Head Movement as a Phonological Operation*

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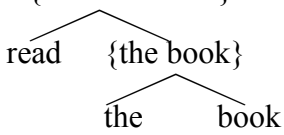
1 Purpose

The purpose of this paper is twofold: first, I establish a diagnostics of Head Movement (HM) that helps to distinguish HM from other instances of movement, and secondly, I present a phonological account of HM, that circumvents the technical problems facing syntactic HM. Among other things, syntactic HM violates the Extension condition and the requirement that a moved element should c-command its copy. To avoid such problems, Chomsky (1995), without going into details, suggested that HM is a phonological phenomenon. For more elaborate implementations of this view, see e.g Brody (2000), Hale & Keyser (2002), Bury (2003) and Harley (2004). On the other hand many scholars, like Matushansky (2006), Lechner (2007) and Zeller (this volume), have tried to find ways to overcome the problems with syntactic HM. My phonological account can handle the data at least as well as the syntactic accounts, without the theoretical drawbacks. A solution that I will not discuss here is to see HM as remnant movement, like Wiklund et al. (2007). As Zeller (this volume) has observed, this fits badly with polysynthetic languages like the Bantu languages, where the complex verb is unlikely to be created by evacuation movement.

2 Displaced heads

According to Matushansky (2006: 70), a "head is a syntactically indivisible bundle of formal features". We may add that heads have the option of projecting structure, i.e., a head can merge with a phrase projecting a higher projection of the head. See (1), where the head *read* is merged to the phrase *the book*, yielding the phrase *read the book*:

(1) {read the book}



Sometimes, a head does not appear adjacent to the phrase it is merged to:

(2) a. This book John has read.

b. Läste Johan den här boken? (Swedish)

read John this here book.DEF

Did John read this book?

In (2a) the phrase *this book* has been moved to sentence initial position, thereby appearing in a position not adjacent to the head *read*. This is an instance of phrasal movement. In cases like (2b), on the other hand, it is assumed that the head *läste* 'read' has moved away from its complement, an instance of head movement.

It is well known that phrasal movement and head movement have different properties,. One difference is that a head cannot head move out of its maximal functional projection, hence V cannot head move out of CP. There is no such restriction on phrasal movement. Thus the noun phrase *the book* in (3) is first merged in the lower subordinate clause, but is spelled out in the matrix clause. The initial verb in (4) cannot have its origin in the embedded clause:

(3) This book, John thinks that Eva read last summer.

(4) a. *Has Mary said that John stolen the book?

b. Has Mary said that John stole the book?

In general, HM is more local than phrasal movement, which led Travis (1984) to propose the Head Movement Constraint, HMC:

(5) An X° may only move into the Y° which properly governs it

An updated version of HMC, not formulated in terms of government, was suggested by Pesetsky & Torrego (2001:363):

(6) **Head Movement Generalization**

Suppose a head H attracts a feature of XP as part of a movement operation.

a. If XP is the complement of H, copy the head of XP into the local domain of H.

b. Otherwise, copy XP into the local domain of H.

This formulation makes it impossible to move a complement of a head to the specifier of this head.

3 Organization of the paper

In section 4 I will give an overview of the particular implementation of the minimalist program that I am assuming. In section 5 I will present the outlines of a diagnostics for HM. Section 6 is devoted to a presentation of my hypothesis that HM is not syntactic movement, but a phonological process that works upon a narrow syntactic representation. Since HM is phonological in nature, it lacks both syntactic and semantic effects, in line with the diagnostics. Section 7 is a summary and conclusion.

4 Theoretical background

4.1 Merge and lexical information

According to Chomsky (1995, 2001, 2007), syntax is a computational system, driven by the operation Merge, which works on grammatical features. Merge adds a syntactic object to the edge of another syntactic object, leaving the two objects unchanged. Hence, merge of X to Y yields the set {X,Y}, see (1) above.

Chomsky (2007:6) notes that"[i]n addition to Merge, UG must at least provide atomic elements, lexical items LI, each a structured array of properties (*features*) to which Merge and other operations apply to form expressions. [---] A particular language is identified at least by valuation of parameters and selection from the store of features made available by UG, and a

listing of combinations of these features in LIs (the lexicon)". Regarded in this way, the syntactically relevant lexicon is simply a list of idiosyncratic, memorized information, see e.g. Halle & Marantz (1993), Marantz (1997), and Embick (2003). Following Embick & Noyer (2007:301), I assume that lexical information not necessary for narrow syntax enters the system from two additional lists, the Vocabulary, containing rules "that provide phonological exponents to abstract morphemes" and the Encyclopaedia which contains semantic information "that must be listed as either a property of a Root, or of a syntactically constructed object (idioms like *kick the bucket*)". These lists are accessed outside the system of narrow syntax, the Vocabulary at the Sensory-Motor interface (SM, roughly *phonology*), and the Encyclopaedia at the Conceptual-Intentional interface (CI, roughly *semantics*).

4.2 Features

A syntactic structure is the result of merging syntactic objects built from lexical entries, which consist of features with semantic and phonological values. With Pesetsky & Torrego (2007) I will assume that features are interpretable in one position and valued in another. I will use the following notations, where F is an arbitrary feature:

(7) ***iF***+ Interpretable and valued F ***iF*** Interpretable and unvalued F

uF+ Uninterpretable and valued F ***uF*** Uninterpretable and unvalued F

Only interpretable and valued features are allowed at the CI / SM interfaces, hence the syntactic computation must assign a value to the unvalued instances and link an uninterpretable instance of a feature to an interpretable instance. If not, the derivation will crash.

