Syntactic operations

- **Merge** is a syntactic operation. It takes two syntactic objects and creates a new one out of them.
- The new syntactic object created by Merge inherits the features of one of the components (the head projects its features).
- Merge cannot “look inside” a syntactic object. Syntactic objects are only combined at the root.

**The Extension Condition**: A syntactic derivation can only be continued by applying operations to the root projection of a tree.

Feature checking

- Syntactic objects have features.
- Lexical items (syntactic objects) are bundles of features.
- Some features are **interpretable**, others are **uninterpretable**.
- By the time the derivation is finished, there must be no uninterpretable features left (**Full Interpretation**).
- Uninterpretable features are eliminated by checking them against matching features. This happens as a result of Merge: Features of sisters can check against one another.
- Merge doesn’t just happen. It has to happen.

Heads and complements

- When Merge combines two syntactic objects, one projects its features, one does not.
- When a lexical item projects its features to the combined syntactic object, it is generally called the **head**, and the thing it combined with is generally called the **complement**.
- A syntactic object that projects no further is called a **maximal projection**.
- Where X is the category, this is alternatively called **X** or **XP**.
- The complement is necessarily a maximal projection.

Heads and complements

- A syntactic object that has not projected at all (that is, a lexical item) is sometimes called a **minimal projection**.
- Where X is the category, this is alternatively called **X** or **X**.
- The head is a minimal projection.
- In traditional terminology, the complement of a verb is generally called the **object** (or “direct object”).
- So, often, is the complement of a preposition (“object of the preposition”).

Linear order

- Merge takes two syntactic objects and combines them into a new syntactic object.
- Merge does not specify **linear order** (which of the two combined objects comes first in pronunciation).
- In the English VP, heads always precede complements. But languages differ on this.
**The head parameter**

- Languages generally have something like a basic word order, an order in which words come in in “neutral” sentences.
- English: SVO
  - Akira ate an apple.
- Japanese: SOV
  - John wa ringo o tabeta.  
    John top apple acc ate
    ‘John ate an apple.’
- In our terms, this amounts to a (generally language-wide choice) as to whether heads are pronounced before complements or vice-versa.
  - English: **head-initial**  
    Japanese: **head-final**

**Second Merge**

- Merge occurs when there is a selectional feature that needs to be satisfied.
- If there is more than one such feature, Merge must happen more than once.
- As always, the node that projects is the one whose selectional feature was satisfied by the Merge.
- The sister of the head (that projects) after the first Merge involving that head is called the **complement** (as above).
- The nonprojecting sister of a syntactic object that has already projected once from a head is called the **specifier**.

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**Heads and complements**

- A transitive verb like *called* needs two arguments (the caller and the callee).
- We encode this knowledge by hypothesizing two selectional features for *N*.
  - The first selectional feature will be checked by the callee.
  - The second selectional feature will be checked by the caller.
- So, *called* is Merged with *me*.

**Specifiers, etc.**

- In English, specifiers are on the left of the head, unlike complements.
- As with the head-complement order, languages (arguably) also differ in the linear order of their specifiers.
  - However, Spec-initial order is overwhelmingly more common...
  - VOS order (Malagasy)
    Nahita ny mpianatra ny vehivavay.  
    saw the student the woman
    ‘The woman saw the student.’
• In the ’70s and ’80s, these ideas went by the name “X’-theory”:
  • Every XP has exactly one:
    • head (a lexical item)
    • complement (another XP)
    • specifier (another XP)
  • for any X (N,V,A,P,I, etc.)

**X’-theory**

![Diagram of X’-theory]

- maximal projection
- intermediate projection
- minimal projection

Merge v. X’-theory

• The system of selectional features and Merge is preferable because it gets this structure without stipulating the template.
• The structure assigned to sentences is generally the same—except that for us, there are no intermediate or maximal projections unless they are needed.

