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Linearizing morphemes and the Mirror Principle

«Yo sé de un laberinto griego que es una línea única, recta».
'I know of a Greek labyrinth that is a single, straight line'.
—Jorge Luis Borges, *La muerte y la brújula* 'Death and the Compass'

1 Overview

- Today's lecture deals primarily with the relation of morphosyntactic structures to the linear order of morphemes, following chapter 3 of Embick 2015
- One goal is to account for systematic relations between linear order and hierarchical structure.
  - Embick looks at how linear relations derived from complex morphosyntactic structures are represented.
  - The focus is on the complex structures that we commonly identify as *words*.
- As with most of the material we've looked at recently, Embick's discussion is couched in Distributed Morphology (DM).
  - As we've been assuming, this a Constructionist approach, with no division between word formation and phrase formation.
  - On the assumption that morphemes are the fundamental unit manipulated by syntax, one of his goals is to outline the properties of the structures and linear relations that morphemes occur in.

In other words, syntax all the way down!

- The problem is that *the syntax creates structures*, and structures are hierarchical.
  - The standard view in GB and Minimalism is that syntax does not encode linear order, only dominance and sisterhood.
  - The need for these elements to be pronounced in a certain order is imposed by PF.

This is different from theories based on phrase structure rules, which *do* encode the linear order of constituents.

- A fundamental idea is that the order in which morphemes occur is a reflection of the syntactic structure that produces them.
  - This is a hypothesis dating back to at least Baker 1985.
  - This link between morphological order and the underlying syntax should fall out automatically in a syntax-based theory of morphology,
- Today, we are going to take a close look at this link, especially how complex heads are create and how these structures are mapped into linear strings of morphemes.

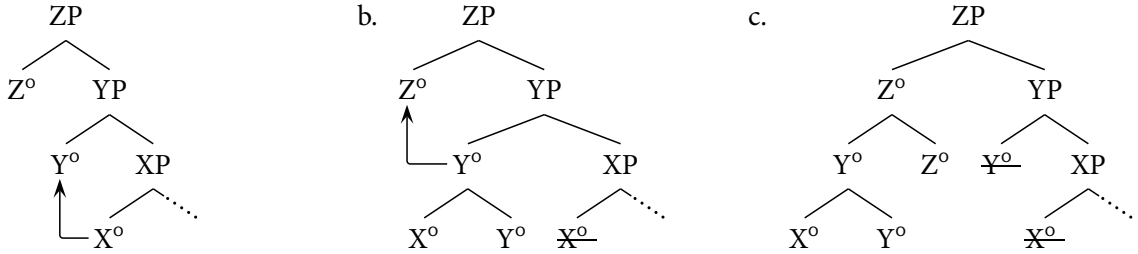
2 Syntactic structure in words

2.1 A review of head movement and head adjunction

- As we've seen, many constructionist approaches rely on the syntactic operation HEAD MOVEMENT to create morphologically complex elements.
- The standard view of head movement is that it is a recursive syntactic operation that creates complex heads through adjunction (Baker 1988, Travis 1984).
  - If a head X^o moves to a head Y^o, it creates a new complex head $[_{Y^o}\ X^o\ Y^o]$, where X^o is adjoined to Y^o as in (1b).
  - This new COMPLEX HEAD can then be adjoined to the next higher head, as in (1c), and this head can subsequently be moved to the next head.

If you're familiar with Bare Phrase Structure (BPS; Chomsky 1995), you will head movement causes some problems for the theory of movement.

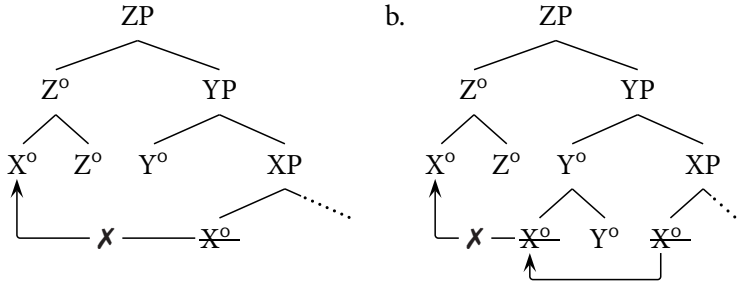
(1) a. b. c.



- Head movement is a highly constrained phenomenon:
  - Head movement is subject to the HEAD MOVEMENT CONSTRAINT (Travis 1984). A head X^o must move to an immediately c-commanding, projecting head Y^o; it cannot skip over Y^o to move to a higher head Z^o, as in (2a).
  - It is also subject to the ban on EXCORPORATION (Baker 1988). Once a head X^o becomes part of some complex head $[_{Y^o}\ X^o\ Y^o\ ]$, it becomes impossible for X^o to move on its own as in (2b).

This also prevents head movement into and out of specifiers and adjuncts.

(2) a. b.



