Another look at PSRs: Intermediate Structure

Starting X-bar theory
Substitution

- If a group of words can be replaced by a single word, they are a constituent.
- I saw [the teacher]/him.
  → [the teacher] is a constituent
Substitution

- If a group of words can be replaced by a single word, they are a constituent.
  - I saw [the teacher]/him.
    - [the teacher] is a constituent

- If two constituents can be replaced by the SAME word, they are constituents of the same type.
  - I saw [the teacher]/him.
  - I saw [my crazy uncle]/him.
    - [the teacher] and [my crazy uncle] are constituents of the same type (NP)
NP \rightarrow (D) (AdjP+) N (PP+)
I saw the tall [student of physics] with red hair not the short [one] with brown hair.
I saw the tall [student of physics] with red hair not the short [one] with brown hair.
I saw the tall [student of physics with red hair] not the short [one].
I saw the tall [student of physics with red hair] not the short [one].
I saw this [tall student of physics with red hair] not that [one].
I saw this [tall student of physics with red hair] not that [one].
the student of physics with red hair
N’ rules
N’ rules

\[ \text{NP} \Rightarrow (D) \text{ N’} \]
N’ rules

- NP \rightarrow (D) N’

- N’ \rightarrow (AdjP) N’ \text{ or } N’ (PP)
N’ rules

- NP → (D) N’
- N’ → (AdjP) N’ or N’ (PP)
- N’ → N (PP)
N’ rules

- NP $\rightarrow$ (D) N’
- N’ $\rightarrow$ (AdjP) N’ or N’ (PP)
- N’ $\rightarrow$ N (PP)

An iterative (self-recursive) rule: can apply as many times as needed
One-Replacement

Replace an N’ node with [one]
One-Replacement

Replace an N’ node with [one]

not N, not NP
I saw that tall student of physics with red hair.
I saw that tall student of physics with red hair,

*the short [one] of chemistry with brown hair

One replacement
I saw that tall student of physics with red hair, not *the short [one] of chemistry with brown hair.

One replacement

NP

D
the

AdvP

N'

tall

N'

N

PP

with red hair

N

student

PP

of physics

some of you might find this one grammatical -- this is a dialect issue

*the short [one] of chemistry with brown hair
I saw that tall student of physics with red hair, not the short [one] with brown hair. *the short [one] of chemistry with brown hair*

One replacement

some of you might find this one grammatical -- this is a dialect issue

the short [one] with brown hair

*the short [one] of chemistry with brown hair*
I saw that tall student of physics with red hair,
the short [one] with brown hair
*the short [one] of chemistry with brown hair

some of you might find this one grammatical -- this is a dialect issue

One replacement
I saw that tall student of physics with red hair, not...

This [one]
The short [one]

with brown hair

*the short [one] of chemistry
with brown hair

One replacement

NP
D
the

AdvP
N'
tall

N'

PP
with red hair

*N*

N
student

of physics
I saw that tall student of physics with red hair, not...

This [one]
The short [one]
with brown hair

The short [one]
with brown hair

some of you might find this one grammatical -- this is a dialect issue

*the short [one] of chemistry
with brown hair

*the short [one] of physics
with brown hair
Flat Structure in VPs

\[ \text{VP} \rightarrow (\text{AdvP}+) \text{ V} (\text{NP}) (\text{AdvP}+) (\text{PP}+) (\text{AdvP}+) \]

- **VP**: The main verb phrase.
- **AdvP**: Adverb phrase.
- **V**: Verb.
- **NP**: Noun phrase.
- **PP**: Prepositional phrase.

Example sentence:
- **AdvP**: often
- **V**: sings
- **NP**: opera
- **AdvP**: loudly
- **PP**: at church
John often sings opera loudly at church and Mary [does so too].

