Verbal Morphology: Return of the Affix Hopping Approach[*]

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1. The Tale of Three Approaches to Verbal Morphology

This paper investigates the mechanism responsible for the English verbal morphology paradigm in (1), analyses of which have played pivotal roles in theories of syntax, the lexicon and the syntax-morphology interface since Chomsky 1957.

(1) a. John left.
b. John did not leave. (*John not left / *John left not)
c. John has not left (*John not has left)
d. John is not leaving (*John not is leaving)

These data demonstrate the following properties: (a) it appears that main verbs (e.g., *leave*) must stay in situ whereas *have/be* must raise to a higher position (which I assume to be a T head); and (b) a dummy auxiliary *do* is needed when the verb and T head are intervened by negation. There have been three major analyses of this paradigm. The *affix hopping approach* (Chomsky 1957) essentially proposed that the verbs are stored in bare form in the lexicon but obtain an affix via the affix hopping transformation in syntax. Chomsky (1993), however, rejected his earlier position and argued for the *lexicalist approach*: the verbs in the lexicon are already stored in the inflected forms, and whether they raise overtly in syntax is determined by their feature settings: main verbs have weak features and do not raise overtly, while auxiliary verbs overtly raise due to their strong features. Finally, building on the asymmetry between main verbs and auxiliary verbs in the VP ellipsis paradigm (2) reported by Warner (1986), Lasnik (1995b) argued for the *hybrid approach*, i.e., main verbs are bare in the lexicon (as in the affix hopping approach) but auxiliary verbs like *have/be* are inflected in the lexicon (as in the lexicalist approach; Section 2 presents details of Lasnik's account).

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(2) a. [OK]John slept, and Mary will ~~sleep~~ too ([OK]John slept, and Mary will sleep too)
b. *John was here, and Mary will ~~be here~~ too ([OK]John was here, and Mary will be here too)
c. *John has left, but Mary shouldn't ~~have left~~ ([OK]John has left, but Mary shouldn't have left)

On the face of it, the hybrid approach seems empirically superior to the former two accounts as it successfully accounts for the basic distribution of verbal morphology (1) as well as the VP ellipsis paradigm in (2).[1] Building on earlier criticisms of the hybrid approach (Freidin 2004; Omaki 2007), however, this paper argues that the affix hopping approach can in fact be conceptually and empirically superior if we add the following property to the grammar: head movement does not leave a trace/copy behind.[2]

The paper is organized as follows. Section 2 presents a summary of Lasnik's hybrid account of English verbal morphology, as well as the conceptual and empirical problems that have challenged his theory. In Section 3, I will argue that the modified affix hopping approach can readily solve these conceptual as well as empirical problems. Consequences and potential problems with the present proposal are discussed in Section 4. Section 5 concludes this paper.

2. Lasnik's Hybrid Approach and Its Problems

2.1 Core Properties of the Hybrid Approach

The core properties of Lasnik's hybrid system are summarized in (3):

(3) a. Main Vs are stored in bare form in the lexicon and have no T feature.
b. Auxiliary Vs (*have/be*) are inflected in the lexicon and have T features.
c. T can be affixal *or* featural. Affixal T undergoes PF-merger with adjacent (main) V at PF (Bobaljik 1994; Embick and Noyer 2001); otherwise the affixal T has the phonological property of being pronounced as *do*.[3] Featural T needs to check its feature with featural Vs, triggering overt (auxiliary) V-raising.
d. *en/ing* are introduced together with *have/be* (Chomsky 1957), and PF-merge with an adjacent V.

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[1] See Potsdam 1997 and Roberts 1998 for lexicalist accounts for the VP ellipsis paradigm in (2). Since Lasnik (1997) presents a fairly strong counter-argument to these analyses, I will refer the readers to Lasnik 1997 for details and not discuss their analyses in the interest of space.

[2] Howard Lasnik (personal communication) has argued that conceptually there appears to be no principled reason for syntax to postulate traces for any movement except for A-bar movement that establishes operator-variable relations so long as semantic representations can be computed derivationally.

