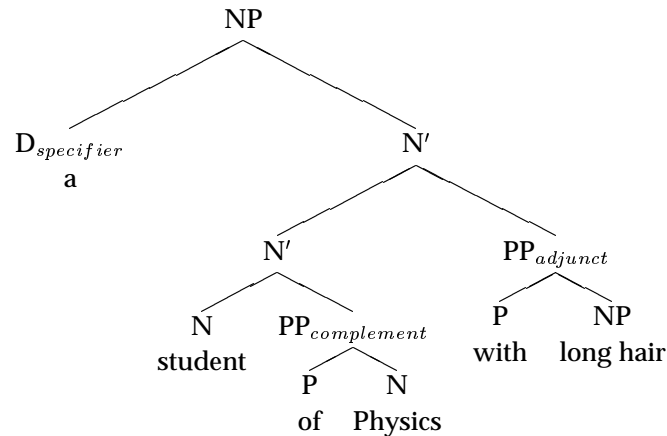


- (1) a student of Physics with long hair



1 On differences between Complements and Adjuncts

1.1 Semantic Arguments

Each N' denotes a semantic property. To attribute (1) to someone is to attribute two properties to them - one of studying Physics and another of having long hair.

On the other hand, (2a, b) both involve only one property attribution: that of being a student in (2a) and that of studying Physics in (2b).

- (2) a. John is a student.
b. John is a student of Physics.

Note that the post-copular¹ NPs contain only one N' each. On the other hand, (1) contains two N's and involves two property attributions.

• In some cases, PPs are quite unambiguously either adjuncts (*with long hair*) or complements (*of Physics*). In most cases, however, PPs don't so wear their complement/adjunct status on their sleeves. Consider the ambiguous (3).

- (3) a student [*of high moral principles*]
a. a person who studies high moral principles
b. a student who has high moral principles

This ambiguity can be characterized in structural terms: on the reading in (3a), the PP *of high moral principles* is a complement of *student*, while on the reading in (3b), the PP *of high moral principles* is an adjunct. A similar point is made by (4).

- (4) a. Arguments [*with Tim*] are often pointless. (complement)
b. Arguments [*with few premises*] are often pointless. (adjunct)

¹*be* is also called the *copula*. a post-copular NP is an NP that follows the copula.

Evidence for the proposal that *with Tim* in (4a) is a complement and that *with few premises* in (4b) is an adjunct comes from the contrast in (5).

- (5) a. Arguments [with Tim] [with few premises] are often pointless.
- b. *Arguments [with few premises] [with Tim] are often pointless.

1.2 Syntactic Arguments

- (6) Phrase Structure Rules for Noun Phrases
 - a. $N'' \rightarrow D N'$ (Determiner Rule)
 - b. $N' \rightarrow N' PP$ (Adjunct Rule)
 - c. $N' \rightarrow N (PP)$ (Complement Rule)

One consequence of these rules that we saw last time is that a complement must precede an adjunct.

- (7) a. a student [of Physics] [with long hair]
- b. * a student [with long hair] [of Physics]

These rules have other consequences too. Note that the adjunct rule is *recursive* i.e. in principle, it could apply an arbitrarily large number of times.

On the other hand, the complement rule is not recursive i.e. it can apply only once. These predictions are borne out:

- (8) a. a student [with long hair] [with short arms]
- b. * a student [of Physics] [of Chemistry]

Further, unlike complements which have to precede adjuncts, adjuncts can be freely reordered with respect to each other.

- (9) a. a student [with long hair] [with short arms]
- b. a student [with short arms] [with long hair]

1.2.1 Co-ordination

Complements can be co-ordinated with other complements.

- (10) a student [of Physics] and [of Chemistry]

Likewise, adjuncts can be co-ordinated with other adjuncts.

- (11) a student [with short arms] and [with long hair]

But adjunct PPs and complements PPs cannot be co-ordinated.

- (12) a. * a student [of Physics] and [with short arms]
- b. * a student [with short arms] and [of Physics]

Since *a students of Physics* and *professors with long hair* are both N's, our analysis predicts that it should be possible to co-ordinate them.

- (13) the [[students of Physics] and [professors with long hair]]

1.2.2 Extraposition

Adjuncts are less tightly bound to the head noun than complements. This can be seen by the fact that it is possible to extrapose adjunct PPs but not possible to extrapose complement PPs.

