

# Class 6

## The Mirror Principle

11/2/23

### 1 The relationship between syntax and morphology

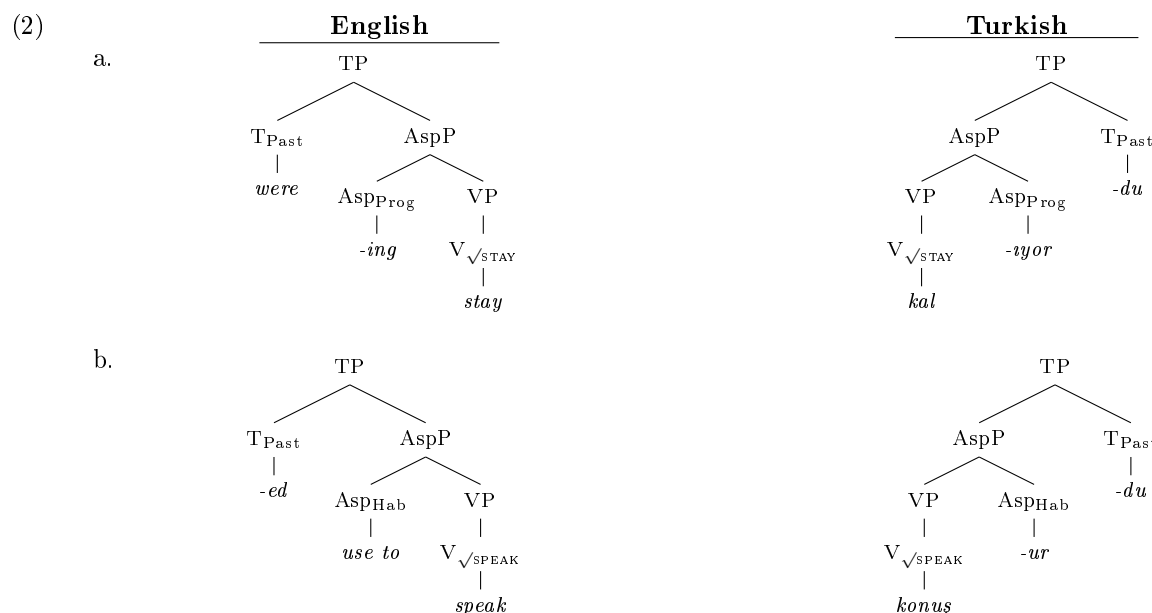
#### 1.1 Some data

- Here's some morphologically complex words in Turkish (data from a handout from Philipp Weisser, citing Good & Yu 2005), with their English translations:

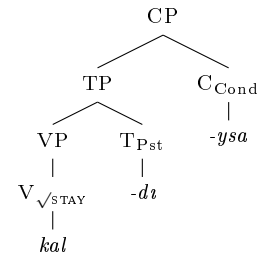
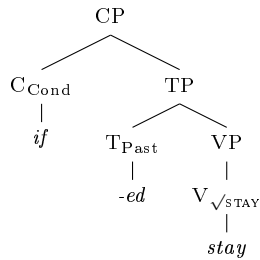
(1) Morphologically complex words in Turkish and their English counterparts

Turkish	Constituency structures	English
a. kal-iyor-du-lar stay-PROG-PST-3PL	[[[[kal]-iyor]-du]-lar]   [[[[stay]-PROG]-PST]-3PL]	[they [were [[stay]-ing]]]   [3PL [PST [PROG-[stay]]]]
b. konuş-ur-du-lar speak-HAB-PST-3PL	[[[[konuş]-ur]-du]-lar]   [[[[speak]-HAB]-PST]-3PL]	[they [use-d to [[speak]]]   [3PL [PST-[HAB [speak]]]]
c. kal-dı-ysa-nız stay-PST-COND-2PL	[[[[kal]-dı]-ysa]-nız]   [[[[stay]-PST]-COND]-2PL]	[if [you [[stay]-ed]]]   [COND [2PL [PST-[stay]]]]
d. koş-tur-du run-CAUS-PST	[[[koş]-tur]-du]   [[[run]-CAUS]-PST]	[made [run]]   [PST-[make [run]]]
e. koş-uyor-du-ysa-lar run-PROG-PST-COND-3PL	[[[[[koş]-uyor]-du]-ysa]-lar]   [[[[[run]-PROG]-PST]-COND]-3PL]	[if [they [were [[run]-ing]]]]   [COND [3PL [PST [PROG-[run]]]]]