[3] An obvious question arises as to why adverbs do not block PF-merger (i):

(i) *John did never leave. ([OK]John never left.)

Stepanov (2001) argues that this problem goes away if one assumes a multiple cycle system in which adverbs are inserted into the derivation post-cyclically, i.e., after PF merger occurs in (i). I will adopt this analysis and no longer discuss this problem in the remainder of the paper.

These properties (3a-c) basically establish a dichotomy between main Vs and *have/be* by means of feature distribution and the status of inflection in the lexicon: Main Vs are not inflected in the lexicon and hence lack T features that trigger V-raising (1a, 1b), whereas *have/be* are inflected and have T features, and thus undergo overt V-raising (1c, 1d). *Do*-support seen in (1b) is considered a mere pronunciation of affixal T when it does not have an adjacent V (3c). The analysis that *en/ing* undergoes PF-merger with the adjacent V is compatible with the data in (1c,1d) so long as *have/be* originate in a V position (Ross 1969) and later undergoes V-raising (Emonds 1978).

Lasnik's account successfully explains the VP ellipsis paradigm in (2) together with the form identity condition on VP ellipsis (4):

(4) Form identity condition on VP ellipsis (Lasnik 1995b):
The elided VP and its antecedent VP must be identical in form.[4]

(5) shows the representation of (2) before PF merger occurs. Under Lasnik's account, the main V *sleep* is bare as it enters the derivation, and therefore the forms of the main V remain identical (5a) and the VP ellipsis meets the form identity condition. On the other hand, *have/be* in (5b,5c) have different forms, and the copies left behind after V-raising render the antecedent and elided VPs different in form, hence the VP ellipsis is illicit.

(5) a. John T [$_{VP}$ ***sleep***], and Mary will [$_{VP}$ ***sleep***] too
b. *John was$_1$ [$_{VP}$ ***was$_1$*** here], and Mary will [$_{VP}$ ***be*** here] too
c. *John has$_1$ [$_{VP}$ ***has$_1$*** en leave], and Mary shouldn't [$_{VP}$ ***have*** en leave]

Thus, Lasnik (1995b) elegantly accounts for the distribution of verbal morphology and VP ellipsis in (1) and (2), while the affix hopping approach and lexicalist approach seem to offer no account particularly for the asymmetry observed in the VP ellipsis paradigm (see footnote 1). However, the hybrid account suffers from several conceptual and empirical problems, which are reviewed below.

2.2 Conceptual and Empirical Problems with the Hybrid Approach

Freidin (2004) points out the first conceptual problem with the hybrid approach, namely, that there seems to be no principled reason why certain Vs have T features and certain Ts have V features while others don't. This stipulation becomes especially problematic once we treat categorial selection as derived from local feature checking (Svenonius 1994): T cannot select V if the target V does not have T features. The second conceptual problem is raised by Omaki (2007): If the inflected forms of verbs can be derived by either

[4] Questions have been raised with regard to the validity of this condition. First, clarification is in order: the use of the term "form" is rather ambiguous, in the sense that it could refer to the pure PF "form" or to the "formal property" of the lexical items such as feature specifications, and in Lasnik's system these are indistinguishable (i.e., inflected Vs and uninflected Vs differ in feature specifications as well as PF forms). However, the intended meaning seems to be the latter, i.e. the formal properties of the relevant constituents. Given this assumption, this form identity condition is essentially a syntactic identity condition on ellipsis. See Chung (2005) and Merchant (2007) for related proposals (cf. Merchant 2001).

inflection in the lexicon or PF-merger, and given that the surface forms observable in the input are ambiguous with respect to how they were derived, how do children learn which verbs acquire inflection in one way or the other?[5]

On the empirical side, the following three problems challenge Lasnik's account. First, since *have/be* can surface in bare forms with modals as in (6), the hybrid account incorrectly predicts *do*-support to be possible as in (7), contrary to fact (Lasnik 2000).