- The effect of these two constraints together lead to the derivation seen in (1).
  - If X^o must move to Z^o, but some head Y^o intervenes, then it is necessary to move X^o to Y^o first and then move Y^o to Z^o.
- This successive head movement means that as one head moves to the next, the structures they create become increasingly complex.

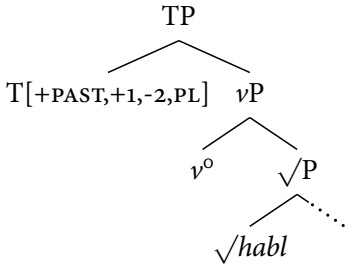
In other words, if Y^o intervenes between X^o and Z^o, Y^o must become part of the resulting complex head. Forming $[_{Z^o}\ X^o\ Z^o]$ is impossible.

2.2 Spanish verbs again

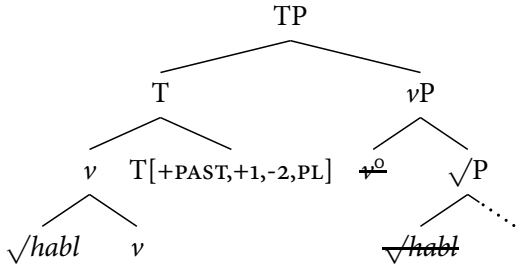
- We have seen this already in a number of cases, including our discussions of derivational affixation, compounding, and incorporation.
- In fact, Embick discusses an example we've looked at already – Spanish verbal inflection (see section 2.1 of the handout on inflectional morphology).
  - Recall from there that the assumption is that we can treat the underlying structure of Spanish more-or-less like English (or any other language).
  - Head movement assembles the key pieces of the verb it T°:

I've opted to use Embick's (2015) tree notation here. For the sake of simplicity, he simplifies Oltra-Massuet and Arregi's (2005) assumptions about theme vowel insertion. He also collapses the distinction between *v*° and Voice° here.

(3) a. *Base structure*:

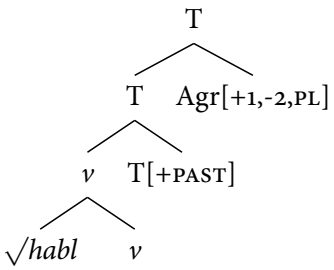


b. *After head movement*:

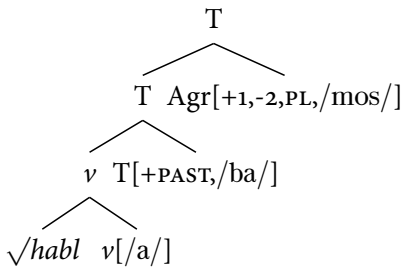


- The resulting complex head is Spelled Out and sent to PF.
- On its way to PF, it is subject to morphological operations (including Fission of the agreement features and Vocabulary Insertion).

(4) a. *Fission*:



b. *Vocabulary Insertion*:



As mentioned last week, Embick (2015) assumes that roots are not subject to Vocabulary Insertion, but see his discussion in Chapter 2, pp. 41–43.

(5) *Vocabulary Items (Fragment)*:

a. $v \leftrightarrow$ /a/ / {…√*gust*, √*habl*, √*jug*,…} __

b. T[+PAST] ↔ /ba/ / *v*[/a/] __

c. Agr[+1,-2,PL] ↔ /mos/

Embick (2015: 63) assumes a binary feature system where [-1,-2] is third person, [+1,-2] is first person, and [-1,+2] is second person.

- As such, a combination of syntactic head movement and post-syntactic morphological operations give us the building blocks of the complex verb in this system.
- But how do we take this structure and turn it into a 'word'? How do we impose an order on this material?

3 The relation between structure and order

- At issue here is how these structures come to get pronounced as the things we intuitively refer to as 'words'.
  - As in syntax, the problem is that structures are two-dimensional objects, organized by sisterhood and dominance.
  - By hypothesis, they do not encode linear order. The ordering we indicate in trees when we draw them is a necessity of putting down on a page.
  - However, when pronounced one morpheme must be pronounced after another due to the PF interface. They are organized into a linear order over time, and the two-dimensional information is often lost.

Signs in sign languages, of course can exist in three dimensional space, and it is possible, in principle, for signers to produce more than one sign at a time. But signing does not directly reproduce morphosyntactic structure, and signs are still ordered over time.

- Since (morpho)syntactic structure does not encode linear order, this must be imposed on morphologically complex objects by some process.
  - The general view, which Embick (2015) pursues here, is that syntactic structure determines what the possible linear orders are.
  - However the system works, it must generally respect the structures created by the syntax.
  - Embick doesn't commit to any specific linearization algorithm here. He is more interested in how the syntax constrains morpheme order and how to represent these relations.
- Embick (2015) is particularly interested in a property of grammar called the Mirror Principle, originally identified by Baker (1985).
  - The Mirror Principle states that morphological derivations must reflect syntactic derivations and *vice-versa*, in a way to be made clearer below.
- Before we can do this, though, we need to introduce some technical machinery to explain the relation between syntax and morpheme order.
  - Here I'll concentrate how to talk about the relations between morphemes in complex heads, and how to map these to linear orders at PF.