- (14) a. (?) A student came to see me yesterday [*with long hair*].
b. * A student came to see me yesterday [*of Physics*].

1.2.3 Preposing

Complements and Adjuncts behave differently with respect to preposing.

- (15) a. [What branch of Physics] is Jack a student of?
b. * [What kind of hair] is Paco a student with?

(Note that Complements and Adjuncts go in opposite directions with respect Extraposition and Preposing.)

1.3 Co-occurrence Restrictions

Heads place significant restrictions (i.e. *subcategorise*) on what can appear as their complement.

- (16) a. a student of Physics
b. * a boy of Physics
c. * a girl of Physics
d. * a teenager of Physics
e. * a goth of Physics

No similar restrictions are imposed on adjuncts.

- (17) a. a student with long hair
b. a boy with long hair
c. a girl with long hair
d. a teenager with long hair
e. a goth with long hair

Generalisation: heads are more closely related to their complements than to their adjuncts. Sub-categorisation restrictions hold only between a head and its complement, not between a head and its adjuncts.

1.4 Some more examples

Complements:

- (18) a. your reply [to my letter]
b. the attack [on Starr]
c. the loss [of the ship]

- d. Joan's disgust [at Tamara's behavior]
- e. his disillusionment [with life]

Adjuncts:

- (19)
- a. the book [on the table]
 - b. the advertisement [on the television]
 - c. the fight [after the match]
 - d. his resignation [because of the scandal]
 - e. a cup [with a broken handle]

1.5 Non-PP Complements and Adjuncts

So far we have only considered cases of PP complements and adjuncts. Can other kinds of phrases also be complements/adjuncts of nouns?

Complements: It seems that only PPs and full clauses (Ss) can be complements of nouns.

- (20)
- a. the suggestion [that we should abandon ship]
 - b. the demand [for him to resign]
 - c. the question [whether euthanasia is ethical]

On the other hand, a much wider range of phrases can occur as adjuncts e.g. temporal NPs, APs, and Relative Clauses.

- (21)
- a. the [[_{N'} abolition of taxes] [_{NP} next year]]
 - b. the [[_{N'} students of Physics] [_{AP} absent from class]]
 - c. the [[_{N'} king of England] [_S who abdicated]]

The greater freedom found with adjuncts reflects the fact that fewer restrictions are imposed by a head on its adjuncts than on its complement.

1.6 Complex NPs

What happens when the PP complement or adjunct itself contains a non-trivial NP (i.e. an NP with internal structure)?

- (22)
- a. an advocate of the abolition of indirect taxation
 - b. a woman with an umbrella with a red handle
 - c. his dislike of men with big egos

How can we account for the ambiguity of (23)?

- (23) a woman with three children with ginger hair

2 Prenominal Modifiers

Nouns can have three different kinds of prenominal (i.e. preceding the noun) modifiers:

Determiners: *a*

Attributes (Prenominal Adjuncts): *Cambridge*

Complements: *Physics*

(24) a [*Cambridge*] [*Physics*] student

We already have the following two phrase structure rules:

- (25) a. $N'' \rightarrow D N'$ (Determiner Rule)
b. $N' \rightarrow N' PP$ (Adjunct Rule)
c. $N' \rightarrow N (PP)$ (Complement Rule)

In addition, we will add the following two rules:

- (26) a. $N' \rightarrow NP N'$ (Adjunct Rule)
b. $N' \rightarrow (NP) N$ (Complement Rule)

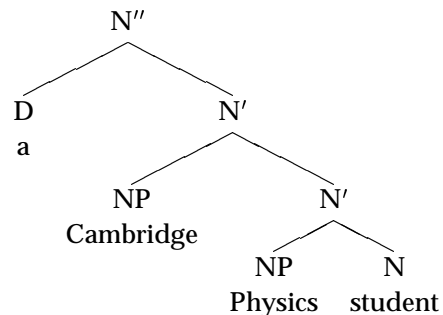
Consider the two readings of (24):

- (27) a. a student of Physics in Cambridge
b. a student of Cambridge Physics (as opposed to New York Physics)

The case of (27b) is somewhat straightforward so we can set it aside for now.

