Cyclic word formation and word augmentation: keeping phonology out of morphology[*]

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SUMMARY

In a number of languages, phonological material is added to certain morpheme combinations only to ensure that the output achieves the minimal size required of well-formed words. Without the augment, the sequence of morphemes does not qualify as a word. It therefore seems that phonology can play a crucial role in word formation. This conclusion is problematic for theories like Distributed Morphology that define words as composed of syntactic elements, thereby excluding phonology from word formation. This paper offers a solution to this problem. Assuming that words emerge at the interpretation of phases (Chomsky 2001, 2008), I argue that augmentation always applies to strings that constitute well-formed words. However, the process applies at final phases but only targets exponents of non-final phases. Consequently, we can maintain the modularity hypothesis that excludes phonology from morphology.

RÉSUMÉ

Dans un certain nombre de langues, un élément phonologique est ajouté à une certaine combinaison de morphèmes dans le seul but d'assurer que l'output atteigne une taille minimale requise par les mots bien formés. Sans l'ajout, la séquence de morphèmes ne se qualifie pas comme mot. Il semble par conséquent que la phonologie puisse jouer un rôle crucial dans la formation des mots. Cette conclusion est problématique pour les théories telle que la phonologie distributionnelle qui définit les mots comme composés d'éléments syntaxiques, excluant de ce fait la phonologie de la formation des mots. Ce papier offre une solution à ce problème. En assumant que les mots émergent à l'interprétation de syntagmes (Chomsky 2001, 2008), j'argumente que cet ajout s'applique toujours à des combinaisons qui constituent des mots bien formés. Toutefois, nous pouvons maintenir l'hypothèse modulaire qui exclut la phonologie de la morphologie.

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1 INTRODUCTION

In Distributed Morphology (DM) (Halle & Marantz 1993, 1994), words are formed by essentially the same system that generates phrases and clauses. The system merges morphemes (i.e. roots and functional elements) into complex structures that are transferred (at Spell-out) to the LF and PF interfaces to be assigned meaning and phonetic interpretation, respectively. The structures that correspond to words are considered to be complex heads (Embick 2010, Bobaljik 2012). I consider such structures to be formed by head movement (Travis 1984). They contain functional elements (i.e. *v, n, a*) that determine the emergence of categories such as nouns, verbs and adjectives.[1] Newell & Piggott (2014) codifies the relation between syntactic structure and words in the following principle.

(1)   *Word(ω)-Projection*
        At Spell-out, exponents of morphemes in a head position are organized as a word (ω), if they contain a root.[2]

This principle treats words as emergent entities at the PF interface. They could be subject to phonological constraints, but not to syntactic ones.

DM's adoption of derivation by phase (Chomsky 2001, 2008) guarantees that word formation must be cyclic. According to phase theory, a derivation proceeds by transferring well-defined chunks of syntactic structure to the interfaces. There is general agreement that maximal projections (e.g. CP, DP) are phases. Compelling arguments that support recognition of non-maximal projections such as transitive and unaccusative verb phrases (*v*P) and number phrases (NUMP) as phases are well represented in the literature (e.g. Bošković & Lasnik 1999, Legate 2003, Heck & Zimmermann 2004, Svenonius 2004, Matushansky 2005, Adger 2006b). Research also supports recognition of other non-maximal phases consisting of structures headed by category-defining little-*x* elements (*v, n, a*) (e.g. Marantz 2000, Marvin 2002, Di Sciullo 2003, Newell 2004 & 2008, Arad 2005, Embick & Marantz 2008, Embick 2010). Derivations in which maximal and non-maximal phases are spelled out would therefore yield recursive word structures. For example, the syntactic representation in (2a) would correspond to the complex word in (2b).