3.1 M-words and subwords

- Following previous work, Embick (2015: 68) introduces the distinction between M-Words and Subwords

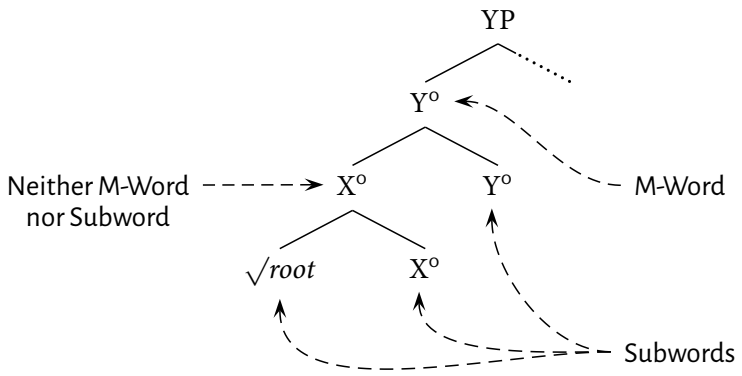
See Embick and Noyer 2001 and Embick 2007b.

(6) a. *M-Word*:
(Potentially complex) head not dominated by a further head-projection.
b. *Subword*:
A terminal node and, therefore, a morpheme (either a functional morpheme, or a Root).

- The definitions essentially distinguish between terminals inside of a complex head and the complex head itself:

If you are familiar with BPS, you will probably recognize these definitions as very similar to the contextual definitions of minimal and maximal projections. See Hornstein et al. 2005: 196–200 for discussion.

(7)

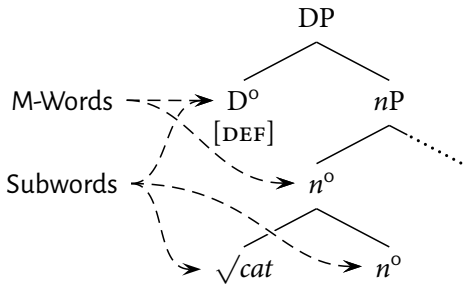


- As you can see in the tree above, not every node in a complex head will be identified as an M-Word or a Subword.
  - One instance of X° is neither a terminal node (and so not a Subword) and is dominated by a segment of Y° (and so not an M-word).

- Additionally, it is possible for an element to be simultaneously an M-Word and a Subword. Such elements are simplex heads:

Again, this is similar to what happens with under BPS, which allows a single element to be both minimal and maximal at the same time.

(8)



  - Here, D° is not dominated by another head projection, so it is an M-Word.
  - However, D° is also a terminal node, so it is also a Subword.

- The distinction seems to be important in several ways:
  - Head movement, as shown above in (1), moves M-Words to create new M-words, using them to assemble ever larger complex heads.
  - Vocabulary Insertion seems to target Subwords. This means that Subwords and morphemes are equivalent in most cases.
  - As we'll see, Linearization is sensitive to the distinction. Subwords within a single M-Word are linearized relative to one another, and M-Words are linearized relative to other M-Words.

3.2 Linear order and No Tangling

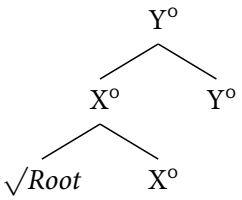
- The typical assumption in syntax is that the syntactic structure constrains the orders in which elements are linearized.

At its most basic, a lot of syntax is about figuring out what the underlying structures of sentences can be based on the order of words. If there were no mapping between linear order and syntactic structure we could not do this.

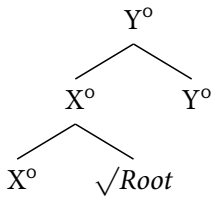
- Given a root with two affixes, there are only four possible orderings, depending on how the terminals are arranged at PF

(9) *Possible orders of root with two affixes*:

a. ROOT-X-Y:

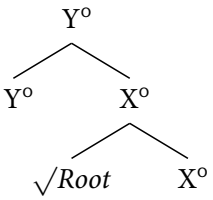


c. X-ROOT-Y:

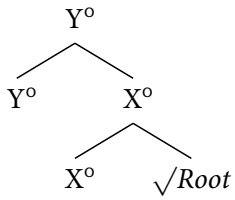


Remember, these trees are all technically identical, syntactically speaking. The orders shown are meant to demonstrate that the nodes in tree can come in the indicated order.

b. Y-ROOT-X:



d. Y-X-ROOT:



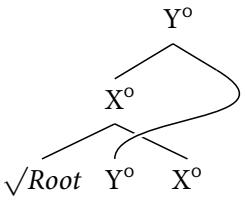
- The assumption that limits the derivation to these orders is that branches in the tree will never cross each other.
  - Embick (2015: 72) labels this the No Tangling condition.
  - It's nothing new though; it is implicit in basically all syntactic theorizing.