Node labeling conventions

- When we Merge two objects, the features of one of them projects to become the features of the new object.
- The label for new node comes in two pieces:
  • The category (projected from the head)
  • The projection “level”:
    - P = maximal projection
    - ° or nothing = minimal projection
    - ′ = intermediate projection
- An XP is any node that does not project its features up.
- An X° (or X) node comes from the lexicon.

Maximal v. Minimal v. Intermediate

• Notice that whenever you Merge two things, the result is going to be a maximal projection. An “XP”.
• But if in the next step if projects when you Merge it with something, that same node is now an intermediate projection.

Features and checking

• When we combine two things with Merge and check an uninterpretable feature, we cross it out.
• For simplicity, we can simply write the features under the head, and cross them out there.
  • This is as opposed to copying all but the checked feature and into a feature specification of the VP node.
  • This is just about how we write it down, it is the same system either way.

Adjuncts

• "Pat put the book.
• Pat put the book on the shelf.
• Pat put the book on the shelf dramatically.
• Pat put the book on the shelf dramatically on Tuesday.
• Pat put the book on the shelf dramatically on Tuesday before several witnesses.
• Some things are required. Some things are not.
  • *Arguments get θ-roles and are required.
  • Adjuncts are modificational and are optional.
Adjuncts and distribution

Adjuncts are relatively “transparent” — having an adjunct does not seem to change the distributional characteristics.

- Pat wants to eat lunch (quickly).
- Pat wants to dine.
  - *I like to draw eat lunch (quickly).
- I like to draw (happy) elephants.
  - *Pat wants to (happy) elephants.

Idea: A verb (phrase) with an adjunct is still a verb (phrase), just as if it didn’t have an adjunct.

Adjoin

- The operations Merge and Adjoin are two different ways to combine two objects from the workbench.
- Merge takes two objects and creates a new object (with the label/features inherited from one of them).
- Adjoin attaches one object to the top of another one.
  - The linear order of adjuncts does not appear to be set parametrically, so they can either before or after the object they attach to.

The luxury of adjunction

- We will also assume that Adjoin only applies to maximal projections.
- That is: If a syntactic object still has a selectional feature, Adjoin cannot attach something to it. Merge must happen first. Once all of the things that need to happen are taken care of, then you have the luxury of adjunction.

A phrase

- So, a full phrase can have all of these pieces (plus perhaps some additional adjuncts)

Complements vs. adjuncts

- PPs seem to be freely reorderable — when adjuncts.
  - I ate lunch on Tuesday at Subway with Pat
  - I ate lunch on Tuesday with Pat at Subway
  - I ate lunch with Pat on Tuesday at Subway
  - I ate lunch on Tuesday with Pat at Subway
- But consider glance at Chris.
  - I glanced at Chris on Tuesday
  - *I glanced on Tuesday at Chris
- Ok: Why?
Mary saw him

- A pronoun like him refers to somebody in (our mental model of) the world.
- A pronoun refers to somebody or something that's been part of the conversation, or that you are pointing at.
- When you hear a pronoun and want to interpret it, you have to resolve its reference.

John arrived.
Mary saw him.

- Here, him is likely to refer to John.
- Though we could be pointing at Bill, in which case him refers to Bill.
- The person who hears this has to figure it out.
- The person who says this knows who they meant.
- And had the grammar that generated the sentence.

Indices

- To describe what the speaker intended (that is, which sentence the speaker actually used), we use an index on each referent.
  1) John\textsubscript{i} arrived. Mary\textsubscript{j} saw him\textsubscript{i}.
  2) John\textsubscript{i} arrived. Mary\textsubscript{j} saw him\textsubscript{k}.
- The index represents what you are “pointing at” (perhaps just mentally).
- Two noun phrases that share an index necessarily share the same reference. They are coreferential.