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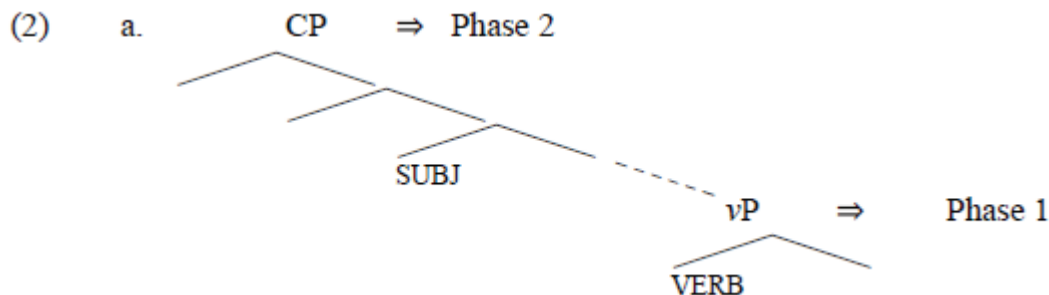
[1] Note that DM assumes that root morphemes are not lexically specified for category.
[2] See Embick & Noyer (2001) for the assumption that the difference between a root and non-root morpheme is lexically represented.

b.
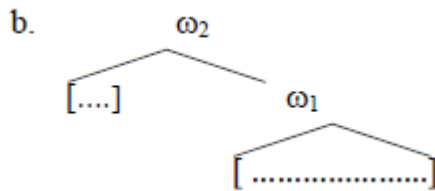
The embedded word (ω_1) is the realization of the first phase (vP), while the maximal phase (CP) yields an output (ω_2) that corresponds to the surface word, subject only to phonotactic and prosodic adjustments.

1.1   THE PROBLEM OF WORD AUGMENTATION

The hypothesis that well-formed words are exclusively composed of syntactic elements (i.e. morphemes) appears to be undermined by the phenomenon of word augmentation. This process adds phonological material to certain combinations of morphemes to ensure that the derivation terminates in a disyllabic or bimoraic word. It is generally considered to be triggered by a phonological constraint that imposes a minimal size on words.

(3)   MINIMAL WORD (MINWD)
          A word contains more than one syllable (or mora).

Among the languages that make use of the augmentation strategy are Lardil (Hale 1973), Slave (Rice 1990, 1992), Choctaw (Lombardi & McCarthy 1991) and Mohawk (Michelson 1988, 1989). The manifestation of this phenomenon in Lardil is illustrated by the 'uninflected' words in the second column of the data in (4).

(4) | | Roots | Uninflected | Inflected | |
          |---|---|---|---|---|
          | a. | yak | yaka | yak-in | 'fish' |
          | | yur | yura | yur-in | 'body' |
          | | ṭurk | ṭurka | ṭurk-in | 'black' |
          | b. | wun | wunta | wun-in | 'rain' |
          | | r̪il | r̪ilta | r̪il-in | 'neck' |
          | | kaN | kaNka | kaN-in | 'speech' |
          | | l̪u | l̪uwa | luy-in | 'fat' |

Augmentation takes the form of a vowel in (4a) and a CV sequence in (4b).[3] In the phonological literature, the choice between V and CV as the augment in Lardil is linked to the nature of a root-final segment. If the latter can be syllabified as a coda consonant, the CV augment occurs and the consonant in the augment is homorganic with the root-final segment. Otherwise, the augment takes the form of a vowel.

In the Iroquoian language, Mohawk, the augment is added at the beginning of the word; it

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[3] A monosyllabic CV root containing a high vowel is augmented by a glide-vowel sequence (e.g. /lu/ → [luwa] 'fat'), while a non-high vowel seems to be lengthened (e.g. /ja/ → [jaː] 'foot').

takes the form of a prothetic vowel /i/ (cf. Michelson 1988 & 1989, Piggott 1995 & 1998). This vowel, which is always stressed, is distinct from the epenthetic vowel /e/ whose appearance is conditioned by phonotactic restrictions on certain sequences of consonants. Some occurrences of the augment /i/ are provided in the following words. Its behaviour in (5c) is typical of other stressed vowels in open syllables; it is subject to tonic lengthening.

(5) a. íkyʌs, *kyʌ́s   'I put it'
         k-yʌ-s
         1SG-PUT-HABITUAL

     b. íktats, *ktáts   'I offer it'
         k-tat-s
         1SG-OFFER-HABITUAL

     c. í:keks, *kéks   'I eat'
         k-ek-s
         1SG-EAT-HABITUAL

Both the augment and the epenthetic vowel (italicized for purposes of identification) may appear in a Mohawk word, as shown by the following examples.