See, *e.g.*, Carnie (2013: 126–127) discussion of precedence in syntax.

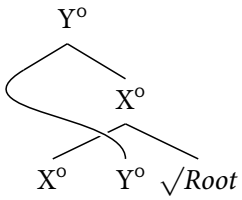
- Two logically possible orders are ruled out because the structure prevents the terminal node Y° from intervening between the root and X°:

(10) *Orders ruled out by the No Tangling condition*:

a. *ROOT-Y-X:



b. *X-Y-ROOT:



- The use of head movement combined with the No Tangling condition predicts that the possible orders that morphemes will occur in will generally be restricted as in (9), ruling out the orders in (10).
  - It is, however, possible for post-syntactic morphological operations to affect this order.

3.3 Concatenation

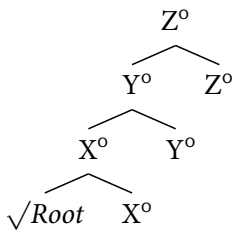
- Given that orders are restricted by structure, we now have to consider how things actually get ordered.
- When syntacticians talk about precedence, we normally think about it terms of a binary relation: One object precedes another.
- To that end, Embick (2015) introduces the ⌢ operator which CONCATENATES two elements.
  - 'X⌢Y' should be read 'X immediately precedes Y'.
  - These elements must be of the same type, either both M-Words or both Subwords (within the same M-Word).

The effect is that morphemes within a single M-Word are linearized relative to each other, while M-Words are linearized with respect to other M-Words. Material inside one M-Word cannot appear in another.

- Because concatenation is a binary relation, multiple concatenation statements are necessary to determine the total ordering of an element:

(11) $\sqrt{Root}$-X-Y-Z

a. $\sqrt{Root}$⌢X
b. X⌢Y
c. Y⌢Z



- These statements must be defined for adjacent heads to satisfy the No Tangling condition.
  - For the tree above, the statement X⌢Z would be incoherent, since these are not structurally adjacent Subwords.
  - This is because Y° intervenes structurally between X° and Z°.
- An important aspect about these statements that Embick (2015) does not raise precedence is TRANSITIVE and that the resulting orders must be IRREFLEXIVE.

See the discussion in, *e.g.*, Nunes (2004).

  - When we say precedence is transitive, we mean that if X precedes Y, and Y precedes Z, then X precedes Z.
  - Irreflexivity is a condition on orderings. No element X may precede itself.
  - This means, taken together, the statements X⌢Y, Y⌢Z, and Z⌢X are incoherent, because it would ultimately mean that all of the Subwords would precede themselves. This would make it impossible to actually organize the order in the word.

4 The Mirror Principle

- All of these things taken together allow us to explain an important aspect of the relation between morphology and syntax, originally explicated by Baker (1985): The Mirror Principle.
- The Mirror Principle, as originally stated, proposes that morphological derivations must reflect syntactic derivations and *vice-versa*.
- This can already be glimpsed in the examples we've looked at in this course.
  - For example, if we take the order of projections, given in (12a), and compare them order of the elements in the Spanish verb, the elements that are the same in each case come in the opposite order.

(12) a. *Order of phrases in the clause*:
TP – VoiceP – *v*P– $\sqrt{}$P

b. *Order of morphemes in a verb*:
$\sqrt{}$ – *v* – ThV – T – Agr
dulc – ific – a – ba – mos

dulcificábamos 'we were sweetening'

- It's not as though we built this theory of syntax around the Spanish verb.
  - The order of (12a) is the order of projections we find in English.
  - We should want an explanation for why the opposite order appears in the Spanish verb.

This is basically just the order you learned in LIN232.

- As Baker explains at length, this shouldn't be an accident.
  - Rather, we should want our theories of syntax and morphology to interact in such a way so as to explain this phenomenon.
- That's what the theory laid out in the previous two sections does. It explains how the syntax gives rise to these patterns by restricting:
  i. How complex heads are built,
  ii. How these structures can be mapped to linear orders, and
  iii. How those terminals can be concatenated relative to each other.
- Ultimately, this lets deal with more complicated interactions in morpheme order that reflect differences in constituency that have semantic effects.
  - The morpheme order can literally tell us the order of projections in a tree, and therefore the relative scope of those elements.
  - This is especially important in cases where word order alone cannot give us all the information.

4.1 An example: Quechua

- Embick (2015) looks an example from Quechua (S. America), citing data from Muysken (1979).
  - This language shows an interaction between its causative suffix and its reciprocal and reflexive suffixes.
  - I've tried to take some simpler examples from Muysken's work so we can look at what's happening more closely.
- Quechua has a verbal suffix *-chi* that introduces causative semantics.
  - In essence, this adds another argument to the verb. That argument causes the event described by the verb:

(13) *Quechua* (Muysken 1979: 452):

a. Pay puñu-n.
he sleep-3SG
'He sleeps.'

b. Pay-ta puñu-chi-ni.
he-ACC sleep-CAUS-1SG
'I cause him to sleep.'