4.3 The operation Agree

Unvalued features are valued with the help of the operation Agree, see Chomsky (2001:3ff.). This operation is also responsible for linking an uninterpretable instance of a feature to an

interpretable instance, creating an interpreted feature link, see (8), Step 4. Agree proceeds in the following steps:

(8) **Agree**

Step 1: Select a probe i.e. a head with at least one unvalued feature F.[1]

Step 2: Search the c-command domain of the probe for the closest goal with the same feature valued, F+.

Step 3: Value the unvalued feature of the probe in accordance with the value of the goal.

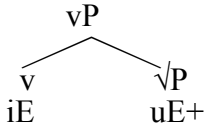
Step 4: Link the probe and the goal and replace all uninterpretable markers in the chain with interpreted ones. When this step is taken, the links are visible both at the CI- and the SM interfaces and may take part in further syntactic operations.

It is important to notice that the Agree operation is dissociated from phonological information, i.e. from the point of view of Agree it is a coincidence if the operation has a phonological correspondence or not.

4.4 The categorial phrase

Little v is the categorial marker for verbs. Merged to a root phrase valued for the ontological feature Eventuality[2] (see Bach 1981), v makes a verb out of a root:

(9)

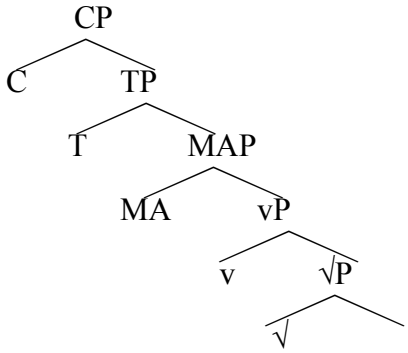


The unvalued E-feature in v probes the valued but uninterpretable E-feature in the root, eliminating the unvalued and uninterpretable versions of the feature. Making a verb out of a root means among other things that the root is embedded under particular functional projections.

4.5 The extended projection of the verb

In the final part of this section, I will outline the built-up of the sentence, seen as the maximal extended projection of the verb. The calculation presented is simplified and only involves the most important parts, but the presentation is sufficient for my purposes. The sentence structure we will use is presented in (10). MAP is a modal/aspectual phrase, see below.

(10)



The various steps in the derivation of (10) are presented below.

vP

As mentioned above, little v is a categorial marker for verbs, making a verb out of a root when it is merged to a root phrase, as illustrated in (9) above. In addition to the interpretable and unvalued iE, little v is assumed to host an uninterpretable but valued feature for modality (uM+).[3]

MAP

Among the lexical items, we find MA with an interpretable but unvalued modal feature, iM, in addition to an uninterpretable but valued feature for tense, uT+. Since the modal feature in MA is unvalued, it probes v for its valued M-feature, as outlined in (11).

(11) The Agree-relation MA – v

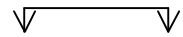
MA	v
iM/uT	uM+/ iE+[4]

In some languages, MA is represented as an auxiliary.[5] Since there may be more than one auxiliary of the relevant type in a sentence, the system must have more possibilities than I have illustrated here. For my discussion, the simple system in (11) will be enough.

TP

The functional head T comes with an interpretable but unvalued feature for tense, iT. Since this feature is unvalued, it probes its c-command domain for a valued tense feature, uT+, which it finds in MA. The Agree-relation is outlined in (12):

(12) The Agree-relation T – MA



T	MA
iT/uF+	uT+/iM+[6]

As illustrated in (12), the head T is further assumed to host an uninterpretable but valued finiteness feature F. Finiteness expresses the localization in time and space[7] of a subject-predicate combination. Whereas tense introduces time in the clause, relating the predication to a time line, finiteness determines the precise value of this time line by identifying the speech time with the here and now of the speaker at the moment of speech. Without this anchoring of the time line associated with the predication, no truth value can be determined.

CP

The functional head C comes with an interpretable but unvalued feature for finiteness, iF. Since this feature is unvalued, it probes its c-command domain for a valued finiteness feature, uF+, which it finds in T. The Agree-relation is outlined in (13):

(13) The Agree-relation C – T

C	T
iF	uF/iT+

I will assume that C differs from T, MA, v and √ in not hosting any uninterpretable feature, hence C is not in need of any higher probe.[8] At this point in the derivation, all features are interpretable and valued, and the chain of heads can be sent to the Vocabulary at the SM

interface, where it will get a phonological interpretation. How this is done is outlined in the next section.

Before proceding, let me clarify that lexical insertion, i.e. the selection of an element from LI is assumed to provide both a phonological footnote and the relevant valued feature. Hence, e.g., an element with a valued finiteness feature is picked from LI and merged to TP, either with phonological information, as in the case of complementizers, or no phonological information, as in the case of main clauses; compare the similar idea in Pesetsky & Torrego (2001) that complementizers result from T-to-C movement.

5 Towards a Diagnostics for Head Movement

5.1. Introduction

In (14) I list a number of properties that have been claimed to distinguish HM from phrasal movement. These properties are highlighted in sections 5.2 to 5.8 with the intension to determine which can be used as diagnostics for HM.

