• Introduction to syntax
• The X' schema — Heads and phrases

Background reading:
• CL Ch 5, §1 through §1.3 (§1.1 is review)
• CL Ch 5, Appendix sections on Merge
1. Syntax in the mental grammar

• So far, we have looked at
  - **phonetics** — the articulation (and acoustics and perception) of **speech sounds**
  - **phonology** — how **speech sounds** are represented and altered by the mental grammar
  - **morphology** — how the mental grammar puts **morphemes** together to form **words**

• Next we will look at **syntax** — how the mental grammar puts **words** together to form **phrases** and **sentences**
1. Syntax in the mental grammar

• The mental grammar must include a mechanism for **generating** and **analyzing** previously unknown sentences — *Why?*
1. Syntax in the mental grammar

• The mental grammar must include a mechanism for *generating* and *analyzing* previously unknown sentences — *Why?*
  → Human syntax is *creative*: humans can produce and understand sentences never seen before

• Linguists want to know: What is this mechanism?
  - How does the mental grammar combine words into phrases and sentences?
1. Syntax in the mental grammar

Review (from the first week of class)

- **Descriptive grammar**
  - What people do say (and understand)

- **Mental grammar = Linguistic competence**
  - “What do we know when we know a language?”

- **Linguistics is a scientific approach to language**
  - Our data: What people say (and understand)
  - Using this data, we aspire to build a **model** of human **mental grammar**
1. Syntax in the mental grammar

- **Descriptive grammar** — We want to know how a native speaker would do the following:
  
  - Classify possible sentences (arrangements of words and phrases) as *grammatical* versus *ungrammatical*
  
  - Group the words in a sentence into larger units (called syntactic *constituents*)
1. Syntax in the mental grammar

• After we discover what native speakers *do*, we want to determine what speakers’ **mental grammar** must be like for their language to be that way

• We do this by **developing a model of mental grammar** that can:
  - Produce sentences that native speakers find **grammatical**, and not produce sentences that native speakers find ungrammatical
  - Make the right predictions about which words in a sentence form **constituents** (units, subgroups)
1. Syntax in the mental grammar

Review (from the first week of class)

- A word, sentence, etc. is **grammatical** with respect to a particular language variety if:
  - Native speakers **produce** it (and it’s not a speech error)
  - When native speakers hear it, their mental grammar **classifies** it as grammatical (part of the language; structurally acceptable)

- Being **grammatical** is **NOT** the same thing as “being true” or “making sense”!
  - For more on this point, review the slide set “**Grammaticality judgments**” from W Aug 12
2. Words and phrases

• “Sentences are not formed by simply stringing words together like beads on a necklace.” (CL, p 172)
  - Words (and phrases) are grouped into larger phrases
  - The internal structure of a sentence is not flat, but hierarchical

• We have already modeled hierarchical structure inside words with word trees (which affix attaches first?)

• Now we will apply a similar tree technique in analyzing phrase and sentence structure
2. Words and phrases

• Overview of our phrase-structure discussion:
  - First, we will look at a **linguistic model** that is designed to generate the structure of phrases within a sentence: the **X' schema**
  - Then, we will investigate how well the phrase structures produced by this model **match** grammaticality judgments by native speakers
  - We will make some additions and refinements to our model when needed to account for the data
2. Words and phrases

• The X' schema (pronounced “X-bar”) is a blueprint for sentence structure in our model of mental grammar.

• Consider this phrase:

   *a book about rabbits*

   - What is the head (core word) of the phrase?
   - The word category of the head is: _____
   - Thus, we call this phrase a ____ phrase
2. Words and phrases

- The **X' schema** (pronounced “X-bar”) is a **blueprint for sentence structure** in our model of mental grammar.

- Consider this phrase: 
  
  *a book about rabbits*

  - What is the **head** (core word) of the phrase?
  - The word category of the head is: **N (noun)**
  - Thus, we call this phrase a **noun phrase (NP)**
2. Words and phrases

- We can draw a tree structure for this noun phrase as follows:

```
NP
   (label)
   a
   N
   book
   (label)
   about rabbits
```

- This is the basic idea behind the **X' schema**
3. Words and phrases in the X' schema

- The **X' schema** is a key piece of our model of the syntax component of human mental grammar.

- Another key piece of our model is the Merge operation ([CL, p 175](#)), which builds **phrases**

**Merge**: Combine words in a manner compatible with the X' schema.
3. Words and phrases in the X' schema

- The **X' schema** is a key piece of our model of the syntax component of human mental grammar
  - Word combinations that **don’t fit** into the X' schema are predicted to be **ungrammatical**
  - Anything that is an **XP** in the X' schema is predicted to be a **constituent** (discussed next time)

- If human speakers differ from our model in terms of what is grammatical or what is a constituent, we need to **adjust** our model!
3. Words and phrases in the X' schema

- **Lexical categories** and their phrases
  - N → NP
  - V → VP
  - A → AP
  - P → PP

- **Functional categories**
  - (see CL p 169, Table 5.1)
  - Det: determiner
  - Deg: degree word
  - Aux: auxiliary verb
  - Con: conjunction
  - T → TP
  - C → CP

(we will use C and CP later)
3. Words and phrases in the X' schema

- The X' **schema** is a blueprint for sentence structure in our model of mental grammar.

```
XP
   /\  
(SPECIFIER) X'
     /\  
    X (COMPLEMENT)
   HEAD
```

- **Note:** An element in parentheses (...) is **optional**.
3. Words and phrases in the X' schema

**X' schema:**

- **head**—word-level category (N, V, A, P, T, and C); determines the **category** of the whole phrase.
  - These category types **always** project (create) an XP — an N is **always** part of an NP, etc.