Quechua is a pro-drop language, so pronouns are often left unpronounced. Agreement on the verb often identifies the subject.

- It also has a reflexive affix *-ku* (rather than a reflexive pronoun).
  - This has the effect of making an argument of a transitive verb the same as the subject.

(14) *Quechua* (Muysken 1979: 454):

a. ñukaga wagra-ta riku-rka-ni
I cow-ACC see-PST-1SG
'I saw a cow.'

b. riku-ku-n.
see-REFL-3
'He sees himself.'

Also, $\sqrt{}$*Root*-TNS-AGR order again.

- These two affixes may co-occur in a single verb.
  - However, their order is not fixed, and each order corresponds to a different meaning:

(15) *Quechua* (Muysken 1979, 1988):

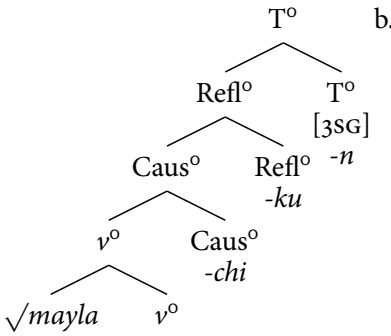
a. *maylachikun*
mayla -chi -ku -n
wash -CAUSE -REFL -3
'He$_i$ causes himself$_i$ to wash someone'

b. *maylakuchin*
mayla -ku -chi -n
wash -REFL -CAUSE -3
'He causes someone$_i$ to wash himself$_i$.'

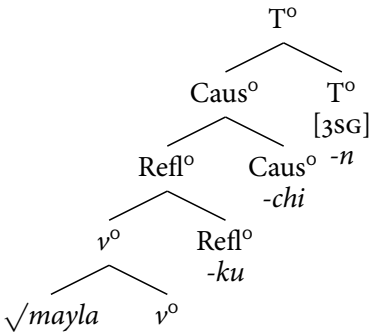
The reading in (15a) is mentioned in Muysken 1988: 278 alongside the reading noted in Muysken 1979, 'He$_i$ causes someone to wash him$_i$.' To keep things simple, I won't go into this extra reading here.

- Since morpheme order is determined by structure, these verb forms must have different structures:

(16) a.



b.

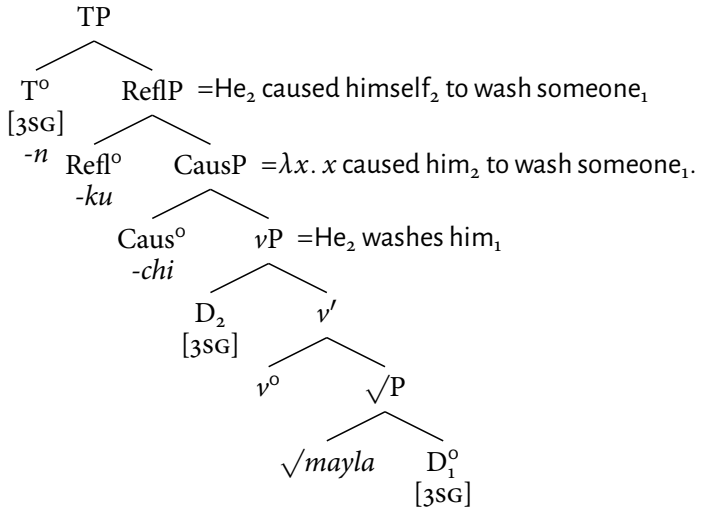


I'm using CausP and ReflP as shorthand here, since the precise category doesn't really matter.

- Based on the assumptions about head movement, the structure of the complex head is determined by structure that head movement occurs in:

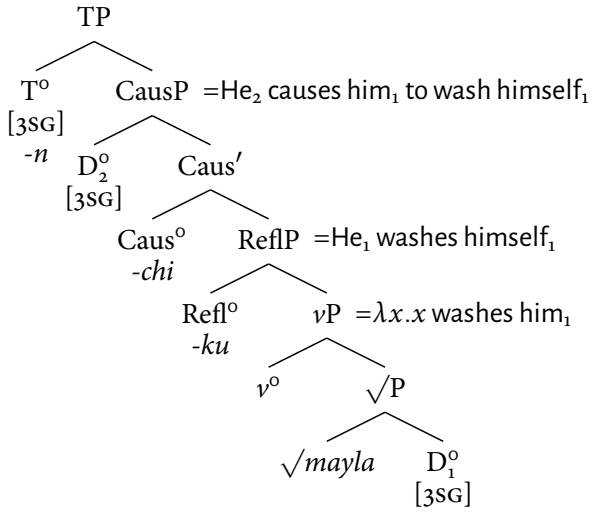
(17) *Syntactic derivations*:

a.