(14) **Properties of Head Movement not shared by Phrasal Movement**

a. *Violation of the Extension Condition*. HM does not extend the root when moved, contrary to phrasal movement.

b. *Locality*. HM is restricted to occur within a single extended projection. Phrasal movement is not restricted in such a way.

c. *Relativized Minimality.* HM but not phrasal movement is blocked by an intervening head.

d. *No extraction.* If a head β moves to α, then {α+β} acts as one constituent. A moved phrase may display a similar "freezing" effect.

e. *The higher the bigger.* If {α+β} is the result of HM of β to α, then the features of β are a proper subset of those of α. There is no similar effect of phrasal movement.

f. *Mirror Principle.* HM obeys the Mirror principle, saying that the order of affixes attached to a head is a mirror image of the order of functional heads corresponding to these affixes. There is no mirror principle in connection with phrasal movement.

g. *No semantic effects*. HM seems to lack semantic effects, whereas phrasal movement may have such effects.

5.2 The Extension Condition

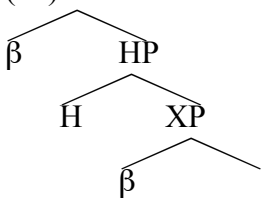
According to the Extension Condition (Chomsky 1995: 327), Merge always adds a syntactic object to the edge of another object:

(15) **Extension Condition**

Merge should be effected at the root

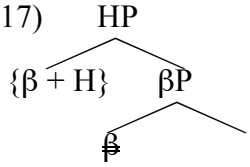
(16) illustrates the case where H is merged to XP, and β is merged to HP.

(16)



Chomsky (1995) notices that HM, seen as a stepwise adjunction of a head to the next higher head, does not obey the Extension condition, cf. (17), where β is head moved to H:

(17)

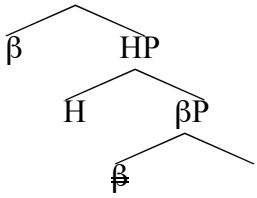


Note also that the Extension condition derives the c-command restriction on movement. In the case with HM illustrated in (17), this restriction is violated, since β does not c-command its copy.

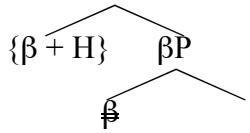
Various attempts have been made to circumvent the problem that HM does not obey the Extension condition, see e.g. Richards (1997) and Matushansky (2006). Matushansky's solution is well known, used by many scholars wanting to retain syntactic HM. According to

Matushansky, the moved head actually adjoins to the root of the structure, see (18a), and a complex head is created by a second operation, called "M-Merger", illustrated in (18b):

(18) a.



b.



In my phonological account of HM presented in section 3, there is no need for M-Merger. Since the insertion of phonological material takes place at SM, after narrow syntax, merge is not involved, and no extension of the structure either.

5.3 Locality

As mentioned in connection with examples (3) and (4) above, a phrase can be extracted from the maximal projection within which it is merged, whereas a head cannot: a head cannot be phonologically expressed outside its extended projection chain. Phrasal movement, especially A-bar movement, may cross constituency borders. This can be seen as a strong diagnostics for A-bar movement. If locality is taken as a diagnostics for HM, occasional cases of heads that seem to be spelled out outside their extended projection chain of heads must be phrasal movement in disguise:

(19) [$_{VP}$ sjungit] trodde Kalle att han hade. (Swedish)
sung thought Kalle that he had

This fronting must be analyzed as VP topicalization, see Platzack (in press).

5.4 Relativized Minimality

That displacement of a head is blocked by a higher phonologically expressed head in the same extended projection chain of heads. This is a strong diagnostics for HM: a verb cannot move across an auxiliary (20a), whereas a subject DP may (20b). Likewise, the object DP in (21a)

cannot move across the subject DP,[9] but the auxiliary head in (21b) can: this follows from Relativized Minimality, Rizzi (1990).

(20) a. *John thrown had ~~thrown~~ the ball

b. John had ~~John~~ thrown the ball.

(21) a. *Where had the ball$_i$ John thrown ~~the ball~~

b. Where had John ~~had~~ thrown the ball.

The presence of an auxiliary in MA prevents the main verb from moving anywhere (Rizzi 1990: 11), unless as part of phrasal movement, as in the VP topicalization case in (22).

(22) Köpa en ny cykel kan Johan i morgon. (Swedish)

buy a new bike can Johan tomorrow

It seems to be the case that a head in an extended projection of heads that is realized as an affix does not block HM. Consider the examples in (23), showing a potentialis affix in Latin and in North Saami (Julien 2002:290):

(23) a. Hoc sine ulla dubitatione confirmem.

this without any doubt confirm.POT

This may be confirmed without doubt.

b. Mii veahkeh -eazza -i -met da -i -d olbmu -i -d

we help -pot -past 1st pl that pl -acc person -pl -acc

We might (have) helped those people.

5.5 No extraction

According to the standard account of HM, a head γ moves and adjoins to the next higher head β, the result being one constituent, the complex head {γ+β}, as mentioned above. To prohibit extraction of either γ or β, a ban on excorporation out of head adjunctions must be stipulated. As a diagnostics for HM, the "no extraction"- property is weak, since extraction out of a moved

phrase is usually forbidden as well, see e.g. the discussion of CED (Condition on Extraction Domain) in Stepanov (2007).

5.6 The higher the bigger

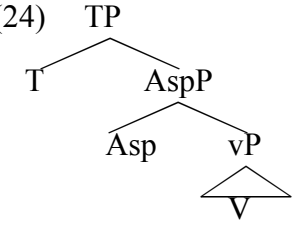
One consequence of the roll-up nature of standard HM is that a moved head combines with more and more material, as a result of subsequent adjunction to higher heads. The higher the head moves, the more complex it grows. As Abels (2003; 264) states: If {α+β} is the result of HM of β to α, then the features of β are a proper subset of those of α.

Abels also notes that *The higher the bigger* theorem does not encode a true generalization about languages. In English, e.g., V does not raise to T, but it is still provided both with tense affix and agreement affix. We conclude that *The higher the bigger* theorem cannot be used as a diagnostics for HM.