(6) a. íseriht, *seriht   'Cook!'
         s-riht-Ø
         2SG-COOK-IMPERATIVE

     b. ítenehre/, *tenehre/   'you and I want'
         t-n-ehr-/
         1INCL-DUAL-WANT-HABITUAL

In each of these examples, the augment is stressed but not lengthened, although it is in an open syllable. This behaviour is typical of any stressed vowel when the following syllable contains epenthetic /e/.[4]

    In languages that use the augmentation device, words containing fewer syllables/moras are unattested. For example, Lardil and Mohawk lack words containing only one vowel (i.e. *CV, *CVC, *CVCC). However augmentation is manifested cross-linguistically, the process seems to be used to ensure that a word attains the minimal size sanctioned by the language. This conclusion is problematic for theories of morphology in which words are formed by combining meaningful syntactic elements. If well-formed Mohawk words cannot consist solely of the exponents of the morphemes in (5) and (6), subject only to phonotactically-driven adjustments, we have to conclude that the phonological augment contributes to word-formation. This conclusion undermines a fundamental tenet of DM that words are formed by the same computational system that generates sentences.

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[4] See Piggott (1995, 1998) for an explanation for why epenthetic /e/ is overlooked in Mohawk for the purpose of satisfying the minimal size requirement.

## 2   EXCLUDING AUGMENTATION FROM WORD FORMATION

Augmentation can be reconciled with DM only if the string to which the process applies is already a word. In other words, at the point in a derivation when augmentation is triggered, words would already have been formed. The proposed solution to the problem follows from two theses: (a) words emerge from the spell-out of the first phase; (b) the word minimality requirement (MINWD) is imposed on the spell-out of the final phase. The first is just a consequence of the implementation of the *Word(ω)-Projection* principle, while the second is a language-specific option. Consider, now, the Lardil case. As shown in (4), the augment appears to be attached to the exponents of bare roots. DM guarantees that these roots be combined with a category-defining *n*-head before they are spelled out. Since category-defining elements are phase heads, we would expect the roots to be spelled out in the first phase, producing monosyllabic words, as illustrated in the following examples.

(7)   a. $[\text{FISH-SG}_{n\text{P}}]$
             $[\text{yak}_\omega]$

        b. $[\text{RAIN-SG}_{n\text{P}}]$
             $[\text{wun}_\omega]$

These words are well-formed, because MINWD does not apply to the spell-out of the first phase. However, the derivation is not terminated; the final phase in the derivation of a noun is DP. Monosyllabic words are carried over from the spell-out of the *n*P phase to the spell-out of the DP phase. At this stage, MINWD comes into play in Lardil. To satisfy the minimal size requirement, the derived monosyllabic words are subjected to augmentation. Consequently, the phonological process takes a word as input; it does not form words.

(8)   Lardil word enlargement
        a. $[\text{yak}_\omega]$ $\Rightarrow$ $[\text{yaka}_\omega]$
        b. $[\text{wun}_\omega]$ $\Rightarrow$ $[\text{wunta}_\omega]$

     Consider, next, the Mohawk data in (5) and (6). The verbs in these examples are spelled out in the *v*P phase, while the subject prefixes are inserted at the CP phase. The word *i!Ükeks*, 'I eat' (5c) would therefore be the realization of the following word structure.

(9)
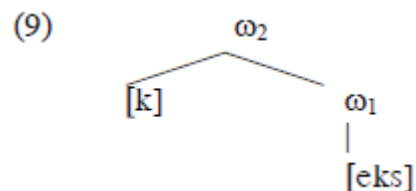
DM allows for certain post-syntactic (post-Spell-out) adjustments such as *Lowering* and *Local Dislocation* (Embick & Noyer 2001, Adger 2006a) that provide for the fusion of the subject prefix with the verb. Assuming that one of these mechanisms is applied to (9), the word consisting of the subject prefix and the verb would still not satisfy the minimal size requirement.

An augmentation process would have to be deployed to rescue the derivation. The addition of the prothetic vowel enlarges the subminimal word to yield disyllabic outputs like those in (10) (before stress is assigned).

