The structure of sentences

1) You will give it to her
2) You will give the book to your roommate
3) You will give the book about syntax to your roommate's sister
   • Someone doing the giving
   • Something changing hands
   • Someone receiving the thing

Sentential players

• It’s like there’s a “spot” for each of these players:
  1) ___ will give ___ to ___
• And it doesn’t matter whether the “player” is described with one word, two words, or several words.

Constituents

• Each “unit” of this sort is what we’ll call a constituent. We enclose them in brackets to indicate that the words form (and behave as) a unit.
  1) [You] will give [the book] to [your roommate].
• A significant property of language is that these units can be arbitrarily complicated:
  2) [You] will give [it] to [Ed's roommate's sister's friend]

Arbitrarily complicated

• [Ed's roommate's sister's friend]
• This has sub-units within it:
  • [[Marge]'s friend]
  • [[[Ed's roommate]']s friend]
• And within that:
  • [[[Marge]'s sister]']s friend]
  • [[[Ed]']s roommate]']s sister]']s friend]
• In general, it looks like wherever a name can go, so can [name’s noun].

[name’s noun]

• Wherever a name can go, so can [name’s noun].
  1) I gave the book to Homer.
  2) I gave the book to Bart’s father.
  3) I gave the book to Lisa’s brother’s father.
• This replacement rule is recursive. The thing we are replacing is also contained in the thing we replaced it with.
### Groups of groups of groups

- Sentences are made of grouped words. These groups can be contained in other groups, arbitrarily deep. A group of this kind: a constituent.
- Constituents can contain constituents that can contain constituents, etc.—The structure of a sentence is hierarchical.
- Constituents behave as a unit...

### Constituents

- Functioning as a unit...
  - The students did their syntax assignment.
  - The students did the crossword puzzle.
  - John did the crossword puzzle.
  - The crossword puzzle is what John did.
  - *Crossword puzzle is what John did the.*
  - John likes the crossword puzzle.
  - John likes the jigsaw puzzle.
  - John likes the theater.

### Finding constituents

- How do we find constituents in a sentence? For many of them, we can guess, but a guess isn't evidence.
- The structure of a sentence has consequences.
- To find the constituents (to determine the structure) we test for the consequences.

### Constituency tests

- Replacement test
- Fragment test
- Ellipsis
- Clefting
- Movement test

### Replacement test

- A constituent is a group of words which function as a unit. If you can replace part of the sentence with another constituent (the smallest constituent being a single word), this tells us that the replaced section of the sentence is a constituent.
- This isn't foolproof, but it usually works if you try to keep the meaning as close as possible.

### Replacement test

1) The students left.
2) **They** left.

- The students is a constituent.
  1) The students will eat the sandwiches.
  2) **They** will eat the sandwiches.
  3) The students will eat them.
  4) The students will dine.

- [The students] will [eat [the sandwiches]].
Sentence fragment test

• Generally, only constituents can be used in the fragmentary response to a question.
  • Who will eat the sandwiches?
    *The students. Students will eat the.
  • What will the students do?
    *Eat the sandwiches. Eat the.
  • What will the students eat?
    *The sandwiches.
  • [The students] will [eat [the sandwiches]].

Ellipsis test

• If you can elide a string, it qualifies as a constituent.
  • Ellipsis is really deletion of a string from a sentence. Sometimes this is “repaired” by using the verb do, something which we will seek to explain at a later point.
  • The professors will eat the sandwiches, and then.
  • The students will.
    *The students will eat the cookies, and then...
  • *The professors will sandwiches.

Movement (topicalization) test

• Sometimes you can “move” a string of words to the front of a sentence (then generally interpreted as the topic of the sentence). When you can, you’ve found a constituent.
  • The sandwiches, the students will eat _.
  • Eat the sandwiches, the students will _.
  • The students, they will eat the sandwiches.
  • *Students will, the eat the sandwiches.
  • *Students, the will eat the sandwiches.
  • Failing a constituency test isn’t evidence against constituency!

Clefting test

• Like the movement test, if you can fit your string into the frame it be X that S (where you move the string X from inside S), X is a constituent.
  • It’s the sandwiches that the students will eat _.
  • It’s the students that _ will eat the sandwiches.
  • It’s the students that the students will (do) _.
  • *It’s students eat that the _ will the sandwiches.
  • *It’s eat the that the students will _ sandwiches.

Finding constituents

• Tests: Replacement, (ellipsis,) movement, clefting, fragment.
• Some to try:
  • Two African swallows can carry a coconut.
  • A cat was walking down the street.
  • A creature was stirring up trouble.
  • Flying planes can be dangerous.

And all through the house...
**Bonus: the breakdown.**

**Trees, hierarchy, and constituency**

- [The students] [ate [the sandwiches]]

```
          square bracket notation
         /
    the   students ate   the sandwiches
```

**The triangle**

- Sometimes, when the internal constituency is unknown or unimportant to the current discussion, a triangle is used instead.

```
the students ate the sandwiches
```

**Trees**

- Nodes (with node labels)
- Branches
- Terminal nodes
- Nonterminal nodes
Tree relations

- A node X **dominates** nodes below it on the tree; these are the nodes which would be pulled along if you grabbed the node X and pulled it off of the page.
- Acts as a unit. Is a constituent.