5.7 The Mirror Principle

Baker (1985) argued that the Mirror Principle is the result of the strict locality of HM. The Mirror Principle says that the order of affixes mirrors the order of functional projections. Consider e.g. the following structure, taken from Julien (2007:215), who claims that "universally, temporal heads are higher in the clause than aspectual heads, which in turn are higher than the verb":

(24)



Assuming that tense and aspect markers are realizations of tense and aspect heads, and that these markers, when affixes, must attach to a word, we should find the order V-Asp-T in a language with HM to T. This is also the case, see (25) from Macushi, an Amazonian language.

(25) Yei ya'ti-areti'ka-'pi-i-ya (Macushi)

wood cut-term-past 3-erg

He finished cutting the wood.

The generalization that the order of affixes mirrors syntactic structure is empirically very robust, (Embick & Noyer (2007:304).[10] Since this mirroring effect can be seen as a direct consequence of the HM generalization (6), the presence of such an effect has been seen as a firm diagnostics of HM.

5.8 No semantic effect of verb movement

One of the properties of HM that led Chomsky (1995) to expel it from narrow syntax is that it seems to have no influence on semantics. I will illustrate this using verb movement. The general format of my presentation is based on the situation illustrated in (26), showing an element (verbal head in this case) that is first merged in B, c-commanded by C, and moved to a higher position A that c-commands both C and B:

(26) A …….. C ……...B

If head movement has semantic effects, we would e.g. expect to find different readings between two languages if the only difference is that one languages has HM of B to A, whereas the other one has not. We would also assume to find different readings within one language when B has the option to move or not to move to A. As we will see, it is hard to come up with clear evidence for semantic effects in these cases.

Compare the English and Swedish examples in (27):

(27) a. This book, John has read.

b. Denna bok har John läst. (Swedish)

this book has John read

In Swedish, but not in English, topicalization of an object is accompanied by verb second. Semantically, the two utterances are identical. Hence, the spell-out positions of the finite verb in (27a) and (27b) do not seem to have any semantic effect.

A second indication that verb movement does not have a semantic effect is based on the fact that Negative Polarity Verbs do not have to be c-commanded by the NPI licenser, as Negative Polarity Phrases must. Negative polarity items like *ever*, *even* must be c-commanded by a negation (or another licenser). See the example in (28), where the negation is in italics, and the NPI in bold face:

(28) Johan har *aldrig* **någonsin** varit i Paris. (Swedish)
Johan has never ever been in Paris

The licensing conditions must hold at the CI/SM interfaces; in particular, no reconstruction is allowed, as shown by the ungrammatical example in (29), where the NPI is topicalized and therefore not c-commanded by the licenser at the interface.

(29) ***Någonsin** har Johan *aldrig* varit i Paris.
ever has Johan never been in Paris

In (29), the NPI has been A-bar-moved out of its licensing context. Also an NPI that is A-moved out of its licensing context triggers ungrammaticality, as seen by the following Norwegian example, which is based on example (56) in Johannessen (2003).

(30) *Nu så **noen gutt** *ikke* meg.
now saw any boy not me

Whereas adverbial and nominal NPIs thus have a c-command requirement,[11] verbal NPIs have not. As Johannesson (2003:51) points out, the V2 position is systematically higher than the negation that licenses NPIs. Nevertheless, finite NPI verbs appear in the V2 position in main clauses in Norwegian and Swedish, in spite of the fact that they are not c-commanded by the

licenser in this position. Consider the Norwegian examples in (31), taken from Johannessen's paper, and the Swedish examples in (32). These examples are ungrammatical or have a different meaning in the absence of the negation.

(31) a. Det raker *(*ikke*) de utenlandske arbeidsgiverne. (Norwegian)
it concerns not the foreign employers.DEF
It is of no business to the foreign emplyers

b. Hun enset *(*ikke*) bråket.
she sensed not noise.DEF
She didn't notice the noise.

(32) a. Han gitter *(*inte*) göra det. (Swedish)
he bothers not to-do it
He doesn't bother to do it.

b. Det nyttar *ingenting* till.
it is nothing to
It is of no use.

If verbal NPIs like other NPIs must be c-commanded by the negation to be licensed, and reconstruction is not available, syntactic verb movement leads to a problem, since it places the verbal NPI in the wrong position vis-à-vis the licenser. There is no such problem for the phonological approach to HM that will be outlined below. According to this account, the insertion of phonological material in one of the heads in the extended projection of the verb takes place in SM, after narrow syntax. Thus, at the CI interface, where the NPI should be c-commanded by the negation, it is c-commanded, since at least the lowest link in the extended projection chain of heads is c-commanded by the negation.

The behavior of the Finnish negation *ei* in combination with a subject NPI also supports the hypothesis that HM does not have semantic effects. This negation shows subject agreement and is probably a head. See Holmberg & Nikanne (2002) for more details.

Finnish has a negative polarity item *kukaan* 'no-one' used about people, and *mikään* 'nothing' used for non-human subjects. Since NPIs must be licensed in their first merge position, we predict that the order should be negation > NPI subject, whereas the order NPI subject > negation is predicted to be bad. As a matter of fact, both word orders are accepted, as the following examples show (Nikanne p.c.):

(33) a. Kukaan ei mene ulos. (Finnish)
no-one neg go(negform) out.
'No-one goes out.'

b. Ei kukaan mene ulos.
neg no-one go(negform) out.
'No-one goes out.'

The Finnish data, hence, indicate that HM of the negation has no semantic effect.