As for (27a), we know from our discussion on postnominal modifiers that in (27a), *of Physics* is a complement and *in Cambridge* is an adjunct. If we want to maintain maximal structural symmetry between (24) and its postnominal version in (27a), we are led to the following structure for the reading of (24) paraphrased by (27a).

(28)



2.1 Evidence for the above tree

• Ordering: We know that complements have to be closer to the head than adjuncts while adjuncts can be more freely reordered with respect to each other.

Note that *Cambridge* and *Physics* cannot be reordered. *Physics* has to be closer to the head noun.

(29) a. a [*Cambridge*] [*Physics*] student

b. * a [Physics] [Cambridge] student

• Co-ordination: Prenominal adjuncts cannot be co-ordinated with prenominal complements.

- (30) a. * several [[Physics] and [Cambridge]] students
b. * several [[Cambridge] and [Physics]] students
c. several [[Physics] and [Chemistry]] students
d. several [[Cambridge] and [New York]] students

Also since both *Physics student* and *Cambridge Physics student* are N's, they can both be co-ordinated with another N'.

- (31) a. a Cambridge [hockey player and Physics student]
b. a [hockey player and Cambridge Physics student]

• Recursion: The attribute/adjunct rule is recursive, the complement rule is not. This means that we can have an arbitrarily large number of attribute/adjuncts but only one complement.

- (32) a. * a Physics Economics Agriculture student
b. a [Cambridge] [middle class] student
c. a [middle class] [Cambridge] student

2.2 The Prenominal/Postnominal Parallel

In general, for most postnominal structures, whether they involve complements or adjuncts, we can produce corresponding prenominal structures.

- (33) a. i. the ban [on controversial art] (Complement)
ii. the [controversial art] ban
b. i. recruitment [of personnel] (Complement)
ii. [personnel] recruitment
c. i. the shop [on the corner] (Adjunct)
ii. the [corner] shop
d. i. the lady [of iron] (Adjunct)
ii. the iron lady

However, there is a difference - only nominals can occur in the preverbal position. Unlike postnominal modifiers which could be PPs, prenominal modifiers can only be NPs or adjectives². Not all postnominal modifiers can be paraphrased by prenominal modifiers:

- (34) a. the carrot [on the pan]
b. * the [on the carrot] pan
c. * the [pan] carrot

Further the meaning of a prenominal modifier, esp. if it is an adjunct, can differ substantially from the postnominal PP version.

²Also participles as in 'the eaten apple'.

- (35) a. the book [on the coffee table]
 b. the [coffee table] book

A book kept on the coffee-table is not the same thing as a coffee-table book.

3 Adjectival Premodifiers

So far, we have only considered nominal attributes. Where do adjectives fit into the picture?

- (36) a. a [really excellent] book
 b. a [patently obvious] lie

For the most part, adjectival premodifiers are like NP premodifiers. We can handle them by adding the following rule:

- (37) $N' \rightarrow AP N'$ (Adjunct AP Rule)

Points to consider:

- recursiveness
- Ambiguity of cases like:

- (38) an English teacher
 a. someone who teaches English
 b. someone who teaches, and who is English

4 S in X'-theory

4.1 VP in X'-theory

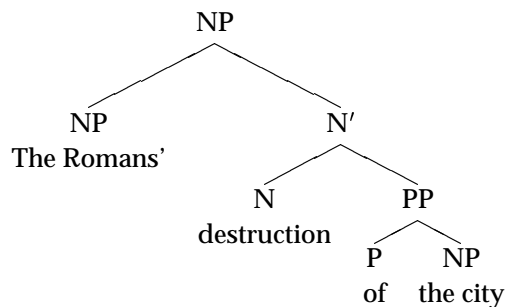
In (39), the NP *the city* is the complement of the verb *destroy*.

- (39) The Romans [_{VP} destroyed [_{NP} the city]].

What goes into the [Spec, VP] position?