Verbs and substitution

- One of the ways we know a verb is a verb (category) is by observing that it can substitute for other verbs.
  1) Pat likes to sing. Pat likes to drive.
  2) Pat bought a book. *Pat bought (a) sing.
  3) Pat likes to eat sandwiches.
  4) *Pat unpleasant to eat sandwiches.
- So is *eat sandwiches* a verb?
- Well, kind of, yes.
- It's a constituent, a phrase, that has the properties a verb does. A *verb phrase.*

The making of a phrase

- We're trying to characterize our knowledge of syntactic structure.
- Our grammatical knowledge is a system (we can judge new sentences).
- All things being equal, a theory in which the system is simpler (needed fewer assumptions) is to be preferred over a theory that entails more complex one.

The making of a phrase

- In that spirit, we know that a phrase differs from a word in that it **contains** words (or other phrases).
- We've seen that when words are combined into a phrase, the phrase inherits the properties of one of the things we combined. (The phrase has a head).
- Suppose: a **phrase** can arise from **merging** two words together, with one taking priority. In a way, attaching one word to another.
- What will Pat do?
  - sing
  - eat sandwiches
- What does Pat like?
  - to eat sandwiches
  - to sing
  - [to [eat sandwiches]]
- So, a phrase can also arise from combining to and a verb phrase, to make a bigger phrase.
Merge

• So, let's go for the simplest theory of structure we can (and only move away from it if the simplest theory won't work)
• A phrase is a syntactic object formed by combining (merging) two syntactic objects, with the properties inherited from one of them (the head of the phrase).
• A word is a syntactic object.

Merge, in the abstract

A good way to think about this is that we have a number of syntactic objects lying around on a workbench of sorts.

We use the operation Merge to assemble them together into one syntactic object.

Merge, in the abstract

We combine D and E using Merge to form a combined syntactic object.

We need to call our new object something, so we call it C.

C is now a syntactic object (containing D & E).

D and E are now “off the table”—we can’t Merge D with anything because it’s inside C. (“Merge only combines objects at their root nodes”).

Merge, in the abstract

Since C is now a syntactic object, we can combine C with the other syntactic object, B, to form a new syntactic object we’ll call A.

Now, all we’re left with is the single syntactic object A.

Merge, in the abstract

• When two objects are Merged, one of them is the head, the most important one.
• The head determines the properties of the constituent— that is, the features of the head project to become the features of the whole combined object.

Trees and constituency

• Pat will eat lunch.
• Pat will dine.

eat [V] lunch [N]
**Trees and constituency**

- Pat will eat lunch.
- Pat will dine.

```
  ?
  / 
eat [V] lunch [N]
```

**So how do we know which is the head?**

- When we Merge two things, one is the head, and determines the properties of the resulting syntactic object.

- The next thing we'll turn to is the question of how the syntactic system knows which is the head.

**This is a proposition**

- Let’s try to ground this a bit more now, to make it clearer what problems we’re solving here.

- A primary—and perhaps the most important—type of sentence is that which represents a proposition.

- A proposition is the kind of thing that can be true or false (basically).

**Truth and Verbs**

1) Michael swam.

- *Michael*: refers to an individual; it is a name, a label. It is complete.

- *Swam*: describes an action that can be undertaken by someone, or a property that someone can have. *Swam* can’t be true—it needs an individual, then it can be true (or false).

**Predicates and arguments**

- Suppose the construction of a proposition to be the end result of a (common kind of) sentence construction.

1) Michael swam

- *Swam* needs an individual to be true or false. Fortunately, *Michael* is an individual. So, combining *swam* (predicate) and *Michael* (argument) gives us a proposition, that can be true or false.
Verbs and participants

- Intransitive (1-place): Sleep
  1) Bill slept.
  2) *Bill slept the book.
- Transitive (2-place): Hit
  3) *Bill hit.
  4) Bill hit the pillow.
- Ditransitive (3-place): Put
  5) *Bill put.
  6) *Bill put the book.
  7) Bill put the book on the table.
- Weather (0-place): Rain
  8) It rained.

Verbs and arguments

- The “participants” in an event denoted by the verb are the arguments of that verb.
- Some verbs require one argument, some require two arguments, some require three arguments, some require none.
- Intuitively, the number of arguments is the number of things that a verb needs in order to make a proposition (something that can be either true or false).

Predicates

- We will call verbs the predicates. They define properties of and/or relations between the arguments.
  1) Bill hit the ball
  - There was a hitting, Bill did the hitting, the ball was affected by the hitting.
- Different arguments have different roles in the event. (e.g., The hitter, the hittee)

Thematic relations

- The thematic relation that the argument has to the verb—the role it plays in the event—will prove useful in describing the behaviors of different classes of verb.
- One thematic relation is agent of an action, like Bill in:
  1) Bill kicked the ball.

Common thematic relations

- Agent: initiator or doer in the event
- Theme/Patient: affected by the event, or undergoes the action
  1) Sue kicked the ball.
- Experiencer: feel or perceive the event
  3) Pat likes pizza.
- Proposition: a statement, can be true/false.
  3) Bill said that he likes pizza.
- Goal:
  1) Chris ran to Copley Square.
  2) Pat gave the book to Tracy (Recipient)
- Source:
  3) Mary took a pencil from the pile.
- Instrument:
  4) Ed ate the burrito with a plastic spork
- Benefactive:
  5) Pat cooked dinner for Chris.
- Location:
  6) Betsy sits under the tree on Wednesdays.