are the following newspaper headlines funny?

  Squad Helps Dog Bite Victim

  British Left Waffles on Falklands

  McDonald's Fries the Holy Grail for Potato Farmers

  https://www.nytimes.com/2010/01/31/magazine/31FOB-onlanguage-t.html

5. Structural ambiguity: Evidence for syntax

- Each headline has a second, unintended meaning

  Squad Helps Dog Bite Victim

  British Left Waffles on Falklands

  McDonald's Fries the Holy Grail for Potato Farmers

  https://www.nytimes.com/2010/01/31/magazine/31FOB-onlanguage-t.html

Group discussion

- Is it possible to read these out loud in a way that distinguishes between the two meanings?

5. Structural ambiguity: Evidence for syntax

- **Why** are there **two meanings** for this sentence?

  British Left Waffles on Falklands

5. Structural ambiguity: Evidence for syntax

- **Why** are there **two meanings** for this sentence?

British	Left	Waffles	on Falklands
noun?	verb?	noun?	= breakfast
adj?	noun?	verb?	= is undecided

5. Structural ambiguity: Evidence for syntax

- Which version goes with which meaning?

  British Left Waffles on Falklands

  British Left Waffles on Falklands

- Is there a **relationship** between pronunciation and meaning with these?

5. Structural ambiguity: Evidence for syntax

- Which version goes with which meaning?

  British Left **Waffles** on Falklands = is undecided

  British Left **Waffles** on Falklands = breakfast

- There tends to be a **large prosodic break** after the **subject** of a sentence in English (and most languages)

  A **large prosodic break** may be signaled by some or all of:

  - A pause
  - Phrase-final intonation (tone pattern)
  - Creaky voice (vocal fry)

5. Structural ambiguity: Evidence for syntax

- When we examine the mental grammar of native speakers (of any language), we find that **within a sentence, words form subgroups**
  - These subgroups are called **constituents**

- Evidence: Constituents can be **replaced** or **moved**

The cute fluffy kittens	*shredded*	*the magazine.*
They	*shredded*	*the magazine.*
The cute fluffy kittens	*shredded*	***it***.
The cute fluffy kittens	***did***.	

5. Structural ambiguity: Evidence for syntax

- Back to this difference…

  British Left **Waffles** on Falklands = is undecided

  British Left **Waffles** on Falklands = breakfast

- We said…
  There tends to be a **large prosodic break** after the subject of a sentence in English (and most languages)

  - Now we can understand this as an effect of syntactic **constituency** on **prosodic structure** (including the location of prosodic breaks)

5. Structural ambiguity: Evidence for syntax

- Note that not all ambiguity is structural

  *I don't like to use my computer because of the **mouse**.*

  Can pronunciation disambiguate this one?

5. Structural ambiguity: Evidence for syntax

- Note that not all ambiguity is structural

  *I don't like to use my computer because of the **mouse**.*

  Can pronunciation disambiguate this one? | No!

  - Some sentences are ambiguous purely because **a word has two different meanings**, and not because the string of words has two different structures

6. Reading a sentence in real time

- A text will appear little by little below.
  - Raise your hand if it stops feeling like a real sentence of English.
  - Put your hand back down if it gets better again.

6. Reading a sentence in real time

- A text will appear little by little below.
  - Raise your hand if it stops feeling like a real sentence of English.
  - Put your hand back down if it gets better again.

  The horse

6. Reading a sentence in real time

- A text will appear little by little below.
  - Raise your hand if it stops feeling like a real sentence of English.
  - Put your hand back down if it gets better again.

The horse raced

6. Reading a sentence in real time

- A text will appear little by little below.
  - Raise your hand if it stops feeling like a real sentence of English.
  - Put your hand back down if it gets better again.

  The horse raced past

6. Reading a sentence in real time

- A text will appear little by little below.
  - Raise your hand if it stops feeling like a real sentence of English.
  - Put your hand back down if it gets better again.