(6) It might not [***be*** raining now] / [***have*** rained]

(7) *It does not [***be*** raining now] / [***have*** rained]

Second, treating *en/ing* as equally derived from PF-merger as in (3d) offers no account for the asymmetry in VP ellipsis licensing observed in (8).[6]

(8) a. *John slept, and Mary was too
(John T sleep, and Mary was ***(ing)*** ~~[VP sleep]~~ too)
b. John slept, and Mary has too
(John T sleep, and Mary has ***(en)*** ~~[VP sleep]~~ too)

Finally, Lasnik's account for the VP ellipsis data (2) illustrated in (5) crucially relies on the copy theory of movement, that is, the form identity of VPs is calculated based on the copies left behind by overt V-raising of *have/be*. However, this assumption runs into trouble explaining (9), where the VPs containing the copies of auxiliary verbs clearly have different forms but VP ellipsis is nevertheless allowed.

(9) a. OKJohn was here, and Bill and Mary were, too.
(John was$_1$ [VP ***was$_1$*** here], and Bill and Mary were$_2$ [VP ***were$_2$*** here], too)
b. OKJohn has left, and Bill and Mary have, too.
(John has$_1$ [VP ***has$_1$*** en leave], and Bill and Mary have$_2$ [VP ***have$_2$*** en leave], too.)

In summary, Lasnik's account suffers from various conceptual and empirical problems, although his insightful use of PF-merger, feature-based V-raising and his version of *do*-support appear fairly useful. I will show in the next section that retaining these devices while returning to the conceptually simpler non-lexicalist, affix hopping approach can overcome the conceptual and empirical problems reviewed in this section.

3. Reviving the affix hopping approach

3.1 Feature-based Affix Hopping System Solves the Conceptual Problems

I propose a feature-based affix hopping system that is exempt from the conceptual problems reviewed in the previous section. Its general properties are summarized in (10):

[5] This problem goes away if one assumes that children are given innate knowledge that overt V-raising is evidence for inflection in the lexicon (Howard Lasnik, personal communication). This account predicts this property to be universal, and hence it requires further cross-linguistic empirical scrutiny.

[6] See Oku 1998 for a similar paradigm in VP fronting.

(10) a. All Vs are bare in the lexicon, but all Vs and Ts have the same set of formal features (though particular lexical items may differ in strength).
b. A lexical item can be affixal (specifying its phonological properties) *and* featural (specifying its syntactic properties).
c. An affixal head receives its default pronunciation (e.g., T pronounced as *do*) unless (i) it PF-merges with an adjacent head, or (ii) another head adjoins to it, in which case the affix is morphologically realized on the adjoined V head (which basically yields the same morphological result as PF-merger).

The proposed revisions in (10a) and (10b) eliminate the first conceptual problem with Lasnik's account. Once we assume that affixal properties and featural properties of a given lexical item are simply instructions for different aspects of their computation and representation, then there is no reason to assume a dichotomy of the sort adopted in Lasnik (1995b). Furthermore, given that all verbs are bare in the lexicon, the learnability problem mentioned above simply disappears: all that children need to learn is the feature settings of different verbs, which are observable in the form of overt head movement and its positioning with respect to Neg head or VP adverbs (Pollock 1989; see footnote 5).

3.2 Feature-based Affix Hopping System Solves the Empirical Problems

Given the general architectural assumptions in (10), I further assume the following properties (11) specifically for English:

(11) a. Main Vs have weak T features, while *have/be* have strong T features.[7]
b. T can check features of *have/be* AND is affixal.
c. Vs selected by modals have weak M features.
d. *ing* has a strong V feature and overtly attracts V, while *en* has a weak V feature.
Crucially, they are both affixal and their default pronunciation is null (like *pro*).

Let us first examine how the system proposed in (10) and (11) accounts for the basic verbal morphology paradigm in (1), repeated here. I shall return later to how to handle the VP ellipsis paradigm (2).