A third argument for the assumption that verb movement does not have semantic effects is the observation that V2 does not interact with quantifier scope. Consider the sentence in (34):

(34) Inte alla pojkarna kan ta en plats i laget. (Swedish)
not all boys.DEF can take a place in team.DEF

There are at least two different readings of (34), see Lechner (2007): either the modal scopes over the universal quantifier (it is not possible for all the boys to take a place in the team, since there are not so many places), or the universal quantifier scopes over the modal (not all the boys are good enough to take a place in the team). Both readings are available in (34).

Now consider (35), where the modal is embedded under a temporal auxiliary *ha* 'have', which forces the modal to be spelled out in MA, not in C.

(35) Inte alla pojkarna har kunnat ta en plats i laget. (Swedish)
not all boys.DEF have can.INF take a place in team.DEF
Not all the boys have been able to take a place in the team.

Despite the fact that the modal in (35) is spelled out in the middle field and not in C, the same two readings as found with (34) are present in (35). Hence, there is no detectable effect of V2 in this case.[12]

Concluding, even if HM does not seem to have semantic effects, this cannot be used as a strong diagnostics, since phrasal movement does not always have semantic effects either. Consider e.g. wh-movement (phrasal movement): in English the wh-word is moved to initial position, in Chinese it remains in situ, Both word orders have an interrogative interpretation, hence we conclude that phrasal movement in this case has no semantic effect. Thanks to the editors for reminding me of this fact.

5.9 A Diagnostics for Head Movement

In this section we have looked at a number of properties that have been suggested to distinguish HM from phrasal movement, and hence may be used as a diagnostics for HM, whether or not this phenomenon is seen as syntactic or post-syntactic (SM). Only the properties that truly distinguish between HM and phrasal movement are summarized in (36):

(36) **Diagnostics for head movement**

a. *Violation of the Extension condition.*

b. *Locality*: HM is local, i.e. restricted to a single extended projection.

c. *Relativized Minimality*: HM is blocked by an intervening head.

d. *Mirror Principle*.

In the rest of this paper I will present an account of HM that meets the diagnostics in (36). I will argue that HM is wholly determined at the phonological part of grammar.

6 Head Movement is not syntactic movement

6.1 Introduction

In this section I will present a partly new account of HM that is compatible with the diagnostics in section 5, not having the technical problems of syntactic HM. The term "Head Movement" is a misnomer, since in my view, HM is not movement at all, but spell-out of the extended projection chain of heads of a lexical item. For convenience, I will retain the label HM.

In the next subsection I will take a preliminary look at the spell-out of the head chain C-T-MA-v-√, leading me to propose two spell-out principles that replace syntactic HM.

6.2 Spell-Out

Languages differ with respect to how the extended projection chain of the verb is spelled out. A few languages seem to spell out C (the V2-languages), see (37a), many spell out T, see (37b), and some spell out MA/v, see (37c). The spell-out points are schematically indicated in (38).

(37) a. Numera kysser Jonas ofta Maria. (Swedish)
nowadays kisses Jonas often Maria

b. Ces jours-là, Jean embrasse souvent Marie. (French)
nowadays Jean kisses often Mary

c. Nowadays John often kisses Mary. (English)

(38) $[_{CP}$ XP C $[_{TP}$ YP T $[_{vP}$ ZP MA/v √P]]]
SWE
FR
ENG

In all three cases, the tensed verb has the syntactic meaning of C+T+MA-v+√, thus there is no difference between these languages with respect to what is expressed at the CI interface. Consider next (39):

(39) bókina sem nemandinn las ekki (Icelandic)
book.DEF that students.DEF read not
the books that the students didn't read.

This example illustrates the case where specific phonology is inserted in an extended projection chain of heads, forcing this chain to be spelled out in a particular way. Here the presence of the complementizer *sem* prevents the chain of heads projected from the root to be spelled out solely as the tensed verb. In (39), the chain C-T-MA-v-√ is spelled out with two different morphemes, *sem* and the tensed verb. Icelandic also allows for three parts of the chain of heads to be spelled out (example from Angantýsson (2007)):

(40) Ég held að stúlkan hafi lamið gamla manninn. (Icelandic)
I think that girl.DEF has beaten old man.DEF

As seen in (40) there is a strict spell-out order, that follows the order of heads in the chain: the insertion of the auxiliary (*hafi*) in MA prevents the main verb from being spelled-out any higher than in v, and the insertion of the complementizer (*að*) prevents the auxiliary to be spelled-out any higher than in T.[13]

Following Pesetsky & Torrego (2001), I assume that spell-out of a goal in the vicinity of the probe takes place in order to visualize the elimination of an unvalued feature in the probe. Pesetsky & Torrego (2001) suggest that this is an effect of the presence of an EPP feature associated with the unvalued but interpretable feature that defines the probe. When the probe is marked EPP, this tells us that the Agree-relation has to be visible at the SM interface. Hence,

when the extended projection of the verb is spelled out in C, as in (37a), there is an EPP feature associated with the unvalued finiteness feature in C (iF^{EPP}), when it is spelled out in T (37b), EPP is associated with the unvalued but interpretable tense feature in T (iT^{EPP}), and when it is spelled out in MA (37c), EPP is associated with the unvalued but interpretable modal feature in MA (iM^{EPP}). I also assume EPP to be associated with the unvalued but interpretable Eventuality-feature in v. See the schematic representations in (41). I will take for granted that a root always enters syntax with a phonological footnote, here indicated by π. This will guarantee that the extended projection chain of heads has access to phonological information. As mentioned above, specific phonological information will not enter the system before the SM interface (the Vocabulary, see section 1.4.1.).