  The horse raced past the barn

6. Reading a sentence in real time

- A text will appear little by little below.
  - Raise your hand if it stops feeling like a real sentence of English.
  - Put your hand back down if it gets better again.

The horse raced past the barn fell

6. Reading a sentence in real time

- A text will appear little by little below.
  - Raise your hand if it stops feeling like a real sentence of English.
  - Put your hand back down if it gets better again.

The horse raced past the barn fell,
but the horse ridden in the meadow didn’t.

6. Reading a sentence in real time

- What happened?

the horse **raced** **past the barn** **fell**

- main verb?
- part of relative clause?

- Two possible interpretations of *raced*
- **Your real-time syntax parser typically chooses the wrong one** (due to frequency?)

the horse **ridden** **in the meadow** **didn't**

- ~~main verb?~~
- part of relative clause?

- Only one interpretation of *ridden* — helps with *raced*

6. Reading a sentence in real time

- What happened?

  the horse raced past the barn fell

- Examples like this are called "**garden-path sentences**" because your real-time syntax parser gets "led down the garden path" and has to recover
  - This causes **processing difficulty**, which can be **measured** experimentally
  - What kind of mistake is the parser making here?

    → Wrong **constituent structure** is initially assigned to the sentence

7. Reading and syntax

Key points about the syntax of (spoken) language:

- Our **mental grammar** produces and comprehends **sentences** using a **hierarchical structure**
- Some sentences have more than one **meaning** because they have more than one **structure**
- Sometimes the different structures are assigned different **pronunciations** (such as prosodic breaks)

7. Reading and syntax

When we read a written text in real time…

- Sometimes we (temporarily) **choose** the "wrong" structure in our mental parser
  - This can impede understanding
- A **text** doesn't provide access to the **prosodic** information that might disambiguate two structures
  - There are exceptions: How can (some) prosodic information be represented in text?
  - There's a trade-off between phonological detail and ease/speed of reading

8. A deeper look at structural ambiguity

Note: Section 8 of the lecture outline is optional material

- To be covered in class if time permits
- For your information if you are interested in learning more about syntax
- See the video that these examples are from (LingVids)

- Two structures and **two possible meanings**

  Ingrid saw the Martian with a telescope

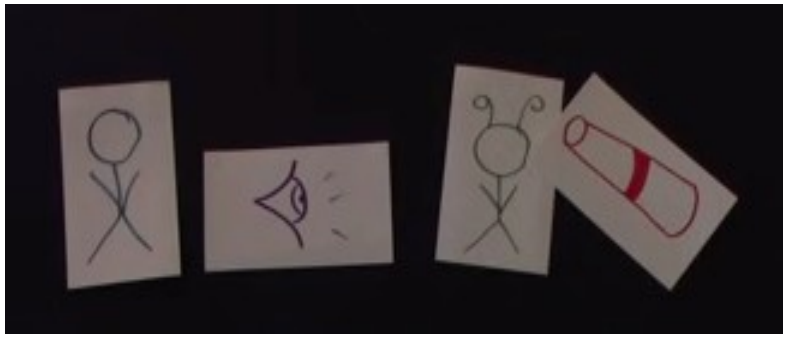
  - What are the two possible **meanings**?
  - What is the **evidence** that they correspond to two different **structures**?

8. A deeper look at structural ambiguity

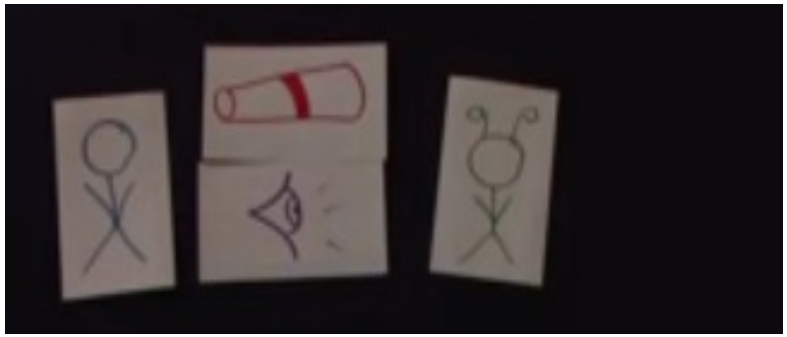
- What are the **two possible meanings**?