This sort of thing is fairly complicated; I'm simplifying a lot here for the sake of presentation. For a good discussion of reflexivization and how it behaves, see Ahn (2015).

b.



This is not distinct from the reciprocal and restituitive ambiguities mentioned in Bobaljik (2017). There are parts of the syntactic structure that can be assigned particular meanings, and these parts correlate with subparts of the verb.

- The observation is that the order of the morphemes in the complex verbs 'reflects' the underlying syntactic structure.

- This is what we mean by the Mirror Principle. The order of the morphemes is the mirror image of the order of the containing structures:
  - When ReflP dominates CausP, the causative suffix precedes the reciprocal suffix.
  - When CausP dominates ReflP, the reciprocal suffix precedes the causative suffix.
- Critically, this is derived from constraints on head movement and our assumptions about linearization.
  - Baker (1985, section 6.1) points out that the Mirror Principle would be 'mysterious' in a theory that derived morphology in a separate component from the syntax.
  - He argues specifically against the lexicalist views of the time, since it is unclear how they could allow the morphological form of a word to determined so closely by the syntax.
  - The morphology of a word must be able to be determined by the structure of the sentence it is in. On this view, there is no need to stipulate the Mirror Principle.

He notes Muysken's (1979) work on Quechua as an antecedent.

- To be clear, this phenomenon happens across diverse languages. A similar case can be seen in the language Bemba (Bantu, Zambia), discussed by Baker (1985):

(18) *Bemba* (cited in Baker 1985: 395):

a. Naa-mon-an-ya Mwape na Mutumba.
1SG.PST-see-RECIP-CAUSE Mwape and Mutumba
'I made Mwape and Mutumba see each other.'

b. Mwape na Chilufya baa-mon-eshy-ana Mutumba.
Mwape and Chilufya 3PL-see-CAUS-RECIP Mutumba
'Mwape and Chilufya made each other see Mutumba.'

Bemba is an SVO language, so the word order gives us some clues about where each argument is in the structure.

- Here, we see that a change in the relative order of the causative and reciprocal affixes changes which arguments are interpreted as being reciprocally bound.
  - In (18a), the conjoined DP is the experiencer of the seeing event, and each member of that DP sees the other.
  - In (18b), the conjoined DP is the causer of the seeing event, and each member of that DP causes the other to see Mutumba.
- These argument structure alternations are the same ones observed in Quechua.
  - This supports the relation between morpheme and order and syntactic structure needs to fall out from some general properties of the theory rather than language-specific morphological mechanisms.
  - But that doesn't mean there aren't problems…

4.2 Empirical challenges

- By and large, it looks like languages obey the Mirror Principle, but there are known exceptions of various kinds
- These are cases where morphological order or bracketing predicted by the syntax does not match the observed order of morphemes.
- These mismatches can manifest in a variety of ways; not all of them are obvious at first glance.

4.2.1 *Bracketing paradoxes (English comparative morphology)*

- English comparatives are formed either with the free-standing word *more* or the suffix *-er*.
  - Comparatives with *more* are known as PERIPHRASTIC comparatives.
  - Comparatives with *-er* are known as SYNTHETIC comparatives.

Everything in this section goes also for the superlative *most/-est*.

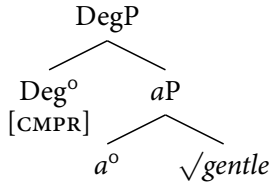
- Some words can occur with either of these options.

(19) a. *Periphrastic*: more gentle
b. *Synthetic*: gentler

There is no apparent difference in meaning between these examples.

- By hypothesis, both of these derive from the same syntactic structure. It's just a matter of selecting the right exponent for the comparative morpheme:

(20) *Structure of a comparative*:



(21) *Hypothetical Vocabulary Items*:
a. Deg[CMPR] ↔ *more*
b. Deg[CMPR] ↔ *-er*

There are many factors that go into this, most of which are phonological, and accounting for the variation is well beyond the scope of what I will cover here. See Smith and Moore-Cantwell 2017.

- However, most words use either one form of the comparative or the other. The most well-known fact is that adjectives over three syllables rarely take the suffix.

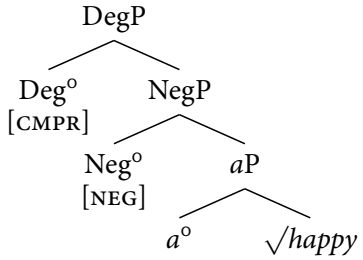
(22) a. *beautiful* ↛ **beautifuller*
b. *exquisite* ↛ **exquisiter*
c. *interesting* ↛ **interestinger*

- However, exceptions are known to occur with derivationally complex adjectives. A clear case is *unhappier*.
  - *Happy*, the adjective that *unhappy* is derived from, is only two syllables long, so it can (and does) take the suffix, forming *happier*.
  - The meaning of this adjective is 'more unhappy' and not 'not more happy'.
  - Since the meaning of *-er* scopes over *un-*, it is assumed that Deg° must c-command the negation (*i.e.*, *-er* attaches to *unhappy*):