Let us consider the case of nominalizations:

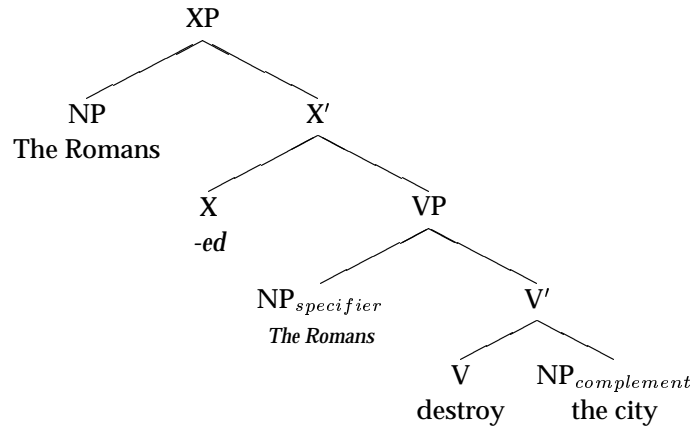
- (40) The Romans' destruction of the city



In (40), we see that all the *arguments* of N occur within its own phrase (maximal projection). A natural idea, within the spirit of cross-categorical symmetry, is to extend the idea that all the arguments of a *head* should occur within its own phrase (maximal projection). This gives us the tree in (42) for (41).

(41) The Romans destroyed the city.

(42)



But there is no *The Romans* inside the VP?

Yes, there isn't because now it is in the [Spec, XP].

Questions:

1. What is XP?
2. Why does the NP move from [Spec, VP] to [Spec, XP]?

We will answer Question 1 in this section and Question 2 in the next.

4.2 What is XP?

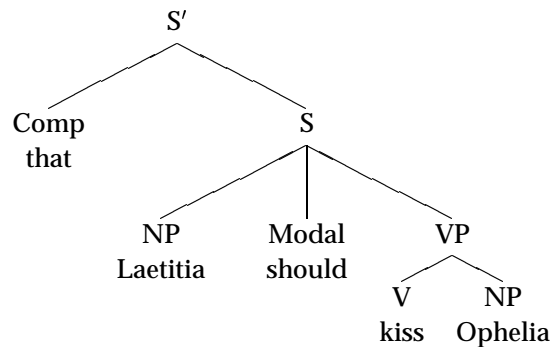
XP = S

However, if XP = S, what is X⁰, the head of XP = S?

We know from our discussion of X' theory that every XP has to have a head *of the same kind* i.e. XP cannot be headed by Y⁰. This property is known as **endocentricity**.

Now let us consider how we have been analyzing cases like (43).

(43) Mark believes that Laetitia should kiss Ophelia.



Neither S nor S' are endocentric. How can we reformulate S and S' so that they are endocentric and fit within the X'-schema?

- Approach 1: The element which we have labeled 'Modal' could be head of S. This is the most natural approach because:

(i) heads are at most lexical items (there may be heads that are smaller than words).

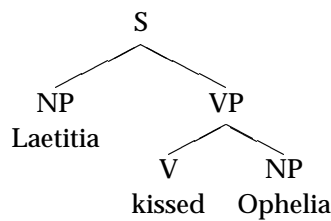
(ii) S has only three constituents, out of which 'Modal' is the only lexical item

What then about cases which don't have a modal such as (44a, b)?

- (44) a. Mark believes that Laetitia is kissing Ophelia (right now).
 b. Mark believes that Laetitia kissed Ophelia (yesterday).

(44a) is easier to take care of. We can just create a class of *Auxiliary* verbs which includes all modal verbs, *be* and one kind of *have*. But cases like (44b) pose a greater challenge. One option is to say what we have been saying up until now i.e. the following structure:

(45)



The immediate problem for this representation is that there is no candidate for the head of S. The immediate constituents of S are NP and VP and neither of them are heads. So we seem to be stuck.

At this point we should look back to cases of VP-preposing (VP-topicalization). We had seen there that some kinds of VPs could be preposed but others couldn't:

- (46) a. [_{VP} Kiss Ophelia], Laetitia did.
 b. *_{VP} Kissed Ophelia], Laetitia.
 c. *_{VP} Kissed Ophelia], Laetitia did.

A similar point can be made with pseudoclefts (cf. 47a).

- (47) a. What Ophelia did was [_{VP} kiss Ophelia].
 b. *What Ophelia did was [_{VP} kissed Ophelia].