![Diagram of X' schema](image-url)
3. Words and phrases in the X' schema

X' schema:

- **complement**—a phrase-level category that “provide[s] information about entities and locations implied by the meaning of the head” ([CL], p 173)
  - Some heads, especially V, *require* complements
3. Words and phrases in the X' schema

X' schema:

```
XP
   (SPECIFIER)
      X'
         (COMPLEMENT)
            X
                HEAD
```

• specifier — “no single semantic function...they occur at the edge of a phrase” (CL, p 173)

  (a) for NP, VP, AP, PP — can be a word-level category (Det, Adv, Deg)

  (b) for TP — this is a special case; see below
3. Words and phrases in the X' schema

**WARNING:** *CL* says (p 174): “It is common (and practical!) to represent tree structures in an abbreviated way, without the intermediate X', when there is no specifier and/or complement…”

**WE WILL NOT DO THIS** in our course. Always show the FULL X' structure in ALL trees!

```
XP     XP     XP
|      |      |
Y      X'    X'    X'
|      |      |
X      X      X    X
```

- *no complement*
- *no specifier*
- *head only*
4. Practice building XPs

- **NP:**

  ![Tree Diagram]

  - **A Det** is a word-level category that includes articles (*a, an, the*), demonstratives (*this, those...*)
    - Only **one** Det can occur per NP (unlike adjectives!)
    - Det must come **first** in the NP
  
  - **Possessives** (*my, the child’s, ...*) are NPs that go in the specifier position of another NP (in place of Det)
4. Practice building XPs

• NP:

  NP
  └── (Det)
      └── N'
          └── N
              └── (XP)

• Some examples to try
  rabbits
  these rabbits
  the child’s rabbits

→ See the answers to all of the practice examples in the first slide set on Wednesday
4. Practice building XPs

• **VP:**

```
  VP
  /\  
(Adv) V'  
  /      |
  V       (XP)
```

- Adv = adverb (*always*, *never*, *happily*, etc.)

• Some examples to try

  *(Oscar) yawned*
  *(Grover) always smiles*
  *(Susan) read a book*
  *(Ernie) usually annoys Bert*
4. Practice building XPs

• **PP:**

```
  PP
  (Deg)
  P
  P'
  (XP)
```

- **Deg** = degree word (*right*, certain adverbs)

• Some examples to try

  - *(Oscar went) out*
  - *(Susan put the basketball) right in*
  - *(a book) about rabbits*
  - *(a liking) for truffles from France*
4. Practice building XPs

- **AP:**

  - (Deg)  
  - A'  
  - A  
  - (XP)

- Some examples to try
  - happy
  - very angry
  - pleased with the results
  - fond of her dog
5. The X' structure of a sentence

- **Sentence** = **TP**:

```
       TP
      /   \
     NP   T'
      \  /
       T  VP
```

- The **head** of a sentence is category **T**, for “tense”
  - **T** contains a **tense feature** (+Pst or –Pst) or a **modal Aux** (which has a tense feature)
  - Modal Aux: *may, might, can, could, will, ...*
  - (Non-modal Aux = *have, be, do*; these are different)
5. The X' structure of a sentence

- Sentence = **TP:**

  - The specifier and complement are **not** optional
  - The complement of TP is a **VP** — this is the **predicate** of the sentence
  - The specifier of TP is an **NP** — this is the **subject** of the sentence (note that this is a **phrase**, not a word)
5. The X' structure of a sentence

- Sentence = **TP**:

```
      TP
     /  \
    NP   T'
     \
      T
        \
       VP
```

- Some examples to try
  
  *Oscar snores*
  *
  *This book is expensive*
  *
  *Ernie usually annoys Bert*
  *
  *Susan likes truffles from France*
  *
  *My friend might sometimes play the oboe*
5. The X' structure of a sentence

• Let’s try one example
  → What are the categories of each word in the sentence?

This book is expensive
5. The X’ structure of a sentence

• Let’s try one example
  → Where are the **subject** and the **predicate**?

```
Det  N     V    A
This book is expensive
```
5. The X' structure of a sentence

- Let’s try one example
  → Is there a modal Aux to go in T? If not, use a tense feature

```
  TP
   /\  \
  T'  VP
   /\  \
  T  VP
   /\  \
 NP
```

Det
This

N
book

V
is

A
expensive
5. The X’ structure of a sentence

- Let’s try one example
  - Can the subject phrase be combined as an NP?

```
Det   N     V      A
This  book  is    expensive
```
5. The X' structure of a sentence

- Let’s try one example
  → For the predicate, starting from the right often helps
5. The X' structure of a sentence

- Let’s try one example
  - Can everything in the predicate be combined into a VP?

```
TP
  /
T
  /
NP
  /
  Det N N' V AP
    This book is expensive

-Pst
```

5. The X' structure of a sentence

• Let’s try one example
  → All the words fit into the X' schema! Nothing is left over.
6. The X' schema and grammaticality

- For a sentence to be **grammatical**, all of its words must be able to **fit into the X' schema**.

- So, we can already explain why these are not grammatical in English:
  
  *book the*
  
  *Susan ate quickly the cookie*

- However, the X' schema is not enough to **guarantee** that the sentence is grammatical — other requirements may need to be met, such as **subcategorization** (we’ll discuss this next time).