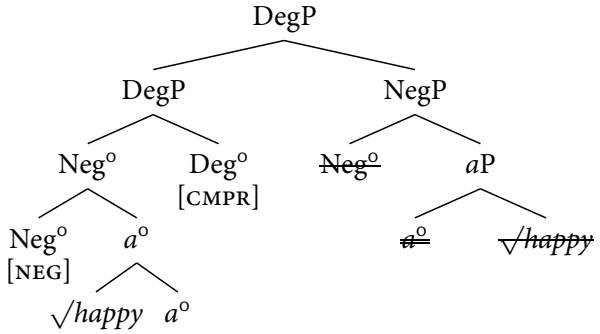
(23) *Structure of* unhappier:

For an analysis with less head movement, see Embick 2007a.

a. *Before head movement*:



b. *After head movement*:



- This means that when it comes time to do Vocabulary Insertion, Deg° will be linearly adjacent to a three-syllable word:

(24) [[*un-* [*happy*]] Deg°]

  - If the two-syllable rule is right, it should be impossible to insert the exponent *-er* here *more* should be used instead.
  - Nonetheless, the comparative is behaving as though it is attaching to the smaller *happy*; *i.e.*, as though the bracketing is as follows:

(25) [*un-* [[*happy*] Deg°]]

- This kind of conflict between the syntactic–semantic bracketing and requirements of the morpho-phonological derivation is known as a BRACKETING PARADOX, one form of a syntax–morphology mismatch.
- As Embick (2015: 80) points out, this has been taken to show that linear adjacency allows for rebracketing to occur.
  - This suggests that the comparative looks at representations that are binary concatenations. An element is sensitive to the element it is immediately adjacent to:

(26) a. *un^happy* b. *happy^er*

- So one solution, then, is to say that the syntactic bracketing doesn't actually matter in this case. It's just the linear order.

And that is built in to many of the contextual specifications that we wee in Vocabulary Items.

4.2.2 *Rigid orders*

- Another challenge for the Mirror Principle are cases where the order of morphemes is fixed and does not represent alternations in the syntax or argument structure of a sentence.
- Embick (2015: 80) discusses the interaction of the causative and applicative morphemes in Chichewa (Bantu; Malawi, Zimbabwe).

  - An applicative morpheme introduces another argument to the verb; in the cases below, these are instruments used to carry out some action.

(27) *Chichewa*:

FV stands for 'final vowel'.

a. Alenjé a-ku-líl-íts-il-a mwaná ndodo.
hunters 3PL-PROG-cry-CAUS-APPL-FV child sticks
'The hunters are making the child cry with sticks.'

b. Alenjé a-ku-tákás-its-il-a mkází mthíko.
hunters 3PL-PROG-stir-CAUS-APPL-FV woman spoon
'The hunters are making the woman stir with a spoon.'

- In each case, an instrument is introduced but associated with different events:
  - In (27a), the instrument is a stick, used to cause the child to cry.
  - In (27b), the instrument is a spoon, used in the stirring event that is caused to happen.

This is because the spoon is an argument of *stir*, not part of the causation event.

- However, the order of the causative and applicative morphemes does not change to reflect which event the instrument is associated with.
  - Since the spoon is associated with the stirring event in (27b) – the event that is caused – we expect the applicative morpheme to precede the causative morpheme.

This stands in comparison to the Quechua and Bemba examples we saw above where the order of the affixes is directly correlated with their scope.

- There have been various explanations for this.
  - Hyman (2002) suggests that this is due to a morphophonological requirement. The language requires these affixes to come in this order regardless of what the syntax is.
  - Pylkkänen (2002: 115–116) suggests that it is because the causative *-its* must select a root directly – so there is no true violation of the Mirror Principle here. She admits, though, there's no immediate explanation for the scope effects.

- If it is phonological, though, we have to find a constrained way to limit rearranging morphemes within a word.
- You saw another, similar thing to this on Assignment 2 – Swedish passives:

Hyman's analysis is in Optimality Theory. He proposes that a markedness constraint TEMPLATE, which demands morphemes come in a certain order, ranks over a faithfulness constraint MIRROR, demanding the order derived by the Mirror Principle.

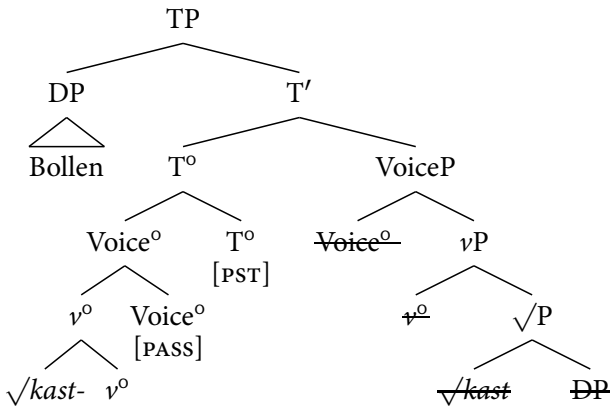
(28) a. Lars kast-a-de boll-en. — Lars throw-*v*-PST ball-DEF — 'Lars threw the ball.'
Boll-en kast-a-de-s. — ball-DEF threw-*v*-PST-PASS — 'The ball was thrown'

- The problem, recall, is that the passive voice affix *-s* comes outside the tense affix.
  - The position of Voice^0 in the clausal structure is very well established cross-linguistically.