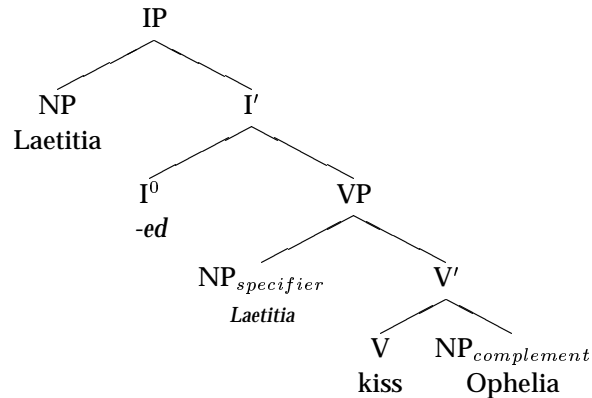
What distinguishes the grammatical examples in (46) and (47) from the ungrammatical examples? The grammatical cases involve VPs without tense/person/number marking. The verb appears in its bare form.

VPs in the ungrammatical cases involve verbs which are marked for tense/person/number marking. In the case at hand, the verb *kissed* is marked for Past Tense.

We want to distinguish between these two kinds of VPs and yet also retain a link between them. The solution lies in postulating a node **Inflection** where the inflectional information associated with a verb could be stored. This node Inflection will head a phrase InflectionP (IP) which will be equivalent to an S.

(48) Laetitia kissed Ophelia.

(49)



• Clearly, there has to be a way for the *-ed* suffix under I⁰ and the verb *kiss* to combine.

Inflection Proposal: An I⁰ and a V⁰ that heads the complement VP of the I⁰ combine in the phonological output.

i.e. when you try to pronounce the above tree, the I⁰ node and the V⁰ node combine and are pronounced together.

Cases like (46b) are bad because they would involve topicalization of an I' and only full phrases can be moved around. (46c, 47b) are bad because there are two sets of tense/agreement markings floating around while there is only one I⁰ to supply the information.

4.3 X' rules for IP

Since we have adopted X'-theory, the form of the rules will be quite familiar:

- (50) a. $I' \rightarrow NP_{Specifier} I'$
b. $I' \rightarrow I VP_{Complement}$

We can now give a new definition of the notion 'subject of a sentence':

The 'subject of a sentence' is the NP that occurs in the [Spec, IP].

In English (and many other languages), the subject of a sentence agrees with the verb. What it means for a subject to agree with its verb is illustrated in (51).

- (51) a. John eats pizza.
b. *John eat pizza.
c. I eat pizza.
d. *I eats pizza.

This relationship between the verb and its subject can be stated extremely locally within our new system as the reflex of the Specifier-head relationship.

- (52) **Agreement Rule:** Copy the person-number features of the NP in [Spec, IP] on the I⁰.

The person-number features of an NP are also referred to as its ϕ -features (phi-features). The ϕ -features of some pronouns are shown below:

- (53) a. I = [+1stperson, +singular]
 b. we = [+1stperson, +plural]
 c. you = [+2ndperson]
 d. s/he = [+3rdperson, +singular]
 e. they = [+3rdperson, +plural]

In English, gender is not part of the verbal agreement system, so *she* and *he* can be taken to have the same ϕ -features but in languages where they are part of the agreement system, they would also need to be represented.

4.4 What can go under I⁰?

In sentences without any auxiliary element, the inflection is all there is in I⁰. However, other elements can also appear under I⁰.

- (54) a. I **must/should/could** [eat some waffles]. (Modals)
 b. I **am** [eating some waffles]. (*be*)
 c. I **have** [eaten some waffles today]. (auxiliary *have*)
 d. I **did** [not eat the waffles]. (auxiliary *do*)
 e. I want **to** [eat waffles]. (infinitival *to*)

Earlier we saw two syntactic processes - VP Topicalization and pseudocleft formation - which were sensitive to the presence of inflection. Another grammatical process that is sensitive to the presence of inflection is VP Ellipsis. VP Ellipsis in English involves a silent tenseless VP together with an overt realization of I⁰.

- (55) a. Jerry shouldn't leave town. Bill **should** [_{VP}leave town].
 b. Tyrone isn't eating waffles today, but Ken **is** [_{VP}is eating apples].
 c. Max hasn't finished his homework, but Jose **has** [_{VP}finished his homework].
 d. Ana doesn't want to leave, but Mona wants **to** [_{VP}leave].
 e. Chunghye doesn't like unicorns, but Maribel **does** [_{VP}like unicorns].
 (*Chunghye doesn't like unicorns, but Maribel [_{VP}likes unicorns].)