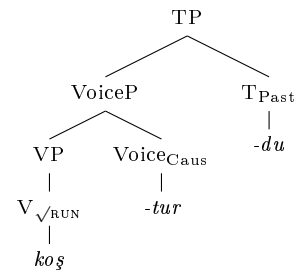
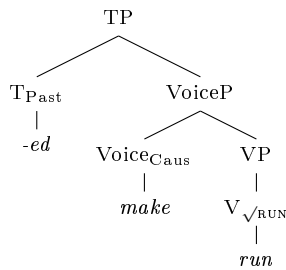
- If we put aside the position of the subject (agreement) (specifically w.r.t. COND), we see that the two constituency structures in each case are nearly perfect mirror images:



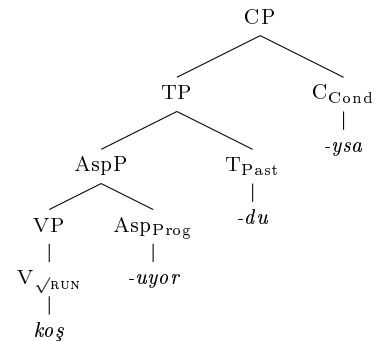
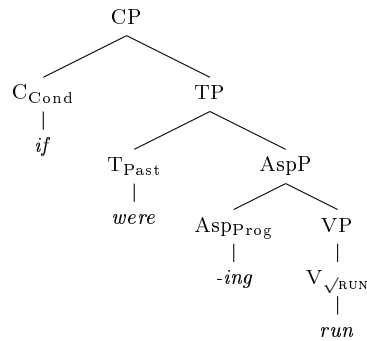
c.



d.



e.



- The English structures are “**left-headed**”, with some functional morphemes being **free-standing words** and some being suffixes that “hop” down to the head beneath them.
  - The Turkish structures are “**right-headed**”, with all functional morphemes being **suffixes (i.e. bound morphemes)** that attach to the head beneath them.
- As long as we take head-direction, the bound/free distinction, and “affix hopping” to be *post-syntactic* concepts, then the two languages exhibit the **exact same syntactic structure**.

## 1.2 The Mirror Principle

- The idea that syntactic structure (in the form of **word order**, for example) and morphological structure (in the form of **affix/morpheme order**, for example) are intimately connected is most famously ascribed to Baker’s (1985) “Mirror Principle”:

(3) **The Mirror Principle** (Baker 1985:375)

“Morphological derivations must directly reflect syntactic derivations (and vice versa).”

\* Why “reflect” (and hence “mirror”)? Why is this something that needed saying in the first place?

- ★ Baker is operating at a time when the most prominent theories of morphology (and the syntax-morphology “interface”) were strongly “**lexicalist**” (e.g. Government-and-Binding, Chomsky 1981; Lexical Phonology and Morphology, Kiparsky 1982):
  - The **lexicon** operates over morphemes, having rules for combining the form and meaning of morphemes to output a phonological form and a syntactico-semantic form (e.g. thematic role information, syntactic categories, etc.).
  - The **syntax** operates over words (specifically, their syntactico-semantic form), which are drawn from the lexicon as *indivisible units*.
- If the lexicon and the syntax are distinct grammatical modules, there is no *a priori* necessity that the internal structure of a word match the syntactic derivation of the phrase it’s inserted into.
- In this context, the form of Baker’s argument has to be that the grammar requires that the internal structures of the two components match each other (some sort of late filtering mechanism).
- But, from the beginning, what he and others really want to say is that they match each other because **they are the same thing**:
  - The derivations that produce multi-word phrases (“syntax”) are **the same derivations** that produce multi-morpheme words (“morphology”).
- ★ This is the foundation for the DM mantra “**syntax all the way down**” (cf. Halle & Marantz 1993):
  - (The structure of) words are built by the syntax.

