X-bar Theory

(1) \[
\begin{array}{c}
\text{XP} \\
\text{specifier} \rightarrow \\
\text{WP} \\
\text{X'} \\
\text{head} \rightarrow \\
X \\
\text{ZP} \\
\end{array}
\xleftarrow{\text{maximal projection}}
\]
\[
\begin{array}{c}
\text{specifier} \rightarrow \\
\text{WP} \\
\text{X'} \\
\text{head} \rightarrow \\
X \\
\text{ZP} \\
\end{array}
\xleftarrow{\text{intermediate projection (X-bar)}}
\]

(2) \[
\begin{array}{c}
\text{XP} \\
\text{adjunct} \rightarrow \\
\text{XP} \\
\text{Spec} \rightarrow \\
X' \\
\text{adjunct} \rightarrow \\
X' \\
\text{X} \\
\text{complement} \\
\end{array}
\xleftarrow{\text{adjunction to XP}}
\]
\[
\begin{array}{c}
\text{Spec} \rightarrow \\
X' \\
\text{adjunct} \rightarrow \\
X' \\
\text{X} \\
\text{complement} \\
\end{array}
\xleftarrow{\text{adjunction to X'}}
\]
\[
\begin{array}{c}
\text{Y} \\
\text{X} \\
\end{array}
\xleftarrow{\text{adjunction to X'}}
\]

Note: To be a valid X-bar structure, every phrase must:
- Have exactly one head (X).
- Have at least one single-bar node (X').
- Have one maximal node (XP).
- Have no more than one specifier.
- Have no more than one complement.
- Have no nodes with more than two daughter nodes.
- Have an entire XP in the specifier if there is a specifier.
  (not just a head, or just an X')
- Have an entire XP in the complement if there is a complement
  (not just a head, or just an X')

\[\theta\text{-Theory}\]

A \(\theta\)-role represents the semantic role (thematic role) played by the argument in the event. The predicate (e.g., verb) assigns \(\theta\)-roles to its syntactic arguments.

(3) The goalie kicked the ball.
\[
\begin{array}{c}
\text{Agent} \\
\end{array}
\xleftarrow{\text{Theme/ Patient}}
\]
\[
\begin{array}{c}
\text{kicked} \\
\end{array}
\]
The $\theta$-criterion
i) Each argument must be assigned exactly one a $\theta$-role.
ii) Each $\theta$-role must be assigned to exactly one argument.

$\theta$-roles are assigned at DS—prior to any movement.

All $\theta$-roles are assigned within the XP of the X assigning $\theta$-roles.

\[
\text{VP} \quad \text{Internal means “internal to the V”}
\]
\[
\text{External} \quad \text{V'} \quad \text{External means “external to the V”}
\]
\[
\text{V} \quad \text{Internal}
\]

In particular—no $\theta$-roles can be assigned out past the VP, or inside spec or comp.

There are basically two places a $\theta$-role can be assigned: spec and comp.

Transitive verbs: Have both an internal and external argument (e.g., kick)
Unergative verbs: Have just an external argument (e.g., run, dance, jump).
Unaccusative verbs: Have just an internal argument (e.g., sneeze, fall, sink)

Case Theory

Chains: The collection of positions occupied by a single argument.

(5) Mary$_i$ seems [TP $t_i$] to have solved the problem].

Chain: \{Mary$_i$, $t_i$ \}

(6) Case Filter
A DP chain must be Case-marked.

(That is, a DP must get Case at some point, between DS and SS).

A single chain cannot have Case assigned to it twice.

Case is assigned within the “government radius” of a Case assigner.
This includes the sister (e.g., lunch gets Case from eat),
the specifier (e.g., he gets Case from T)
and the sister’s specifier (e.g., in He considers me to be a genius).
(7) \[ \text{Finite } T \text{ assigns nominative Case} \]

\[
\begin{array}{c}
\text{DP}_i \\
\text{He} \\
\text{[Nom]} \\
\text{T} \\
-s \\
\text{[Nom]} \\
-t_i \\
\text{V} \\
\text{V'} \\
\text{eat} \\
\text{DP} \\
\text{lunch}
\end{array}
\]

(8) \[ \text{D assigns genitive Case} \]

\[
\begin{array}{c}
\text{DP} \\
\text{DP} \\
\text{Mary} \\
\text{D'} \\
\text{D} \\
\text{N'} \\
\text{N} \\
\text{NP} \\
\text{PP} \\
\text{translation of the book}
\end{array}
\]

(9) \[ \text{D assigns genitive Case to DPs Mary and my} \]

\[
\begin{array}{c}
\text{DP} \\
\text{DP} \\
\text{D'} \\
\text{D} \\
\text{Ø} \\
\text{N'} \\
\text{N} \\
\text{NP} \\
\text{PP} \\
\text{translation of the book}
\end{array}
\]

(10) \[ \text{V assigns accusative Case} \]

\[
\begin{array}{c}
\text{V'} \\
\text{V} \\
\text{TP} \\
\text{believe} \\
\text{DP} \\
\text{T'} \\
\text{him} \\
\text{T[–fin]} \\
\text{VP} \\
\text{to} \\
\text{...}
\end{array}
\]

\text{NOTE: There cannot be a CP here in these cases. That would put him too far away from believe.}
Passives. Attaching -en suppresses the external θ-role, and removes (“absorbs”) the verb’s ability to assign accusative Case.