Each of the elements in (54) has distinct properties. Let us consider them individually. To provide contrast, we will start by looking at one verbal element that cannot occur in I⁰, namely a main verb.

4.4.1 Main Verbs

Main verbs have non-tensed forms: past participles, present participles, and infinitival forms.

- (56) a. Talvin ate the pizza.
 b. Talvin has eaten the pizza. (past participle)
 c. Talvin is eating the pizza. (present participle)
 d. Talvin wants to eat the pizza. (infinitival form)

When negated or questioned, a form of the verb *do* is needed. Otherwise, the sentence is ungrammatical.

- (57) a. Talvin didn't eat the pizza.
b. *Talvin eatn't the pizza.
c. Did Talvin eat the pizza?
d. *Eat Talvin the pizza?
e. Why did Talvin eat the pizza?
f. *Why ate Talvin the pizza?

Cases such as these can be explained by noting that the presence of the negation disrupts the local relationship needed by the I⁰ and the V⁰ in order to combine together.³ Crucially main verbs stay in V⁰ and do not move to I⁰.

The verb *do* comes in and saves the day by giving a realization to the suffix in I⁰, which could not have been pronounced on its own. This process is called **do support**.

4.4.2 Modals

Modals are set apart by the fact that they can never occur in non-tensed environments.

- (58) a. *Talvin wants to must/should/could win this game.
b. *[To must/should/could play baseball] is fun.

Modals *invert* in questions and precede negation.⁴

- (59) a. Must/should/could Talvin win this game?
b. Why must/should/could Talvin win this game?
c. Talvin must/should/could not win this game.

The facts follow if we assume that Modal verbs are always generated in a [+Tensed] I⁰. Since modal verbs are generated in I⁰, they can realize whatever features I⁰ has and the I⁰ does not need to be 'close' to V⁰.

4.4.3 Auxiliaries: *be* and *have*_{Perfect}

Unlike Modals, auxiliaries can occur in non-finite environments.

- (60) a. Talvin wants to **be** popular.
b. Talvin wants to **have** been popular.

However, like modals, auxiliaries invert in questions and precede negation.⁵

- (61) a. Is Talvin winning this game?
b. Has Talvin won this game?

³The structure is something like [IP [Negation [VP]]]. Where do adverbs go?

⁴In fact, *do*-support is not a possibility here.

⁵*Do*-support is not a possibility here either. Consider what happens with *have to*, possessive *have*.

- c. Why is Talvin winning this game?
- d. Why has Talvin won this game?
- e. Talvin isn't winning this game.
- f. Talvin hasn't won this game.

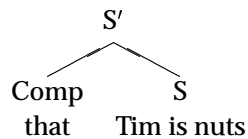
The above examples suggest that the auxiliaries *have/be* are generated in V^0 (like main verbs) but can move up to I^0 (unlike main verbs).⁶

- **to**: only occurs in [-tense] I^0 .
- **do**: only occurs in [+tense] I^0 when the I^0 is unable to combine locally with V^0 .⁷

4.5 S' in X' theory

S' as it stands is an **exocentric** projection i.e. it is not headed by a head of its own category. Actually, things are even worse. It is quite unclear whether S' has a head.

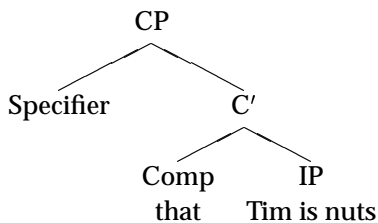
(62)



A neat solution, and one that is compatible with X' -theory is to take $Comp$ as the head of S' . In fact this solution is forced upon us since the only potential head among the immediate constituents of S' is $Comp$. We cannot look inside the S/IP for a head because the IP is a complete phrase by itself.

Assuming the IP to be a complement of $Comp$, we have the following tree.

(63)



What goes into the [Spec, CP]? We will answer this question when we discuss *wh*-movement (questions, relative clauses etc.).

We now move to discuss why the NP in [Spec, VP] moves to [Spec, IP]. The answer lies in the domain of Case Theory.

⁶What does the tree look like now?

⁷What about the other *do*?