(10)   Mohawk word enlargment
    a. [keks$_\omega$] $\Rightarrow$ [ikeks$_\omega$]
    b. [ktats$_\omega$] $\Rightarrow$ [iktats$_\omega$]

This analysis considers augmentation in Mohawk and Lardil to be a strategy that makes an existing word bigger. It is a purely phonological device that is employed to satisfy the demands of a phonological constraint. It plays no role in word formation, per se.

I still have to explain why the satisfaction of MINWD triggers augmentation of derived subminimal words in languages like Lardil and Mohawk rather than renders them ineffable. There must be some constraint the protects such words from censure. Newell & Piggott (2014) recognizes a constraint that produces such an effect. It codifies a well-documented, structure-preserving tendency for representations to be carried over from one cycle to another. For example, stress on the second syllable of the adjective 'oríginal' is preserved as secondary stress on the corresponding syllable of the derived noun 'orìginálity'. As Pater (2000) observes, stress preservation is respected in English in spite of a preference for stress to be on the initial syllable of words when possible (e.g. 'Tàtamagóuchi'). For Newell & Piggott (2014), the constraint that protects structure in the phase-based framework is labelled *Prosodic Persistence*. A slightly modified formulation is provided below.

(11)   *Prosodic Persistence*[5]

    Prosodic categories projected at the interpretation of phase X are inherited as well-formed at phase X+1.

Strictly enforced, *Prosodic Persistence* ensures that syllables, feet and words are carried over from one cycle (i.e. phase) to another. Since a language that enforces late MINWD would readily project monosyllabic/monomoraic words at the spell-out of the first phase, these subminimal entities would be protected by strict enforcement of *Prosodic Persistence*. They could not be completely proscribed. The only option that would be consistent with the demands of the size requirement would be the enlargement of the inherited words.

The available evidence indicates that the input to augmentation always resembles one of the two arrangements of morphemes illustrated by the Lardil and Mohawk cases, respectively. In other words, the target is either the exponent of morphemes spelled out at the first phase (e.g. *v*P, *n*P) or the exponent of the first phase combined with material spelled out in a later phase. In both cases, the representations are at least bi-phasal. There are no examples of augmentation applying to a monophasal output that is uniquely the exponent of the CP or DP phase. This does not appear to be an accident. There is some evidence that a monophasal structure spelled out at the DP or CP phase that fails to satisfy MINWD induces a derivation to crash. This conclusion is based on the treatment of 'derived' monosyllables in Turkish. According to Inkelas & Orgun (1995) and

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[5] This constraint is similar to one proposed by Dobler (2013). The substantive difference is that the latter proscribes any phonological modification to the exponent of a phase, while *Prosodic Persistence* targets changes that affect prosodic structure.

Orgun & Sprouse (1999), certain derived monosyllabic 'words' are proscribed, at least in certain some dialects of Turkish (e.g. Istanbul Turkish). For example, hypothetical words like those in (12) that consist of a vowel-final root and a suffix that marks the 1st or 2nd Person possessor are unattested.

(12)   Ineffable Turkish nouns
         a.   *fam   'my [note]fa'
              fa-m
              [NOTE]FA-1

         b.   *fan   'your(sg.) [note]fa'
              fa-n
              [NOTE]FA-2

         c.   *sum   'my water'[6]
              su-m
              WATER-1

There are no obvious morpho-syntactic reasons for the exclusion of words like those in (12). Piggott (2017) argues that these hypothetical words would be the realization of monophasal structures spelled out at the DP phase. For example, ineffable *fam 'my [note]fa' (12a) would be the realization of the following (abbreviated) structure, resulting from successive head movement (Travis 1984, Piggott & Travis 2017).

(13)