(12) eat: Agent, Theme eaten: Theme Passive

(13) break: Theme Unaccusative

(14) [TP [the sandwich]i was [VP eaten t_i]]
(15) [TP [the vase]i [VP broke t_i]]

Trees

(16) **C-command**

\[ α \text{ c-commands } β \text{ iff:} \]

i) the first branching node dominating \( α \) also dominates \( β \).

ii) \( α \) does not dominate \( β \).

(17) \[ \begin{array}{c} A \\ B \\ C \\ D \\ E \end{array} \]

\[ \begin{array}{c} \text{B c-commands C, D, and E} \\ \text{D c-commands E (and vice versa)} \\ \text{C c-commands B (and vice versa)} \end{array} \]

*Informally:* To find what a node c-commands, go up one level, and it is everything below it except the original node.
Movement

Movement between DS and LF always goes to a position which will c-command the trace.

Some reasons we have seen so far for movement:

- T moves to C: When C is [+Q] in an English main clause, or all the time in V2 languages (sometimes also limited to main clauses)
- V moves to T: When V is an auxiliary in English, all the time in, e.g., French.
- Wh-word moves to SpecCP: When C is [+wh] or when C is [–wh] but a higher C is [+wh] and the wh-word has to stop along the way in order to avoid violating Subjacency.
- DP moves to SpecTP: To satisfy the EPP.
- DP moves to SpecTP: In order to get Case.
- Quantifier moves to adjoin to TP: Quantifiers must be outside of their TP by LF.

**EPP**
The specifier of TP must be filled (at some point during the derivation).

**Quantifier Scope**
A quantifier (everyone, someone) must be outside of (not dominated by) TP by LF.

(18) CP

[Diagram showing the movement of DP, C, T, V, and examples such as Bill will eat which sandwich should be outside of TP by LF with EPP]
(19) Bill suspects everyone. For every person \( x \) [ Bill suspects \( x \ ).

(20) \( LF \)

\[
\begin{array}{c}
\text{DP}_i \\
\text{everyone} \\
\text{DP}_j \\
\text{Bill} \\
\text{T'} \\
\text{T} \\
\text{[PRES]} \\
\text{VP} \\
\text{t}_j \\
\text{V'} \\
\text{V} \\
\text{t}_i \\
\text{suspects}
\end{array}
\]

Quantifier Phrases, \( wh \)-phrases…

- Since they go where DPs go, consider them a \emph{subvariety} of DP.

(21) \[
\begin{array}{c}
\text{DP} \\
D' \\
\text{D} \\
\text{NP} \\
\text{the} \\
\text{cat}
\end{array}
\quad
\begin{array}{c}
\text{DP}[+\text{Quant}] \\
D' \\
\text{D} \\
\text{NP} \\
\text{every} \\
\text{cat}
\end{array}
\quad
\begin{array}{c}
\text{DP}[+\text{wh}] \\
D' \\
\text{D} \\
\text{NP} \\
\text{which} \\
\text{cat}
\end{array}
\]

(22) a. Who solved which problem?
b. for which person \( x \) and which problem \( y \), \([ x \text{ solved } y ] \).

- \( wh \)-movement after the first one (covert in English) \emph{adjoins} to SpecCP.

(23) \[
\begin{array}{c}
\text{CP} \\
\text{DP}_i \\
\text{DP}_j \\
\text{C} \\
\text{TP}
\end{array}
\]

\( who \) \quad \text{which prob} \quad [+Q+\text{WH}] \quad \ldots \text{t}_i \ldots \text{t}_j \ldots

All \( wh \)-words must end up in SpecCP at LF.
(24) SS

```
TP  
   DP  T'
   every cat  T  VP
       eats fish
```

(25) For every cat x, x eats fish.

### Finding PRO

**PRO only appears in nonfinite subject positions**

**PRO does not (and cannot) receive Case.**

> This means that embedded clauses with PRO subjects are always CPs.
> This is necessary in order to keep PRO out of the government radius of the embedding verb.