Seeing him in the mirror

- Regard: Ike\textsubscript{i}, Jim\textsubscript{j}, Kristin\textsubscript{k}.
  1) There’s Ike\textsubscript{i}, Kristin\textsubscript{k} saw him\textsubscript{j} in the mirror.
  2) There’s Jim\textsubscript{j}, Kristin\textsubscript{k} saw him\textsubscript{j} in the mirror.
  3) There’s Ike\textsubscript{i}, Jim\textsubscript{j} saw him\textsubscript{i} in the mirror.
  4) There’s Jim\textsubscript{j}. *Jim\textsubscript{j} saw him\textsubscript{j} in the mirror.
- What’s wrong with that last one?

Seeing himself in the mirror

- Right, ok. Jim\textsubscript{j} saw himself\textsubscript{j} in the mirror.
- For some reason, when Jim is the subject and him is an object, him can’t refer to Jim. Furthermore:
  1) Jim\textsubscript{j}’s father\textsubscript{k} saw him\textsubscript{j}/him\textsubscript{i}/him\textsubscript{k} in the mirror.
  2) Jim\textsubscript{j}’s father\textsubscript{k} saw himself\textsubscript{i}/him\textsubscript{j}/him\textsubscript{k} in the mirror.
  3) Jim\textsubscript{j}’s father\textsubscript{k} said that Mary\textsubscript{m} saw him\textsubscript{j}/him\textsubscript{k} in the mirror.
  4) Mary\textsubscript{m} introduced Jim\textsubscript{j} to him\textsubscript{m}/him\textsubscript{j}.
  5) Mary\textsubscript{m} introduced Jim\textsubscript{j}’s father\textsubscript{k} to him\textsubscript{m}/him\textsubscript{k}.

Binding Theory

- **Binding Theory** consists of three Principles that govern the allowed distribution of NPs.
  - Pronouns: he, her, it, she, ...
  - Anaphors: himself, herself, itself, ...
  - R-expressions: Pat, the student, ...
**R-expressions and anaphors**

- R-expressions are NPs like Pat, or the professor, or an unlucky farmer, which get their meaning by referring to something in the world. Most NPs are like this.

- An anaphor does not get its meaning from something in the world—it depends on something else in the sentence.
  1) John saw himself in the mirror.
  2) Mary bought herself a sandwich.

**Pronouns**

- A pronoun is similar to an anaphor in that it doesn’t refer to something in the world but gets its reference from somewhere else.
  1) John told Mary that he likes pizza.
  2) Mary wondered if she agreed.
- …but it doesn’t need to be something in the sentence.
  1) Mary concluded that he was crazy.

**Constraints on coreference**

1) John, saw himself,
2) *Himself, saw John,
3) *John’s mother saw himself,

- It is impossible to assign the same referent to John and himself in the (2) and (3). What is different between the good and bad sentences?

**John’s mother**

- John’s mother is an NP.
  1) [John’s mother], saw herself,
  2) She saw John.
- But it’s an NP that is made up of smaller pieces (John’s and mother).
- So what is the internal structure of the NP John’s mother?

**[NP John’s mother]**

- Remember that pronouns come in three distinguishable forms (in English):
  - I, he, she nominative
  - Me, him, her accusative
  - My, his, her genitive
- The genitive case forms seem to have pretty much the same kind of “possessive” meaning that John’s does.
- So, let’s suppose that John’s is the genitive case form of John.

- Another point about John’s mother is that it seems that the head should be mother.
- John’s sort of modifies mother.
- Sort of like an adjective does… sort of like an adverb does for a verb…
- Let’s suppose that John’s is just adjoined to the NP mother.
  - Only for now! To be revised in ch. 7.
  - This is kind of hard to draw clearly.
Command domains

• What is the difference between the relationship between John and himself in the first case and in the second case?

We think of the position that John occupies in the first tree as being a position from which it “commands” the rest of the tree. It is hierarchically superior in a particular way. (Really, “non-inferior”)

Tree relations

• A node X c-commands its sisters and the nodes dominated by its sisters.
  • B c-commands C, D, E.
  • D c-commands E.
  • E c-commands D.
  • C c-commands B.
  • A c-commands nothing.