(1) a. John left.
b. John did not leave. (*John not left / *John left not)
c. John has not left (*John not has left)
d. John is not leaving (*John not is leaving)

The fact that main Vs do not overtly raise (1a,1b) while *have/be* do is explained by the feature specifications given in (11a) (Chomsky 1993). Next, (11b) accounts for how the main verbs and *have/be* gain their verbal morphemes. Since T is affixal, it undergoes PF merger to V under adjacency (1a), whereas when T is stranded by Neg (1b), then T is simply pronounced as *do* (with the appropriate tense/agreement marking) as in Lasnik's

[7] Importantly, I am assuming that strong features can generally be on the attractor or attractee, following Lasnik 1995a, 1999b.

system. When *have/be* adjoin to T via head movement (1c,1d), the affixal T is morphologically realized on the adjoined V head (10c).

Let us now turn to the three empirical problems raised in Section 2. The first problem was that in Lasnik's system there was no way to prevent the application of *do*-support with *have/be* in (7) given that they can also appear in bare forms as in (6).

(6) It might not [***be*** raining now] / [***have*** rained]

(7) *It does not [***be*** raining now] / [***have*** rained]

The present proposal handles this problem by the assumption (11c) that the Vs selected by modals have weak M features and no T features. In other words, *have/be* in (6) and (7) may appear identical in surface forms, but they are treated as different lexical entries with different feature specifications. Given that *have/be* in (6) have weak M features, the lack of overt V-raising in (6) is correctly explained. On the other hand, *have/be* in (7) are not selected by M and thus has strong T features, but here the application of *do*-support means that *have/be* did not overtly raise and their features were not checked in overt syntax.[8] Thus, the ungrammaticality of (7) is correctly predicted by the current proposal.

The second empirical problem was the asymmetry of VP ellipsis licensing for *ing/en* observed in (8):

(8) a. *John slept, and Mary was too
(John T sleep, and Mary was ***(ing)*** ~~[VP sleep]~~ too)
b. John slept, and Mary has too
(John T sleep, and Mary has ***(en)*** ~~[VP sleep]~~ too)

This is explained by (11d) as follows: First, *ing* and *en* differ in their feature strength such that *ing* overtly attracts V whereas *en* doesn't.[9] However, the form identity condition (4), repeated below for convenience, essentially requires the VP to be the same in terms of its formal properties. Thus, if Vs remain in situ to meet the form identity condition, then the derivation in (8a) crashes due to the unchecked strong feature of *ing*, while the derivation converges in (8b) since the V feature of *en* can be checked covertly.[10]

(4) Form identity condition on VP ellipsis (Lasnik 1995b):
The elided VP and its antecedent VP must be identical in form.

[8] The other possibility is that *have/be* actually have M features and stayed in situ. In this case, the M features are not checked in the derivation, so the ungrammaticality is still predicted.

[9] There are various possibilities with respect to how exactly *have-en* and *be-ing* are introduced together and represented in syntax. One possible analysis is that *have* selects an *En*P and *be* selects an *Ing*P (Lasnik 2000), and another possibility is that they are introduced as sisters or in some sort of head adjunction configurations, along the lines of Sportiche's (1988) analysis of floating quantifiers. Either way, the empirical predictions for verbal morphology are the same and hence I remain agnostic on this issue.

[10] In principle, the feature checking operations discussed in this paper can be handled by the AGREE operation (Chomsky 2000), although such a move would require extra assumptions about how to require overt head movement. See Matushansky 2006 for discussions.

Another possible derivation in (8) is that V does overtly raise in (8a) whereas it stays in situ until LF in (8b). This way, *ing*'s strong feature is checked in overt syntax, while the form identity condition is satisfied on the assumption that V leaves a copy behind, and therefore the derivation in (8a) should converge, contrary to fact. In order to account for this problem, I propose that *head movement does not leave a trace/copy behind*. Under this proposal, (8a) will be represented as in (12) when V overtly raises to *ing* (see footnote 8 on the structural representation of *ing*):

(12) John T [$_{VP}$ sleep], and Mary was sleep-***ing*** [$_{VP}$ _____] too

Crucially, the V position is left empty after V overtly raises to *ing*. The antecedent VP and the elided VP are no longer identical in form (i.e., one has *sleep* in V and the other has an empty V slot), and hence the ungrammaticality of this sentence is correctly predicted.