### 1.3 History/interpretations of the Mirror Principle

- Baker (1985, 1988) is not the first/only person to come to similar conclusions.
  1. Baker draws heavily on work by Muysken (1979, 1981, 1986) on Quechua.
    - Muysken was heading in the same direction, but retaining a lexicalist view.
    - Baker (1985:404) criticizes this approach by saying it does nothing more than stipulate the Mirror Principle (but Baker doesn’t actually go much further than that himself).
  2. At the same time, Bybee (1985) comes to similar conclusions on typological grounds.
    - Her approach is a functionalist/diachronic one (based on earlier work by Givon 1971):
    - Affix order tends to reflect syntactic structure because the closer a syntactic unit two elements form, the more likely one is to be grammaticalized as an affix onto the other.
  3. Rice (2000), based on an incredibly impressive study of Athabaskan verbal morphology, develops a version of the Mirror Principle based directly on semantic “scope”, rather than syntactic structure, per se.
    - If two elements interact in a semantically meaningful way, that one which combines with the root first appears closer to the root.
    - If two elements do not interact in a semantically meaningful way, they are free to be ordered by other means (primarily arbitrary morphological templates).

## 2 More evidence for the Mirror Principle

- Comparing agglutinating languages like Turkish to analytic languages like English gives only indirect evidence for something like the Mirror Principle.
  - It assumes something like a universal functional hierarchy, along the lines of “cartographic” approaches to syntax (Cinque 1999, 2014, among many others).
  - If all languages have the same functional hierarchy within the various extended projections, then it follows straightforwardly that the mirroring properties between Turkish and English are reflecting the same structure.

- But stronger evidence comes from alternations *within languages* where morpheme order changes in concert with changes in syntactic/semantic structure. This is the type of evidence that Baker actually adduces:

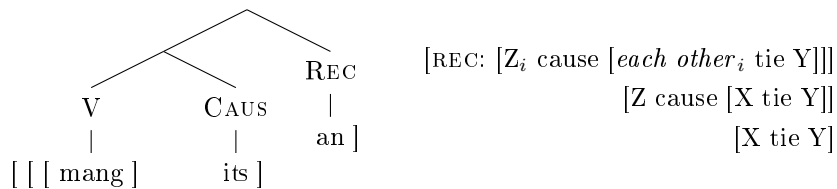
## 2.1 Grammatical Function-changing morphology ( $\approx$ derivational morphology)

- In many languages, pairs of affixes can appear in either order, and the different orders correlate with different interpretations:

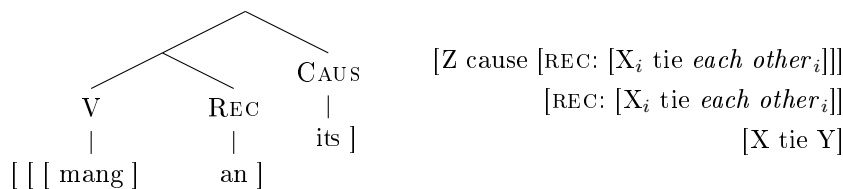
- (4) Variable affix order with compositional meaning
- Root-X-Y = [[[Root]-X]-Y]
  - Root-Y-X = [[[Root]-Y]-X]

### 2.1.1 Chichewa

- For example, the Causative and Reciprocal in Chichewa (Bantu):
  - If Causative /its/ is closer to the root (5a), the meaning of the causative applies to the root (/mang/ 'tie') first, and then reciprocal meaning ( $\approx$  co-indexing the two highest arguments) applies second.
  - If Reciprocal /an/ is closer to the root (5b), the reciprocal coindexing applies to the subject and object of the root verb, and that constituent is then causativized.
- (5) Orders of Causative and Reciprocal in Chichewa (Hyman & Mchombo 1992:350, Hyman 2003:247)
  - Reciprocalized Causative:** *mang-its-an-* 'cause each other to tie'



- Causativized Reciprocal:** *mang-an-its-* 'cause to tie each other'