(41) a. $[_{CP}\ [_{C}\ iF^{EPP}]$ TP MAP vP $[_{\sqrt{P}}\ [\sqrt{}\ \pi]]]$

b. CP $[_{TP}\ [_{T}\ iT^{EPP}]$ MAP vP $[_{\sqrt{P}}\ [\sqrt{}\ \pi]]]$

c. CP TP $[_{MAP}\ [_{MA}\ iM^{EPP}]$ vP $[_{\sqrt{P}}\ [\sqrt{}\ \pi]]]$

d. CP TP MAP $[_{vP}\ [_{v}\ E^{EPP}]\ [_{\sqrt{P}}\ [\sqrt{}\ \pi]]]$

Nothing significant for syntax or semantics is indicated by the presence or absence of EPP on an Agree-relation involving heads. The choice of this feature is just as arbitrary as the fact that the English word *table* corresponds to the Swedish word *bord*. When the goal of an Agree-relation is a phrase, on the other hand, presence or absence of EPP may have consequences for the semantic interpretation.

Whereas spell out of a head due to EPP lacks semantic information, the situation is different when a language has a specific phonology accompanying a particular interpretable but unvalued feature in a probe. Thus, e.g., spelling out C with the complementizer *sem* in Icelandic immediately prevents us from interpreting the clause as a proposition with truth-value. To take

another example, spelling out the feature iM in MA as the modal auxiliary *can* gives another interpretation than spelling it out as *must*, or not spelling it out at all:

(42) a. John can open the door.

b. John must open the door.

c. John opens/opened the door.

The example in (42c) also illustrates the fact that information in the extended chain of heads sometimes can be spelled out as affixes, in this case either a 3rd person singular affix *–s* or a past tense affix *–ed*. Being affixes, these elements must be spelled out as parts of full words,[14] but presumably not before Vocabulary. In (42c), there is only one option: the affix must be a part of the word built upon the phonological information in the root.

In replacement of syntactic HM, I will propose two spell-out rules, one for the phonological information associated with a particular root, here called π, (43) and one for affixes, (44).

(43) **Spell out principle 1 (spell out of π)**

Phonological information, π, introduced in a head H that is part of the extended projection of a lexical item, can be spelled out in H or in any head within the extended projection that c-commands H and does not either introduce its own π, or is linearly separated from H by a head in the same extended projection with its own π (affixes are not marked π).

(44) **Spell out principle 2 (spell out of affixes 1 (spell out of π)**

a. An affix must be spelled out on the closest π that it c-commands.

b. Affixes are marked for suffix/prefix status; a suffix is attached to the right side of π (and eventual suffixes that have already been attached to π), and a prefix is attached to the left side of π (and eventual prefixes that have already been attached to π).

Assume we have an Extended Projection chain of heads A B C D E, where E hosts π and the interpretable feature in D also has π. In this case E^{π} can only be spelled out in E. If, on the other hand, only the interpretable feature in A has π in addition to E, either B, C, D or E may be spelled out by E^{π}, depending on the presence of EPP associated with unvalued features in these heads. And so on. When an interpretable feature is associated with an affix, this affix must attach to the spelled out part of the chain, as stated in (44). The same holds true for an affix that is associated with more than one interpretable feature (portmanteau affix). It should be obvious that the result for suffixes is equal to the effect of the Mirror Principle on syntactic HM.

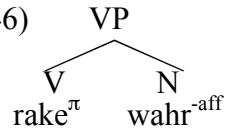
6.3 Incorporation

So far, I have not touched upon the interaction between the extended projection chain of heads and the A and A-bar chains that complement the head chain in building up the sentence. In most cases, this interaction is determined in syntax, with the help of Agree. However, incorporation illustrates a case where information from the A and A-bar chains more directly interacts with the head chain. Consider the following Mohawk example (Baker (1988)); Mohawk is an Iroquois language spoken in Canada and USA:

(45) Owira'a waha'-wahr-ake' (Mohawk)
baby Agr- meat-ate
The baby ate meat.

As Harley (2004) suggests, the derivation starts with picking the roots [$_{N}$ *wahr*$^{-aff}$] 'meat' and [$_{V}$ *rake*$^{\pi}$] 'eat' from the lexicon and merging them; note that *wahr* is marked as an affix. Assuming that only a root with π may project, the result of merging *wahr* and *rake* is given in (46); like Harley (2004) I will use N and V as shorthand for roots with ontological features:

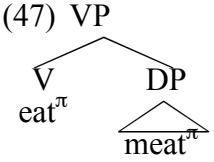
(46)



Since *wahr* is marked –aff, it must be spelled out as part of π, i.e. *wahr-ake*.

The English translation of (45) illustrates the case without incorporation:

(47)



In this case, the N-root *meat* has its own phonetic footnote and projects its own extended projection; *meat* is not, in this case, part of the extended projection chain of the verbal root *eat*. Nevertheless, both in (45) and (46) the complement of the verb denotes what is consumed, i.e. the thematic role seems to be the same. In particular, it does not seem possible to merge another complement to the complex V+N in (45).