It turns out that the current proposal regarding head movement solves the previously noted problem with the VP ellipsis paradigm. First, let us turn now to the original VP ellipsis data in (2).

(2) a. ^{OK}John slept, and Mary will ~~sleep~~ too (^{OK}John slept, and Mary will sleep too)
b. *John was here, and Mary will ~~be here~~ too (^{OK}John was here, and Mary will be here too)
c. *John has left, but Mary shouldn't ~~have left~~ (^{OK}John has left, but Mary shouldn't have left)

Based on the new proposal regarding head movement, we can analyze (2) as in (13):

(13) a. John T [$_{VP1}$ ***sleep***], and Mary will [$_{VP2}$ ***sleep***] too
b. *John was$_1$ [$_{VP1}$ _____ here], and Mary will [$_{VP2}$ ***be*** here] too
c. *John has$_1$ [$_{VP1}$ _____ en leave], and Mary shouldn't [$_{VP2}$ ***have*** en leave]

In (13a), the main Vs remain in situ due to their weak T features and hence the VPs remain identical in form, satisfying the form identity condition (4). In (13b) and (13c), on the other hand, the first clause contains overt V raising while the second clause doesn't (Potsdam 1997; Roberts 1998). Given the assumption that head movement does not leave a copy behind, we can attribute the ungrammaticality of (13b) and (13c) to the violation of the form identity condition since VP1 and VP2 in those examples contain different formal properties.[11] This account in turn predicts the correct results for the case in (9), which Lasnik's account incorrectly predicted to be ruled out.

[11] Note that Potsdam (1997) as well as Roberts (1998) offer an account similar in spirit to the current analysis, in that they both attributed the ungrammaticality of (2b) and (2c) to the fact that there is overt movement in the first clause. However, the crucial difference between the present analysis and theirs is that the current account derives the ungrammaticality based on the form identity condition, whereas Potsdam and Roberts merely stipulate that VP with a trace in it cannot antecede a VP ellipsis, an assumption that leads to numerous empirical problems pointed out in Lasnik 1997.

(9) a. [OK]John was here, and Bill and Mary were, too.
b. [OK]John has left, and Bill and Mary have, too.

Under the current analysis, (9) is reanalyzed as (14):

(14) a. John was [$_{VP}$ _____ here], and Bill and Mary were [$_{VP}$ _____ here], too
b. John has [$_{VP}$ _____ en leave], and Bill and Mary have [$_{VP}$ _____ en leave], too.

Here, since overt V-raising occurs in both clauses, the V positions are all left empty, rendering both VPs identical in form.

In summary, all of the relevant data introduced in this paper can be explained with a conceptually simpler, feature-based affix hopping account introduced in the section as long as we assume that head movement does not leave a copy behind. In the next section, I will discuss the consequences and potential problems of the present proposal.

4. Consequences and Questions for Further Research

The present approach yields several implications for theories of syntax and morphology. One theoretical consequence of the success of the present affix hopping account is that it lends further support to the non-lexicalist approach to syntax and morphology (e.g., Baker 1988; Chomsky 1957). This is also compatible with the recently popular framework of Distributed Morphology (Embick and Noyer 2007; Halle and Marantz 1993; Marantz 1997), which seems to be a welcome result (but see also Williams 2007 for a critical discussion of this framework and lexicalist hypothesis).

Another line of implications is yielded by the somewhat radical proposal that head movement does not leave a copy behind. First, this is another instance of movement where assuming that the trace/copy is not left behind seemingly leads to desired empirical results (see Lasnik 1999a for A-movement; Baltin 1987 and Tanaka 2005 for extraposition; Nakao 2007 for right-dislocation of PP argument), lending support to the view that leaving a copy behind may not be obligatorily required by syntax (Lasnik and Saito 1984; see also footnote 2). Second, this may at first raise a question as to how to represent thematic roles at LF, which were generally made possible by retaining the original theta assignment configuration. However, under the derivational model of syntax in the minimalist program, it has been suggested that theta roles could be assigned in the course of derivation as a result of theta-feature checking (Hornstein 1999; Lasnik 1995a). Thus, the seemingly radical elimination of the trace of head movement will at least be able to handle theta role assignment. Whether this creates problems with respect to other aspects of the LF interface requires further research.