Flat Structure in VPs

```
VP
/ | 
| AdvP| V | NP | AdvP | PP
| Adv |  | NP | Adv | P  |
| often| sings| opera| loudly| at |
|  |  |  |  | NP |
|  |  |  |  | church |
```
John often sings opera loudly at church and Mary [does so too].
John often sings opera loudly at church and Mary frequently [does so too].

Flat Structure in VPs

```
VP
  /   \
 AdvP  V    NP  AdvP  PP
  |     |    |     |     \
 Adv frequently  sings  N  Adv loudly  P
                  opera  at  NP
                              church
```
John often sings opera loudly at church and Mary frequently [does so too].
John often sings opera loudly at church but Mary rarely [does so] in the library.
John often sings opera loudly at church but Mary rarely [does so] in the library.
John often sings opera loudly at church but Mary rarely [does so] quietly in the library.
John often sings opera loudly at church but Mary rarely [does so] quietly in the library.

**Flat Structure in VPs**

- **VP**
  - **AdvP**
    - Adv: rarely
    - **V**: sings
    - **NP**: opera
  - **AdvP**: quietly
  - **PP**: in
    - **NP**: the library
this may seem mysterious, but we’ve done it for a reason -- we’ll see in chapter 8
V’ rules
V’ rules

- VP → V’ (a vacuous rule)
V’ rules

- VP → V’ (a vacuous rule)
- V’ → (AdvP) V’ or V’ ({AdvP/PP})
V’ rules

- VP → V’ (a vacuous rule)
- V’ → (AdvP) V’ or V’ ({AdvP/PP})
- V’ → V (NP)
V’ rules

- VP → V’ (a vacuous rule)
- V’ → (AdvP) V’ or V’ ({AdvP/PP})
- V’ → V (NP)

An iterative (self-recursive) rule: can apply as many times as needed
Do-so (too) replacement

replace a V’ node with [did so (too)]

not VP, not V
John often sings opera loudly in church and/but Mary ...
John often sings opera loudly in church and/but Mary ...

* seldom does so folksongs quietly in the library
John often sings opera loudly in church and/but Mary...

seldom does so folksongs quietly in the library
John often sings opera loudly in church and
but Mary ... seldom does so folksongs quietly in the library

`seldom [does so]` in the library

`seldom [does so]` quietly in the library

*seldom does so folksongs quietly in the library*
John often sings opera loudly in church and/or Mary ...

`seldom [does so] in the library`

`seldom [does so] quietly in the library`

`seldom [does so] in church`

*seldom does so folksongs quietly in the library*
John often sings opera loudly in church and but Mary...

*seldom does so folksongs quietly in the library*
Further Evidence for V’

VP
  \----  
  |     |
  V'    V'
  |     |
V'  Conj   V'
  |     |
  P        NP
  |        |
  with    a
  |        |
NP  fork
  |        |
eats  tosses
  |        |
NP  NP
  |        |
beans  salads
Flat Structure in PPs

- $P \rightarrow P (NP)$
- Tara is very in love with her boss
- $PP \rightarrow (AdvP) P (NP) (PP)$
Flat Structure in PPs

- $P \rightarrow P \ (NP)$
- Tara is very in love with her boss
- $PP \rightarrow (AdvP) \ P \ (NP) \ (PP)$

ok, this only shows up with the idiom “in love” and fixed expressions like it… So I’m giving you a hokey story here.
Flat Structure in PPs

\[ \text{PP} \rightarrow (\text{AdvP}) \text{ P (NP) (PP)} \]

Diagram:
- **AP**: in
- **P**: very
- **NP**: love
- **PP**: with her boss
Mary was very in love with her boss, Susanna was less [so]

Flat Structure in PPs

Mary was very in love with her boss, Susanna was less [so]
Mary was very in love with her boss, Susanna was less [so]
Flat Structure in PPs

Mary was very in love with her boss, Susanna was less [so] with her husband.

```
PP
  AP    P    NP    PP
  /      in    /    /
 A  less  N  love  P  NP
      /    /  /  /
     her husband
```
Flat Structure in PPs