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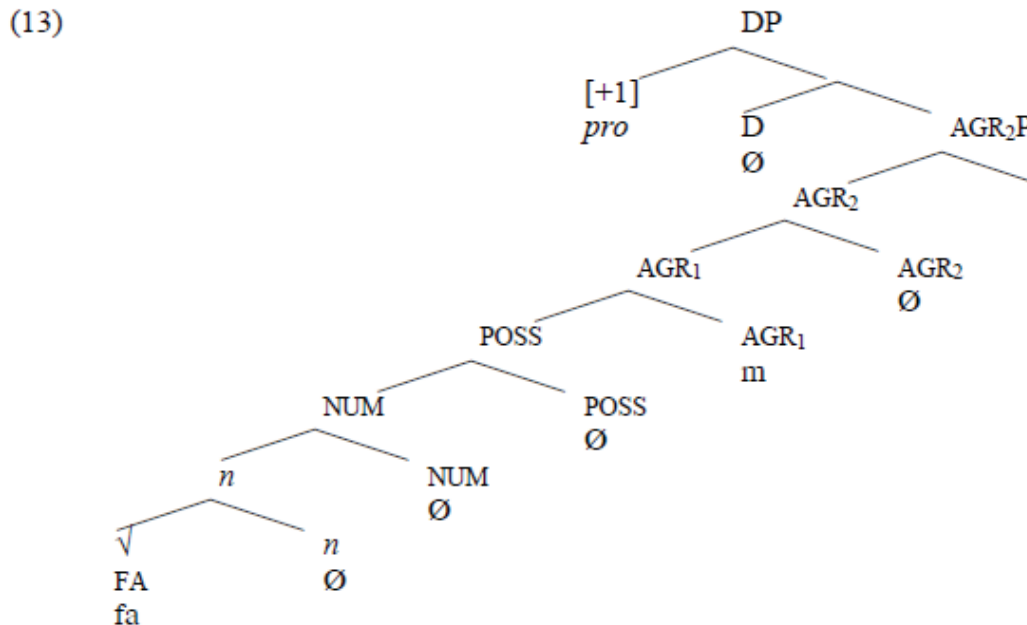
[6] This root has a suppletive form /suy/ that appears in *suy-um* 'my water' and other derived forms.

The failure to satisfy MINWD dooms this derivation at PF; the output is ineffable.

Monophasal structures like one in (13) emerge because of the possibility of delayed Spell-out. The latter entails that the merger of a functional element that qualifies as a phase head does not automatically trigger Spell-out. Svenonius (2004) and Bobaljik & Wurmbrand (2013) defend such a position. Their conception of Spell-out allows elements to be extracted from a phase (XP), if they are required to satisfy the needs of a higher head. To meet such a requirement, the transfer of a phase (XP) would always have to be delayed until the merger of the next head (Y). If Y is needy, X can be extracted from XP to satisfy the needs of Y (i.e. $[Y \ [..X.._{XP}]_{YP}]$ ® $[X+Y \ [..\text{X}.._{XP}]_{YP}])$.[7] Consequently, delayed Spell-out or phase extension allows a phase head to escape from a phase and be spelled out later in a derivation in combination with another head. Early phases like vP and nP, and NUMP are therefore not always transferred to the interfaces, but their spell-out might be delayed until the final phase (CP, DP). In the Turkish example (13), the spell-out of NUMP, a phase, is delayed, because the possessive morpheme (POSS) introduces a possessor argument that must be linked to a possessee. The latter must be extracted from NUMP. This extraction entails that Spell-out is delayed until the merger of the final phase head (D).

Augmentation is a language-specific option. In languages that deploy it, subminimal words are completely banned. Its absence in Turkish might be invoked as the reason why derivations with monosyllabic outputs like those illustrated in (12) cannot be rescued, but it would not explain the ineffability. There are many examples of monosyllabic words in Turkish, some with phonetic shapes similar to ineffable ones (e.g. yem '(animal) food', kan 'blood'). The ineffability of outputs like those in (12) must be the result of a failure in mapping between syntactic form and PF interpretation. If words could not emerge from the monophasal DP structures, the derivation could not be rescued by augmentation even if the process were available to Turkish. The analysis of the conditions under which augmentation is employed predicts that it could not occur in Inuit-type languages. According to Compton & Pitman (2010), words in the Inuit family of languages are formed solely at the CP or DP phase. The relevant structures would have to be monophasal. The enforcement of MINWD by such a language would completely ban subminimal words. Augmentation could not be triggered in such a language. As far as I am aware, the prediction holds.

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[7] Embick (2010:27) also appeals to a version of delayed Spell-out/phase-extension to explain why some English verbs often have special forms in the past tense. The verb is in the vP phase, but the past tense morpheme, introduced in a higher T-head, often conditions the choice of a particular allomorph (e.g. *'break'* vs. *'broke'*, *'buy'* vs. *'bought'*). Another advocate of the concept of phase extension is Den Dikken (2007).

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