Since the head of a complement, but not the head of a specifier, can be part of the extended projection chain of heads involving the verbal root, the account presented here predicts that an incorporated N must be a complement of the root, and the incorporated part is thus restricted to carry thematic roles associated with the complement, not the specifier. Support for this prediction can be obtained from Swedish. The possibility to incorporate objects in a verb is restricted in Swedish and only found in cases where the compound can take an object that refers to a whole, of which the incorporated object is a part, often expressing inalienable possession, as shown in (48a); the examples are taken from Josefsson (1998:73-74):

(48) a. Bonden vingklippte gässen. (Swedish)
farmer.DEF wing-cut geese.DEF

b. *Rebecka bok-skriver. (Swedish)
Rebecka book-writes

In the well-formed case, the object has a thematic role in relation to the compound that indicates that it is merged in the specifier of the root, a benefactor, a possessor, an undergoer etc.

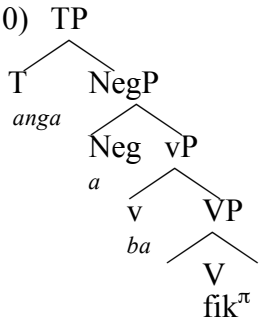
6.4 Further illustration

In this section I will provide additional illustration how the phonological alternative to head movement presented here is working. Let us begin with a Bantu example (Zulu), taken from Zeller (this volume).

(49)	a-	ba-	fik-	anga	(Zulu)
	NEG	SM2	arrive	NEG.PAST	

The relevant syntactic structure for (43) and (44) to work on is outlined in (50).

(50)



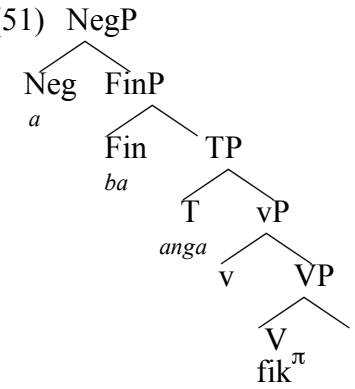
The extended projection chain of heads in (50) has phonological information π in the root. The closest c-commanded affix is *ba*, a subject marker for class 2 words; *ba* is a prefix, and is thus attached to the left of π; the result is *ba-fik*. Now, the negative prefix *a* is the closest c-commanding affix, and it is thus attached to the left of *ba-fik*, yielding *a-ba-fik*. At this stage, the negated past suffix *anga* is the closest c-commanding affix; as a suffix is must attach to the right of *a-ba-fik*, yielding *a-ba-fik-anga*, i.e. the sequence presented in (49). Notice that the order of suffixes according to this account follows the Mirror Principle (Baker 1985): the order of suffixes is a mirror image of the order of functional projections. The order of prefixes, on the other hand, is the same as the order of functional projections.

So far I have not said where the word *a-ba-fik-anga* is spelled out; there are four options, T. Neg, v or V. The word is spelled out in the highest head with an EPP feature, but given only the data in (49), we cannot say which head is the relevant one.

Notice that the Spell-out principles in (43) and (44) predict that an auxiliary MA with phonological information will host any affix that is introduced higher than MA. With the auxiliary taking vP as its complement, only affixes introduced in v are predicted not to end up on the auxiliary, like voice affixes and causative affixes.

An alternative analysis of (49) is presented in (51), based on a suggestion by Julien (2002) that the subject marker *ba-* should have a higher position than v. According to Julien this marker is introduced in FinP. Since the negation in (49) precedes the subject marker, we are forced to assume a pretty high NegP; the revised structure of (49) is given in (51):

(51)



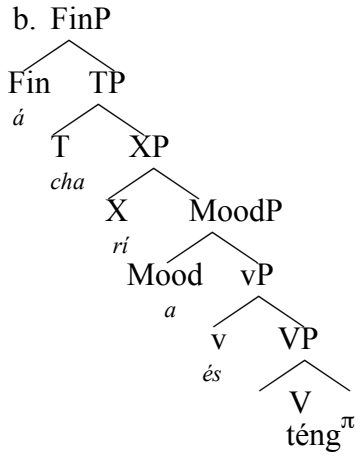
Attaching the affixes, *anga* is first suffixed to the root *fik*, yielding *fik-anga*, and then the *ba-* prefix is added, yielding *ba-fik-anga*. Finally, the negation is added, yielding *a-ba-fik-anga*. Hence, we derive (49) from (51), as well as from (50). More complicated words seem to imply that (51) is closer to the truth. Consider the following Shona-example, modified from Julien (2002:196):

(52) a. Á- cha-rí- téng-és- a (Shona)

SM1- FUT-OM5-buy-CAUS-FV

He will sell it.

b. FinP



The causative suffix *és* is first attached to the root, yielding *téng-és*, after which the "final vowel", here expressing Mood,[15] is attached, yielding *téng-és-a.* In the next step the prefixes *rí-*, *cha-* and *á-* are added to the root, in that order, yielding *á-cha-rí-téng-és-a*. Hence the word in (52a) is derived, given the spell-out principles in (43) and (44), and the structure proposed by Julien (2002). As with (50), we cannot tell in which head the complex word is spelled-out. To be able to do that, we need more information, as in the following examples.

Consider the following Bantu sentences, both taken from Zeller (this volume). In these examples I have underlined the part of the string that expresses the complex verb functioning as the backbone of the sentence. Phrases not part of this verb are in bold face.

(53) a. **Abafundi aba-mnyama** a- ba- fik- anga. (Zulu)

student2 REL2 -black NEG-SM2 arriveNEG.PAST

The black students did not arrive.

b. A - ku- fik- anga **abafundi aba- mnyama**. (Zulu)

NEG EXPL17-arrive-NEG.PAST student2 REL2 black

No black students arrived.