Ingrid saw the Martian with a telescope

#1: **the Martian has**
a telescope



#2: **the seeing happened by means of**
a telescope



- How do we know that they correspond to two different **sentence structures**?

8. A deeper look at structural ambiguity

- When we examine the mental grammar of native speakers (of any language), we find that **within a sentence, words form subgroups**
  - These subgroups are called **constituents**

- Evidence: Constituents can be **replaced** or **moved**

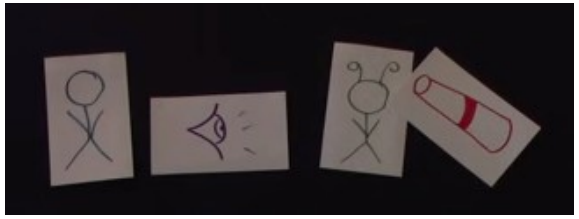
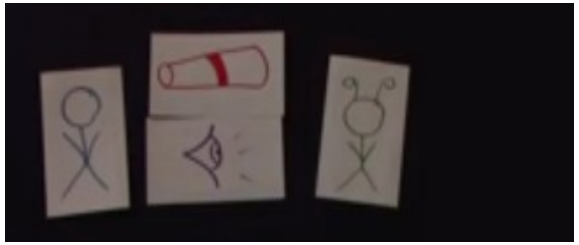
The cute fluffy kittens	*shredded*	*the magazine.*
They	*shredded*	*the magazine.*
The cute fluffy kittens	*shredded*	***it***.
The cute fluffy kittens	***did***.	

8. A deeper look at structural ambiguity

- Which **meaning** goes with which **structure**?

Ingrid saw *<u>the Martian with a telescope</u>*.
Ingrid saw ***<u>it</u>.***

Ingrid saw *<u>the Martian</u>* *with a telescope.*
Ingrid saw ***<u>it</u>*** ***with a telescope.***

-  ?
-  ?

8. A deeper look at structural ambiguity

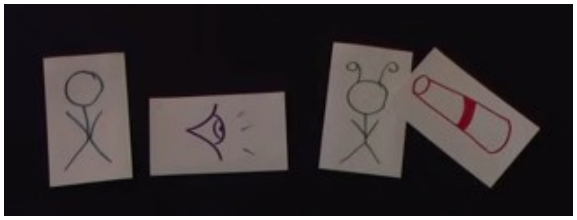
- Which **meaning** goes with which **structure**?

#1: **the Martian has** a telescope

*Ingrid saw **[the Martian with a telescope]**.*

✔ *Ingrid saw **it**.*

✘ *Ingrid saw it with a telescope.*

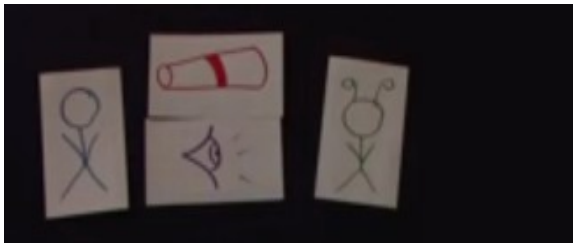


#2: **the seeing happened by means of** a telescope

*Ingrid saw **[the Martian]** with a telescope.*

✘ *Ingrid saw it.*

✔ *Ingrid saw **it** with a telescope.*



9. For next time

- We will look at some basics of **visual processing** of written text
- Use the **discussion prep slides** to help you work through the reading!