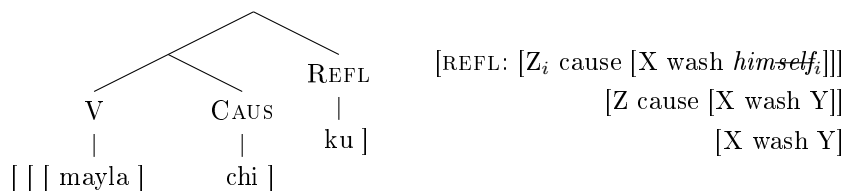


### 2.1.2 Quechua

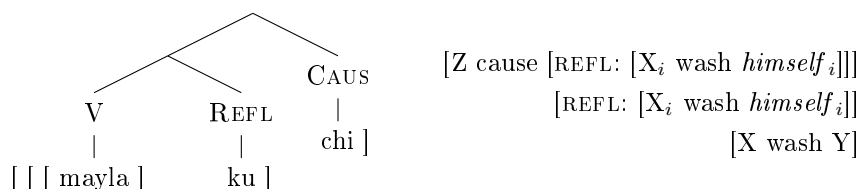
- As discussed in Baker (1985), the exact same thing is found in Quechua (Muysken 1979, 1981, 1986).
- Quechua also shows the same kind of variable order with reflexive and causative:
  - If Causative /chi/ is closer to the root (6a), the causer argument is added to the structure before reflexivization ( $\approx$  co-indexing the highest and lowest argument), and so the causer is co-indexed with the object of the root verb (/mayla/ 'wash').
  - If Reflexive /ku/ is closer to the root (6b), the reflexive coindexing applies to the subject (i.e. the causee) and object of the root verb, and that constituent is then causativized.

## (6) Orders of Causative and Reflexive in Tarma Quechua (Muysken 1979:457, citing Adelaar 1977)

- a.
- Reflexivized Causative:**
- mayla-chi-ku-n*
- 'he
- <sub>i</sub>
- causes someone to wash him
- <sub>i</sub>
- '



- b.
- Causativized Reciprocal:**
- mayla-ku-chi-n*
- 'he causes someone
- <sub>i</sub>
- to wash himself
- <sub>i</sub>
- '



## 2.1.3 Chamorro

- Chamorro (Austronesian) illustrates the same sort of alternating pattern with its Causative and Passive (Gibson 1980, Chung 2017):

- In (7–8), causativized verbs ('make drink', 'make afraid'), with Causative /na'-/ immediately preceding the root, are passivized by adding the passive morpheme to the left of that constituent.
  - There are two passive allomorphs, both left-oriented: prefixing /ma-/ (7) and infixing /-in-/ (8).

- (7)
- Ma-na'-gimin
- i patgun âmut ni ti dinanchi.
- 
- PASS-CAUS-drink the child medicine comp not right
- 
- 'The child
- was made to drink**
- medicine that was not right.' (Chung 2017:267, ex. (8a))

- (8) Kulan
- n-in-a'-ma'â'ñao
- i biha nu esti na klâsi-n tinanum.
- 
- sort.of PASS-CAUS-afraid the old.lady OBL this L type-L plant
- 
- 'The old lady
- was**
- kind of
- made afraid**
- by this type of plant.' (Chung 2017:267, ex. (8b))

- In (9–10), passivized verbs ('be opened', 'be spanked'), with Passive /ma-/ prefixed to the root (9) or Passive /-in-/ infixed into the root (10), are causativized by adding Causative /na'-/ to the left of that constituent.

- (9) In
- na'-ma-baba
- as Antonio.
- 
- 1PLAGR CAUS-PASS-OPEN OBL Antonio
- 
- 'We
- made it be opened**
- by Antonio.' (Chung 2017:268, ex. (11a))

- (10) Bai
- na'-s-in-aolak
- hao nu i ma'estra.
- 
- 1SGAGR CAUS-PASS-spank you OBL the teacher
- 
- 'I will
- let you be spanked**
- by the teacher.' (Chung 2017:268, ex. (11b))