The head sequence *a-ba-fik-anga* in the Zulu sentence (53a) has already been described in connection with (50)/(51), where it is shown how this sequence follows from the spell-out principles in (43) and (44). The head sequence *a-ku-fik-anga* in the Zulu sentence (53b) has the same structure, but instead of a subject marker in Fin there is an expletive prefix *ku*. With respect to the other part of (53a), the DP *abafundi aba-mnyama*, this DP is, being the argument of an unaccusative verb, first merged in the complement of V and moved to the canonical subject position Spec-TP in syntax. In (53b), this DP remains in the complement of V. The word order difference between (53a) and (53b) could be taken as an indication that the complex word is spelled out in T in (53a), but in the root (or maybe in v) in (53b).

Zeller (this volume) observes that DP scopes over Neg in (53a), and Neg over DP in (53b). This follows from my account, given that the scope relations are calculated at the CI interface. At that stage, the affixes are still in the heads where they are merged, hence the negation is in the high Neg-position, where it scopes the DP in the complement of V (53b), yielding Neg>DP. However, in this high position it will also scope DP in Spec-FinP. To get the correct scopal relation for (53a), we have to assume that the subject DP has moved to a position in front of NegP, presumably FocP or maybe ForceP (Rizzi 1997). If that is the case, DP will take scope over Neg. Naturally, this analysis is shaky in the absence of evidence for DP being in a high position above NegP.

7 Summary and Conclusion

Chomsky (1995) suggested that HM is not a narrow syntax phenomenon, but a PF phenomenon. There is no consensus today with respect to the status of HM, see e.g. Matushansky (2006) and Lechner (2007) among others. for views that differ from Chomsky's. In this paper I have tried to outline a concrete implementation of Chomsky's suggestion. According to my proposal, HM is a purely phonological process, based on narrow syntax but with no influence on narrow syntax or semantics. Building on some ideas from Distributed Morphology, I have claimed that what

has been called HM does not involve syntactic movement at all, but is the result of two Spell out principles that determine how the links in the extended projection chain of the verbal root is spelled out:

(43) **Spell out principle 1 (spell out of π)**

Phonological information, π, introduced in a head H that is part of the extended projection of a lexical item, can be spelled out in H or in any head within the extended projection that c-commands H and does not either introduce its own π, or is lineary separated from H by a head in the extended projection with its own π (affixes are not marked π).

(44) **Spell out principle 2 (spell out of affixes)**

a. An affix must be spelled out on the closest π that it c-commands.

b. Affixes are marked for suffix/prefix status; a suffix is attached to the right side of π (and eventual suffixes that have already been attached to π), and a prefix is attached to the left side of π (and eventual prefixes that have already been attached to π).

I have tried to show that my account which is compatible with the diagnostics in (36) for HM captures the main effects of HM without the drawbacks of syntactic HM.

(36) **Diagnostics for head movement**

a. *Violation of the Extension condition.*

b. *Locality*: HM is local, i.e. restricted to a single extended projection.

c. *Relativized Minimality*: HM is blocked by an intervening head.

d. *Mirror Principle*.

It should be clear that HM, seen as the Spell Out principles (43)-(44), adheres to these diagnostics.

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[11] F is to be read “unvalued F”. A valued F is represented as F+.

[2] **Eventuality** subsumes whatever situation a verb may refer to, e.g. an action, an event, a process, a state, a relation or a property. I assume with Josefsson (1998:37) that the root comes with information about ontological category.

[3] The formalization chosen entails that all functional projections must be present in any finite clause, just like in the more standard selection formalism. See Bobaljik & Thrainsson (1998) for a discussion.

[4] The interpretable and valued Eventuality feature, iE+, is the result of the Agree relation in (9).

[5] Between T and v, Cinque (1999) postulates a number of Modal Phrases and Aspect Phrases. I have drastically simplified this system.

[6] The interpretable and valued feature iM+ is the result of the Agree-relation indicated in (11).

[7] A reviewer asked in what sense ”space” is involved here. As I see it, deictic words like *here* get their interpretation through finiteness.

[8] Main clause C and embedded C may perhaps differ with respect to the presence of an uninterpretable feature; if there is such a feature in embedded C, presumably a property of the complementizer, we have a way to account for the fact that embedded clauses usually must be a part of a matrix clause.

[9] As pointed out by the editors, there are cases where an object DP is allowed to move cross a subject DP:

(i) I believed that the ball John had thrown ~~the ball~~ in the basket.

See Lasnik & Saito (1992) for a discussion of these object displacements to a position in front of the subject DP.

[10] See Julien (2007) and Buell et al (2008) for counterexamples..

[11] See Lindstad (1999:90) for some Norwegian exceptions.

[12] Lechner (2007) argues that although there is no scope effect of V2, verb movement nevertheless can be shown to have semantic effects. According to Lechner the modal in the English sentence *Not every boy can make the basketball team* is either in AgrS, where it is in the scope of the universal quantifier, or in Neg, where it scopes over the universal quantifier, hence its position in the tree has semantic effects. Notice however, that this argument is dependent on the correctness of the analysis of the modal that Lechner proposes. Thanks to Winnie Lechner (p.c.) for discussing this point with me.

[13] A head might host both phonological information, π, and an affix, -aff. Such a situation is present if a language expresses the information assigned to a head both by a separate functional word and a particular ending on the verb. A case at hand would be a language that uses both a complementizer and a subjunctive ending to indicate embedding. Note that if both –aff and π are in the same head, -aff must adjoin to a lower instance of π. In the case discussed it must adjoin to π in V (or to an intervening auxiliary).

[14] The Stray Affix filter, see Lasnik (1995).

[1515] The *final vowel* is a verb-final suffix which is linked to a variety of different functions in Bantu; in this example it has a mood value. See Zeller (this volume).