Mary was very in love with her boss, Susanna was less [so] with her husband.
P’ rules
P’ rules

PP $\rightarrow$ P’ (a vacuous rule)
P' rules

- PP $\rightarrow$ P' (a vacuous rule)
- P' $\rightarrow$ (AdvP) P' or P' (PP)
P' rules

- PP $\rightarrow$ P' (a vacuous rule)
- P' $\rightarrow$ (AdvP) P' or P' (PP)
- P' $\rightarrow$ P (NP)
P' rules

- PP → P' (a vacuous rule)
- P' → (AdvP) P' or P' (PP)
- P' → P (NP)

An iterative (self-recursive) rule: can apply as many times as needed
very love with her boss

this may seem mysterious, but I’ve done it for a reason -- we’ll see in chapter 8
very love with her boss

this may seem mysterious, but I’ve done it for a reason -- we’ll see in chapter 8

There is less evidence for this
What about AdjP and AdvP?

- Is there intermediate structure in AdjP and AdvPs?
- There certainly are adjuncts:
  - Lynn is interested in syntax but less [so] in phonology
- What about complements? There is a problem set on this (Challenge Problem 4) that you can try.
For parsimony reasons, we will assume the following rules:

- \( \text{AdjP} \rightarrow \text{Adj}' \) (a vacuous rule)
- \( \text{Adj}' \rightarrow (\text{AdvP}) \ P' \) or \( \text{Adv}' \) (PP)
- \( \text{Adj}' \rightarrow \text{Adj} \) (PP)

And the equivalent set of rules for Advs.
The New Rules (to be revised)

NP → (D) N'
N' → (AdjP) N' or N' (PP)
N' → N (PP)
VP → V'
V' → (AdvP) V' or V' (AdvP/PP)
V' → V (NP)
AdjP → Adj'
Adj' → (AdvP) Adj'
Adj' → Adj (PP)
PP → P'
P' → (AdvP) P' or P' (PP)
P' → P (NP)

YIKES! Is there a simpler way?
Are we missing any generalizations??
Generalization 1: 3 types of rules
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- For each major category there are 3 types of rules:
Generalization 1: 3 types of rules

- For each major category there are 3 types of rules:
  - A rule that generates the phrase $\text{NP} \rightarrow \text{(D)} \text{ N'}$
Generalization 1: 3 types of rules

For each major category there are 3 types of rules:

- A rule that generates the phrase $\text{NP} \rightarrow \text{(D)} \text{ N'}$
- A rule that iterates: $\text{N'} \rightarrow \text{(AP) N'}$
Generalization 1: 3 types of rules

For each major category there are 3 types of rules:

- A rule that generates the phrase $NP \rightarrow (D) N'$
- A rule that iterates: $N' \rightarrow (AP) N'$
- A rule that introduces the “head” $N' \rightarrow N (PP)$
For each major category there are 3 types of rules:

- A rule that generates the phrase $NP \rightarrow (D) \ N'$
- A rule that iterates: $N' \rightarrow (AP) \ N'$
- A rule that introduces the "head" $N' \rightarrow N (PP)$
Generalization 1: 3 types of rules

- For each major category there are 3 types of rules:
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Generalization 1: 3 types of rules

For each major category there are 3 types of rules:

- A rule that generates the phrase $\text{NP} \rightarrow (D) \text{N'}$
- A rule that iterates: $\text{N'} \rightarrow (\text{AP}) \text{N'}$
- A rule that introduces the “head” $\text{N'} \rightarrow \text{N (PP)}$
Generalization 2: Headedness
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In each rule the only item that is obligatory is the item that gives its category to the node that dominates it:
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- \( NP \rightarrow (D) \ N' \)
Generalization 2: Headedness

In each rule the only item that is obligatory is the item that gives its category to the node that dominates it:

- \( NP \rightarrow (D) \ N' \)
- \( N' \rightarrow (AP) \ N' \)
Generalization 2: Headedness

In each rule the only item that is obligatory is the item that gives its category to the node that dominates it:

- $\text{NP} \rightarrow (D) \ N'$
- $\text{N'} \rightarrow (AP) \ N'$
- $\text{N'} \rightarrow N \ (PP)$
In each rule the only item that is obligatory is the item that gives its category to the node that dominates it:

- $NP \rightarrow (D) \ N'$
- $N' \rightarrow (AP) \ N'$
- $N' \rightarrow N \ (PP)$

There are no rules of the form $NP \rightarrow V \ AP$. (This is called endocentricity)
Generalization 3: Optionality
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With the exception of determiners (more on that in chapter 6), all non-head material is both phrasal and optional.
Generalization 3: Optionality

- With the exception of determiners (more on that in chapter 6), all non-head material is both phrasal and optional

  \[ NP \rightarrow (D) \ N' \]
With the exception of determiners (more on that in chapter 6), all non-head material is both phrasal and optional.

- $\text{NP} \rightarrow (D) \text{ N'}$
- $\text{N'} \rightarrow (\text{AP}) \text{ N'}$
Generalization 3: Optionality

- With the exception of determiners (more on that in chapter 6), all non-head material is both phrasal and optional

  - NP $\rightarrow$ (D) N'
  - N' $\rightarrow$ (AP) N'
  - N' $\rightarrow$ N (PP)
Goals of X-bar theory

- Simplify the system of rules
- Capture intermediate structure
- Capture the cross-categorial generalizations.

We will use VARIABLES to do this. A variable is a category that can stand for any other category.

X, Y, W, Z are variables that can stand for ANY of N, V, A, P
The X-bar Rules (to be slightly revised)

Specifier Rule:  \( XP \rightarrow (YP) \ X' \)

Adjunct Rule:  \( X' \rightarrow (ZP) \ X' \)  or  \( X' \rightarrow X' (ZP) \)

Complement Rule:  \( X' \rightarrow X (WP) \)

where \( X \) can stand for any category (N,V, Adj, Adv, P). \( X \) must be consistent through the 3 rules.
X-bar Structures

XP
/     \
|     |
YP   X'

X'
/     \
|     |
X'   ZP₁

X'
/     \
|     |
X'   ZP₂

X
/     \
|     |
X     WP
X-bar Structures

NP

YP

N′

ZP₁

N′

ZP₂

N

WP
X-bar Structures

```
VP
 /   /
YP   V'
   /   /
V'   ZP₁
  /   /
V'   ZP₂
 /   /
V   WP
```
X-bar Structures

AdjP

YP

Adj’

Adj’

ZP₁

Adj’

ZP₂

Adj

WP
X-bar Structures

AdvP

YP

Adv'

Adv'

Adv'

ZP_1

Adv'

ZP_2

Adv

WP
X-bar Structures

```
PP
 /   \
YP   P'

P'  ZP₁

P'  ZP₂

P  WP
```
Summary

- Constituency tests show us there is intermediate structure in phrases. (evidence varies in strength)

- There are cross-categorial generalizations to be made:
  - 3 rules: Specifier, adjunct, complement
  - Headedness & Endocentricity
  - Optionality of modifiers
X-bar rules:

-Specifier Rule: \( XP \rightarrow (YP) \ X' \)
-Adjunct Rule: \( X' \rightarrow (ZP) X' \) or \( X' \rightarrow X' (ZP) \)
-Complement Rule: \( X' \rightarrow X (WP) \)

This is still pretty messy. To do:

- Discuss the differences between the specifier/complement/adjunct rules
- Account for cross-linguistic variation
- Tidy up some ugly loose ends (like the lack of motivation for the specifier rule, the fact that determiners aren’t phrases, and the fact that the TP rule doesn’t fit into the system.)