**PRO receives a θ-role.**

Sentences with raising and sentences with PRO look very similar. With raising sentences, an expletive subject variant is often possible (which makes the θ-roles clearer)

(26) a. Mike\(_i\) seems [TP \(t_i\) to run fast ].  \hspace{1cm} \text{Raising}

b. It seems [CP that [TP Mike runs fast ]]. \hspace{1cm} \text{Expletive subject}

b. Mike\(_i\) is likely [TP \(t_i\) to leave ]. \hspace{1cm} \text{Raising}

c. It is likely [CP that [TP Mike left ]]. \hspace{1cm} \text{Expletive subject}

(27) a. Mike\(_i\) tried [CP [TP PRO\(_i\) to leave]]. \hspace{1cm} \text{Subject control}

b. Mike persuaded Bill\(_i\) [CP [TP PRO\(_i\) to leave]]. \hspace{1cm} \text{Object control}

c. It is difficult [CP [TP PRO\(_{arb}\) to leave ]]. \hspace{1cm} \text{Arbitrary control}
Control verbs are generally those verbs which assign a θ-role to the DP that winds up in its SpecTP (like AGENT or EXPERIENCER) and a θ-role to the embedded proposition. That is, if a single DP gets a θ-role both in the embedded clause and from the matrix clause, then the embedded clause must have a PRO.

**Relative clauses**

(28) Bill heard [DP the speechi [CP whichi [TP Mary made ti ]]].

Restrictive relatives restrict the reference of the head noun. The head noun and the wh-phrase are co-indexed (meaning they share the same referent).

(29) Bill heard [DP the speechi [CP Op i [TP Mary made ti ]]].

(30) DP

```
      D'
     /
    D
  /    NP
 / N'
 / N
     N' CP
     N Opi C'
     /   /
   /   /
  /   /
 /   /
@    /
```

student

C
[+Q]
TP
DPj
T'
Bill
T
VP
tj
V
V'
ti
Noun complements:

(31) DP (*the one that Bill went home.)

Recoverability Condition
The content of a null category must be recoverable (from a co-indexed overt category in the sentence).

Doubly Filled Comp Filter
*[Comp wh-XP that/if], if wh-XP is overt (non-null).
Auxiliary verbs

Auxiliary verbs *have* and *be* have their own V projection with a VP complement. Auxiliary verbs do not assign θ-roles (subject is not in their specifier). We treat past and passive participles (e.g., *eaten*) or gerunds (e.g., *eating*) as V.

(32)  

```
       VP
        ↓
        V'
       / \
  V     VP
 /     / \
be   subject V'
     / \         \
    V   object
     /   /         \ 
   eating
```

The uppermost auxiliary verb moves to T in English. **Main verbs do not.**

(33)  

a. Bill is not eating. Is Bill eating?  
b. Bill did not eat. Did Bill eat?

(34)  

```
       TP
        ↓
        T'
       / \
  DP j    T  
   / \          \
He   V_i+T VP
  /     / \         \
have+[PAST] V' VP
  /     / \         \
  t_i   V' VP
   /     / \         \
 been NP VP
  /     / \         \
 t_i   V' VP
   /     / \         \
   V   DP VP
    /     /     \    
   eating sandwiches
```
Proper names

(35) DP

D’

D
Ø
N
N’
Bill

(36) DP

D’

D
Ø
N
N’
New York

Binding Theory

Binding. \( \alpha \) binds \( \beta \) iff

i) \( \alpha \) c-commands \( \beta \)

ii) \( \alpha \) and \( \beta \) are coindexed.

Anaphors: him, she, I, them, …

R-expressions: Mary, the students, …

Pronominals: them, him, her, …

Principle A: An anaphor must be bound in its binding domain.

Principle B: A pronominal must be free in its binding domain.

Principle C: An r-expression must be free.

Binding domain: TP. (Slightly simplified—this is good enough for now)

Constraints on movement (Subjacency, HMC, ECP)

Subjacency
Movement cannot cross more than one bounding node in a single step

Bounding nodes (English): IP and DP. (Italian: CP and DP)
Head-movement constraint (HMC)
Movement of an $X^\circ$ category $\alpha$ is restricted to the position of a head $\beta$ that governs the maximal projection of $\alpha$. (“No skipping”)

Empty Category Principle (ECP)
Traces must be properly governed

$\alpha$ properly governs $\beta$ iff
(i) $\alpha$ governs $\beta$ and $\alpha$ is a lexical head
or
(ii) $\alpha$ antecedent-governs $\beta$.

$\alpha$ antecedent-governs $\beta$ iff
(i) $\alpha$ binds $\beta$
(ii) no more than one bounding node dominates $\beta$ but not $\alpha$.
(iii) there is no filled $C$ governing $\beta$.

Movement must be motivated. If something moves, it must be for a reason. For example, moving to SpecTP to satisfy the EPP or to get Case, moving T to C in questions, moving to SpecCP in an embedded clause because moving further would violate Subjacency. This means movement to SpecTP in a passive sentence does not stop in SpecVP—there is nothing to be gained in SpecVP; a DP cannot get a $\theta$-role by moving, it can’t get Case in SpecVP, and it wouldn’t violate Subjacency if it just moved straight up to SpecTP.

Some stuff to try?

Selected sentences…
Which student will Mary say took every prerequisite?
Mary said that Bill’s mother was chosen.
Who wants to be met at the airport?

*What did the rumor that Alan said $t$ yesterday cause stock prices to plummet?
*Ed$_i$ shaved himself$_j$.
*He$_i$ told me that Mary considers Bill$_j$ to be an idiot.