There are also good semantic reasons to think Voice comes between the verb and tense; see Kratzer 1996.

– The assumptions above predict it should occur between the verb stem and tense.

(29)



- This is a potential case where PF-reordering operations are necessary.
  - The DM operation Local Dislocation (Embick and Noyer 2001: 562–563) can change the order of two adjacent Subwords or M-Words:
    - [X^[Z^Y]] → [[$_{Z°}$ Z+X]^Y]
  - This is the same operation we saw last week that accounted for the position of the Latin clitic *=que*.

(30) …Voice^T → T+Voice
kasta^s^de → *kasta^de+s*

- I don't know if this is what is actually going on in these cases, but it is a good candidate for Local Dislocation.
  - T° and Voice° are Subwords in the same M-Word, which is one prerequisite.
  - They are linearly adjacent, which is another requirement.

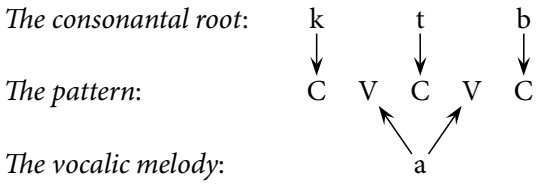
This is why it's called 'local'.

- This is a very limited operation. It has a narrow domain of application, and can effect only certain elements.
  - It does not allow us to simply rearrange anything the way we want to.

4.2.3 *Non-concatenative morphology*

- The last thing that is a problem for the Mirror Principle – and our analysis of how it works – are words where there is no obvious reflection between the morphology and the syntax but where there are distinguishable morphemes.
- Semitic languages (including Amharic, Arabic, and Hebrew) famously display a form morphology known as root-and-pattern morphology.
- In these languages, consonantal roots combine with vowels in a certain pattern to form words.

(31) *The morphology of* katab *'he read' (Hebrew)*:

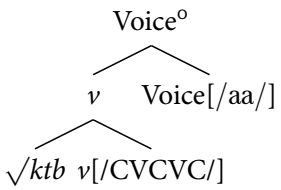


Agreement affixes can be added to this. I won't discuss those here.

- Each of these elements contribute something to the meaning:
  - The root contributes the core meaning 'read.
  - The vowels and pattern contribute information about the voice and argument structure.
- The problem for the concatenative system discussed in this lecture should be apparent:
  - Let us assume, as before, that each of these morphemes is a head.
  - These morphemes are assembled into a complex head.
  - Each morpheme is subject to Vocabulary Insertion (since each morpheme is a Subword).

For a really detailed discussion, see Arad (2005).

(32)



- Trying to concatenate the exponents in the theory above leads to nonsensical ordering statements.

(33) a. /ktb/^CVCVC
b. CVCVC^/aa/

- In other words, there is no such word **ktb-CVCVC-aa*, but this follows the $\sqrt{}$*Root-v*°-Voice° order predicted by what we have above.
- This fairly obviously requires phonology to get the facts correct.
  - The exponents are phonemic forms, remember.
  - If the concatenation determined by the morphology creates something that is not immediately parsable by the phonology, there is no reason to think the phonology will not fix it.
- We will return to this last problem on 1 April.

Terms

bracketing paradox A kind of syntax–morphology mismatch where the bracketing predicted by the syntactic structure or semantic meaning does not match the bracketing of the morphological structure.

complex head An element that behaves syntactically as a head but which is syntactically complex. Usually assembled in the syntax by head-to-head movement and head adjunction.

concatenation The process of imposing a linear order between two morphosyntactic elements.

DM Distributed Morphology

excorporation Movement out of a complex head. This widely thought to be impossible (Baker 1988).

Fission In DM, an operation which takes a single node in the syntax and splits it into two nodes in the morphological representation.

Head Movement Constraint 'An X^0 may only move into the Y^0 which properly governs it' (Travis 1984: 131). Requires a head to move to the next immediately c-commanding, projecting head.

M-Word (Potentially complex) head not dominated by a further head-projection (Embick 2015).

Mirror Principle Morphological derivations must directly reflect syntactic derivations and *vice-versa* (Baker 1985: 375).

Subword A terminal node and, therefore, a morpheme (either a functional morpheme, or a Root) (Embick 2015).

Vocabulary Insertion In DM, an operation pairing syntactic terminals with phonological underlying representations.

Vocabulary Item In DM, objects in which phonological exponents are paired with conditions on insertion, stated in terms of features of functional morphemes.

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