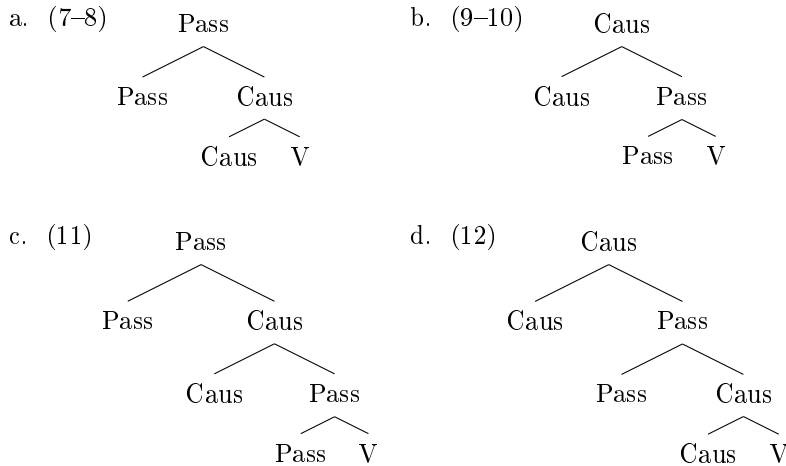
- In fact, in Chamorro, you can passivize a causativized passive (11) and you can causativize a passivized causative (12).

- (11) ...yan maseha hâyi malago'-ña i Lahi-ña para u
- n-in-a'-ma-tungu'
- Gui'.
- 
- and ever who WH.want-POSS the son-POSS FUT PAGR:3SG PASS-CAUS-PASS-know he
- 
- '...and whoever his Son wants to cause Him (lit. that He
- be caused**
- )
- to be known**
- by.' (NT 124)
- 
- (Chung 2017:268, ex. (12a))

- (12) Si Josephine ha
- na'-ma-na'-suha
- i atgoya gi gui'eng-ña.
- 
- ABS Josephine PAGR:3SG CAUS-PASS-CAUS-go.away the nose.ring LOC nose-POSS
- 
- 'Josephine had her nose ring removed (lit.
- caused**
- the nose ring
- to be caused to go away**
- ).'
- 
- (Chung 2017:269, ex. (13a))

- In all cases, the morpheme order tracks the syntactic compositionality:  
→ The affix immediately preceding the root combines with it first, then the next affix, and so on.
- It is straightforward to assume that the semantic compositionality is isomorphic with the (morpho)syntactic compositionality:

(13) Syntactic structures for Chamorro Causative/Passive combinations



## 2.2 Agreement morphology

- Baker (1985) doesn't actually talk about how Chamorro's causative and passive provide evidence for the Mirror Principle. The context in which he talks about Chamorro is its agreement system. (See also Grimshaw 1986.)
- Chamorro has two different positions of agreement morphemes, as shown in (14).
  - Person/number agreement with the subject of the clause, to the left of the verb: e.g. PAGR:3PL /u/.
    - Baker, following Gibson (1980), takes it to be a prefix on the verb. Chung (2017) seems to take it as an independent particle. It doesn't make any real difference.
  - Number agreement with *nominals in certain configurations*: NAGR:PL /fan/ ([fang] in (14)).
    - In the irrealis mood: NAGR:PL is realized as /man/ and NAGR:SG is realized as infixal /-um-/.
    - NAGR:SG has no exponent in the realis mood. (Chung 2017:265)

(14) Ti para u fang-âti i famalão'an.  
 not FUT PAGR:3PL **NAGR:PL**-cry the women  
 'The women are not going to cry.'  
(Chung 2017:266, ex. (6c))

★ *Why is /fan/-agreement an argument for the Mirror Principle?*

- In *causative* constructions, /fan/-agreement doesn't occur with a plural subject of the clause (causer).  
\* **N.B.:** I have not been able to find any examples of this sort, but Chung (2020:263) makes this very clear.
- But it does appear when the “underlying”/“semantic” subject of the root verb is plural:

(15) Hu na'-fan-otchu siha.  
 PAGR:1SG CAUS-NAGR:PL-eat **them**  
 'I made them eat.'  
(Baker 1985:382, ex. (15c))

- And when a plural complement of the verb has been raised by passivization:

(16) Para u **fan-s-in-aolak** i **famagu'un** gi as tata-n-niha.  
 FUT PAGR:3PL NAGR:PL-PASS-spank the children OBL father-THEIR  
 'The children are going to be spanked by their father.' (Baker 1985:382, ex. (15b))

- This is true even if the passive is causativized, including with a singular causer:

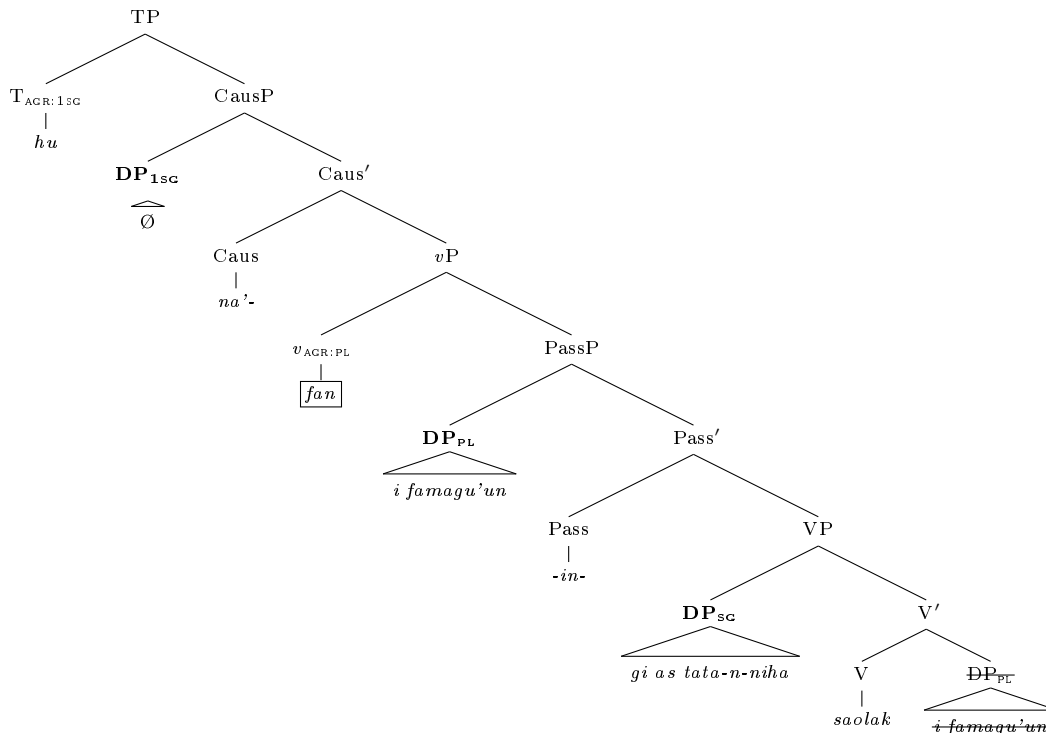
(17) Hu na'-**fan-s-in-aolak** i **famagu'un** gi as tata-n-niha.  
 PAGR:1SG CAUS-NAGR:PL-PASS-spank the children OBL father-THEIR  
 'I had the children spanked by their father.' (Baker 1985:385, ex. (25))

- ★ In this case, /fan/ appears linearly between the causative (farther from the root) and the passive (closer to the root).

→ Therefore, the order is tracking what arguments can trigger /fan/-agreement.

- Plural arguments below Caus are in a position to trigger number agreement.
- Plural arguments above Caus are not.

(18) Syntax of (17) [roll-up head movement; verb word ends up in T, or maybe Caus]



- Under a cyclic view of structure building (à la Baker 1985), the “/fan/-agreement process” takes place **before** the causativization process.
- Therefore, necessarily, the causer argument is not accessible to /fan/-agreement, regardless of how the process actually works, because it is not part of the structure yet.
- ★ If the syntactic structure and the morphological structure were built up separately, /fan/-agreement could potentially target a plural causer argument (Grimshaw 1986). But if they’re built up together, then clearly it never could.

## 2.3 Lexical/aspectual morphology

- These sorts of compositional variable affix orders are not limited to argument structure and/or co-indexing processes.
- Rice (2011:175), citing Slavin (2005), reports that Oji-Cree (Algonquian) has this sort of variable ordering with (aspectual?) preverbs:
  - In (19) and (20), the meaning of the preverb that comes closer to the root (i.e. the first prefix counting from the right) combines with the meaning of the root first, and then the meaning of the second preverb is combined.
  - The contrast between the (a) and (b) examples shows that these can be transparently reversed, following that same compositional logic.