Furthermore, the current approach to head movement has interesting implications for its status in broader syntactic theories. Lately it has been argued that head movement may need to be treated as a PF operation rather than as an operation in narrow syntax (e.g., Boeckx and Stjepanović 2001; Chomsky 2000, 2001). However, it has been argued that head movement does occur in narrow syntax and feeds into subsequent steps in the

syntactic derivation (e.g., Baker 1988, Den Dikken 2007; Donati 2006; Matushansky 2006; Zwart 2001), and that simply treating head movement as a PF operation merely creates a set of new empirical problems. The present analysis is compatible with the latter approach in that it accommodates head movement within narrow syntax. However, crucially it makes one prediction that has not been made by the previous attempts to accommodate head movement in syntax, namely, head movement does not show reconstruction effects. I leave open for future research whether this prediction is borne out (see, however, Lechner 2007 for an argument for reconstruction of head movement).[12]

One potential empirical problem with the current approach is the Verbal Identity Generalization in V-stranding VP ellipsis (17) observed by Goldberg (2005).[13]

(17) In languages in which V overtly raises and VP ellipsis is allowed (e.g. Hebrew), then the verb in the antecedent and elided VPs must be identical.

The example in (18) illustrates (17), and their representation based on the current assumption regarding head movement is given in (19). Here, the elided VPs in both (19a) and (19b) contain the same constituents (i.e., the empty V plus *her to the school*), and therefore the VP ellipsis is predicted to be fine in both (19a) and (19b), contrary to fact.

(18) Q: Rivka hisi'a ota le-beit ha-sefer?
Rivka drive.past.3.F.sg acc.her.F.sg to-house the-book
'(Did) Rivka drive her to school?
a. A: *(Ken,) hi hevi'a.
yes she bring.past.3.F.sg
'(Yes,) she brought (her to school)'
b. A: (Ken,) hi hisi'a.
yes she drive.past.3.F.sg
'(Yes,) she drove (her to school)'

(19) a. *(Ken,) [$_{TP}$ hi hevi'a ~~[$_{VP}$ ____ ota le-beit ha-sefer]~~
yes she bring.past.3.F.sg acc.her.F.sg to-house the-book
b. (Ken,) [$_{TP}$ hi hisi'a ~~[$_{VP}$ ____ ota le-beit ha-sefer]~~
yes she drive.past.3.F.sg acc.her.F.sg to-house the-book

Here, I tentatively adopt Lasnik's (1997) argument that (19a) is bad due to pragmatic difficulties. He argues that (19a) rather appears to be an unresponsive answer, making it difficult for the hearer to recover the elided constituent. (19b), on the other hand, is clearly responding to the question given that the same verb is used in question and

[12] Lechner (2007)'s argument for reconstruction of head movement is based on interaction of modals and a DP subject containing constituent negation. However, his analysis relies on several peculiar stipulations about the clausal architecture and a series of head movement, so I will leave open for further research whether Lechner's assumptions are valid and constitute counter-evidence to the proposal put forth here.

[13] I thank Atakan Ince and an anonymous NELS38 abstract reviewer for drawing my attention to this issue.

answer, and hence the pragmatic difficulties observed in (19a) do not apply. To what extent this account is valid awaits further research with specific attention to the pragmatic conditions that license the recovery of elided VPs in these sentences (cf. Potsdam 1997).

5. Conclusion

In this paper I argued that the feature-based affix hopping approach is empirically most successful without suffering from conceptual problems that have challenged Lasnik's hybrid account, once we assume that head movement does not leave a copy behind. This particular proposal regarding head movement has interesting implications for the architecture of grammar, as exemplified in the issues of derivational theta role assignment or head movement reconstruction. Although the topic still requires further investigations, the current study presents a promising line of inquiry into the nature of the syntax-morphology interface.

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