(19)	a.	<i>ishkwaa-niipaa-sookihpaw</i> [sic] [finish-[at.night-[be.snowing]]] 'It stopped snowing at night.' (does not snow at night anymore)	(20)	a.	<i>kiimoo-ci-kishahtapi-wihsini</i> [secretly-[fast-[eat]]] 'He secretly eats fast.' (nobody knows that he eats fast)
	b.	<i>nipaa-ishkwaa-sookihpaw</i> [sic] [at.night-[finish-[be.snowing]]] 'It stopped snowing at night.' (was snowing the whole day)		b.	<i>kishahtapi-kiimoo-ci-wihsini</i> [fast-[secretly-[eat]]] 'He eats secretly and he does it fast.' (nobody knows that he eats)

## 2.4 Local conclusions

- There is evidence from a number of domains that morphological structure directly tracks syntactic/semantic structure:
  - (21) Evidence for the Mirror Principle (*vel sim.*)
    - a. Correlations between affix order and word order
    - b. Correlations between affix order and semantic compositionality in GF-changing morphosyntax
    - c. Correlations between affix order and agreement domains
    - d. Correlations between affix order and semantic compositionality with lexical/aspectual affixes
- The Mirror Principle is a way of *describing* these correlations, but it does not *explain* them.
  - An explanation will only come when the Mirror Principle *follows from architectural assumptions*.
- ★ Therefore, the job of the modern morphological theorist is to develop an architecture of the grammar where the Mirror Principle is a consequence of that architecture, rather than a principle which must be stipulated.

## 3 Deriving the Mirror Principle

- An architecture like DM is designed to make accounting for the Mirror Principle easy.
  - Indeed its architecture is informed by wanting to derive rather than stipulate the Mirror Principle.
  - But, once we consider the full range of phenomena, the Mirror Principle nevertheless doesn't fall out for free.

★ *Why is DM well-suited for capturing the Mirror Principle?*

- In DM, “the lexicon” is not a distinct grammatical **module**. [it's not a **lexicalist** theory]
- Rather, the lexicon is simply a list of Vocabulary Insertion rules [it's a “**realizational**” theory]

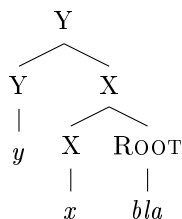


- This means that there are only two ways to explain morphological generalizations in DM:
  1. Generalizations can emerge from the list of VI rules.
    - These generalizations are necessarily language specific (and thus largely arbitrary, *modulo* constraints on VI itself), because VI rules are arbitrary connections between meaning and phonological forms (broadly construed).
  2. Generalizations can follow from syntactic structure and post-syntactic operations (i.e. operations on structure that take place after the narrow syntax but before VI; cf., e.g., Arregi & Nevins 2012).
    - These are *bona fide* morphological generalizations, because syntactic and post-syntactic operations are universal (if we buy UG), or at least universally available.
      - Post-syntactic operations can feed language-specific generalizations about Vocabulary Insertion, but it's really the operations that are doing the work.
- ★ Since the Mirror Principle has universal applicability (though it has interesting exceptions, which we'll dive into), it should fall into the latter camp.
  - We want it to follow from the way that (post-)syntactic operations work.
  - \* Similarly, though, we could consider explanations where it is made to follow from the architecture responsible for the rest of the PF mapping *after* VI...

### 3.1 Cyclic concatenation

- The approach that Baker prefigures is one that we could call “**cyclic concatenation**”.
  - \* “Concatenation” is a fancy word for ‘sticking things together’.
- In DM terms, this means full-on cyclic spellout.
  - Given a tree like (22) with the VI rules in (23), cyclic spellout would entail first spelling out the Root (because it's the most deeply embedded), and then X, and then Y. This is shown in (24).
  - Let's assume that all spellout knows how to do is stick things together (concatenation). The decision tree in (24) illustrates the different ways that spellout can stick things together.

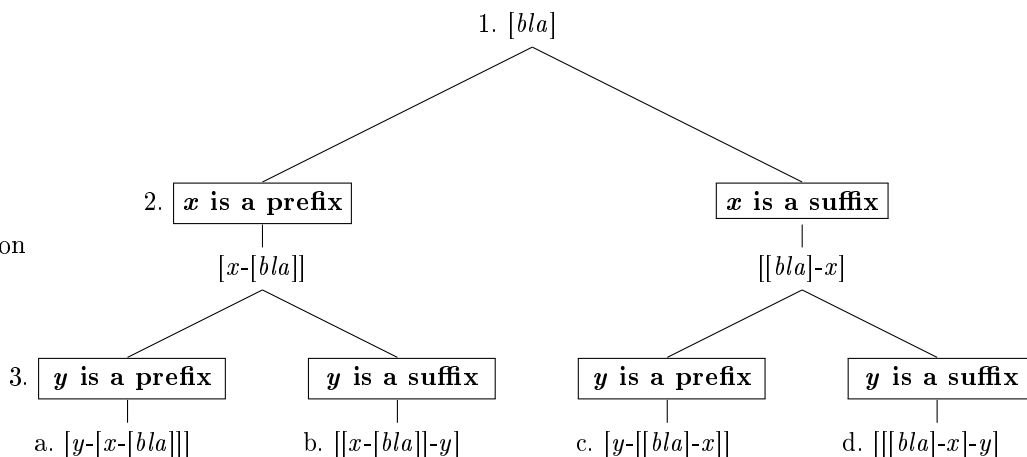
(22) Schematic tree



(23) Vocabulary insertion

1. ROOT  $\Leftrightarrow$  *bla*
2. X  $\Leftrightarrow$  *x*
3. Y  $\Leftrightarrow$  *y*

(24) Cyclic spellout (read top to bottom)



- The final outputs in (24) are all and only the Mirror Principle-compliant orders of the three elements given the tree in (22).
  - In each case, the bracketing in the linear outputs correlates with the bracketing in the hierarchical input.
  - More to the point, each time the affixes are on the same side of the root — (24a) and (24d) — *x* is closer to the root than *y*. This is consistent with the fact that X combines with the root before Y.

→ This sort of cyclic spellout rules out exactly the two linear orders that are not consistent with the Mirror Principle:  $*[x-y-bla]$  and  $*[bla-y-x]$ .

- If the spellout process, or the VI rules themselves, come equipped with a means of determining whether a given affix is a prefix or a suffix, then the decision tree in (24) reduces to a single output:

(25) Vocabulary insertion with affix direction and cyclic spellout (e.g.)

1. ROOT  $\Leftrightarrow bla \rightarrow [bla]$
2. X  $\Leftrightarrow -x \rightarrow [[bla]-x]$
3. Y  $\Leftrightarrow y- \rightarrow [y-[[bla]-x]]$

- Since cyclic concatenation only ever allows a Mirror Principle-compliant order, putting affix direction in the VI rules can never violate the Mirror Principle.

\* Embick (2007) tries to formalize cyclic concatenation with a “concatenation operation” that takes advantage of projection within a complex head. But actually he gets himself confused about which structures do and do not actually have linear information available. What he ends up deriving is only Mirror Principle orders where the affixes are on the same side, i.e. not (24b,c). He corrects himself in Embick (2015) by basically abandoning the details of his earlier proposal.

### 3.2 The problem(s) with cyclic concatenation

- This works well for the basic cases. But there’s a lot of things that it doesn’t do so well with:
    - Templatic/position-class morphology (causes Mirror Principle violation)
      - Baker (1985) is already saying this is a real problem that needs to be solved.
    - Freely variable order (one of the orders presumably violates the Mirror Principle)
    - Infixation (not strictly concatenative, at least on the surface)
    - Root-and-pattern/nonconcatenative morphology (definitely not concatenative on the surface)
      - Baker (1985) is also already saying this is a real problem that needs to be solved.
    - Mobile affixation (harder to say that the affix is specified for direction)
    - Phonologically-conditioned affix order (if it exists, it’s clearly going to be a problem)
  - ★ These are the topics we’ll be tackling the rest of the course.
  - Also worth thinking carefully about whether totally cyclic concatenation is consistent with our conclusions about VI from allomorphy (I’m thinking especially about Deal & Wolf 2017).
- What I think the solution is: abandon cyclic concatenation, and handle things after VI while retaining traces of morphosyntactic structure...

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