Does Phonological Output Contain Morphological Structure?

Evidence from Consistency of Exponence and Fine Phonetic Details

Aaron Braver*
Rutgers, The State University of New Jersey
abraver@rutgers.edu

HUMDRUM 2008
26 April, 2008

1 Introduction

(1) Big question: What does the output of the phonological module look like? Just a string of segments? An entire winning *candidate*? Somewhere in between?

(2) Today's (smaller) question: Does the output of phonology contain morphological structure?

(3) Where might we find evidence for this question?
   a. Consistency of Exponence
   b. Fine phonetic details of segments in varying morphological environments

2 Morphological Structure in the Output

(4) On a conceptual/aesthetic level (to whatever extent that this is important), should the phonological output contain morphological structure?

(5) A "Minimalist" thought experiment
   a. Assume that the input to phonetics is the output of phonology
   b. The only things legible to the phonetics/phonology interface are those that are "virtually conceptually necessary"
   c. Morphological structure is not needed by the phonetics (maybe... see §5)
   d. Morphological structure is therefore not legible to the interface (by (b))
   e. Since it is not legible, morphological structure must therefore not be present in the output of phonology/input of phonetics

(6) A less Minimalist story:

*I owe a great deal of thanks to the following individuals for their comments and suggestions: Wm. G. Bennett, Patrick Houghton, Paula Houghton, Paul de Lacy, Alan Prince, B. W. Smith, and Jonathan North Washington. All errors are, of course, my own.

a. Assume that phonological output is *not* the direct input to phonetics
b. Assume that there is a "cleanup" operation that occurs between phonology and phonetics, which removes anything that might be illegible to the phonetics
c. Even if phonological output contains morphological structure, this "extra" information will not crash the derivation

(7) An even less Minimalist story:
a. Assume that phonological output *is* the direct input to phonetics
b. Assume that the phonetics is smart, and can deal with unnecessary information

(8) So, from a conceptual standpoint, we have no preference for or against morphological structure in the phonological output

3 Defining Consistency of Exponence

(9) Why would we look at Consistency of Exponence (CoE) for evidence? CoE is normally thought to require morphological structure in the output - let's see if this holds

(10) The original definition (McCarthy and Prince 1993)
a. CoE: "No changes in the exponence of a phonologically specified morpheme are permitted"
b. The phonological specifications of a morpheme cannot be affected by GEN

(11) This definition is very clear in a PARSE/FILL/Containment model - no matter how you slice it, the segments belonging to a morpheme will be in that morpheme in both the input and output
a. $/\mathrm{p}_j\mathrm{a}_j\mathrm{k}_j + \mathrm{t}_k\mathrm{a}_k/ \rightarrow [\mathrm{p}_j\mathrm{a}_j\langle\mathrm{k}_j\rangle.\mathrm{t}_k\mathrm{a}_k]$
b. CoE is not violated here - which is good, especially if we continue to assume CoE is a restriction on GEN[1](and therefore inviolable)

(12) It is less obvious how CoE should work in a Correspondence model. The definition we will end up with:
a. Correspondence-CoE: Output segments[2] have all of the morphological affiliations that their corresponding input segments do. Output segments have only the morphological affiliations that their corresponding input segments do

[1]I will continue to assume that Consistency of Exponence is a restriction on GEN, following McCarthy and Prince (1993) and, more recently, van Oostendorp (2006). For an opposing view, see Walker and Feng (2004) and Łubowicz (2008).

[2]This definition and others might more accurately refer to "phonological units". The use of "segments" here and elsewhere is for explanatory clarity.

(13) Why not a "direct translation" of (10a)?

a. Direct-translation-CoE: A segment in morpheme M in the input has a correspondent in that morpheme in the output

b. Would be violated by deletion (bad!)

i. / p_j a_j k_j t_j a_j /
[p_j a_j t_j a_j]

(14) A quick-fix solution

a. Deletion-allowing-CoE: Corresponding input-output segments do not differ with respect to their morphological affiliation

b. Would be violated by coalescence[3,4] across a morpheme boundary (bad!)

i. a_j b_k → c_{jk}

(15) This leads us back to the definition proposed in (12a) ("Correspondence-CoE"), repeated here:

a. Correspondence-CoE: Output segments have all of the morphological affiliations that their corresponding input segments do. Output segments have only the morphological affiliations that their corresponding input segments do

4 What does CoE Tell Us About the Output?

(16) Our definition of Correspondence-CoE does not necessarily require morphological structure in the phonological output

(17) There are two ways to model Correspondence-CoE - "inheritance" requires morphological structure in the output, while "reference" does not

(18) "Inheritance": Output segments "inherit" morphological affiliations from their correspondent input segment(s). Inheritance is mandatory, and morpheme affiliations cannot be assigned to output segments in any other manner.

a. Epenthesis:

a_j b_k
c_j e d_k

Coalescence:

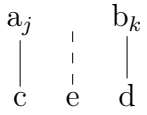
a_j b_k → c_{jk}

[3] I assume here and throughout that coalescence occurs by fusion. An account of coalescence composed of assimilation followed by deletion would not violate this definition.

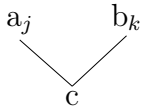
[4] I use the notation c_{jk} to mean that segment c is affiliated with both morpheme j and morpheme k

(19) "Reference": Markedness constraints that are assessed with respect to the morphological affiliation of a segment can only do so via "referring" to the morphological affiliation of that segment's input correspondent. Output segments never have morphological affiliations.

a. Epenthesis:



Coalescence:



b. The "left edge of morpheme M" in the output is the leftmost output segment that corresponds with (an affiliate of) morpheme M in the input

c. No major difference in predictions from inheritance

(20) Since these two views make essentially identical predictions with respect to how CoE operates, we cannot distinguish between them on those grounds

a. As such, we can't use one or the other as evidence for morphological structure in the phonological output

(21) CoE, then tells us very little about morphological structure in the output, so let's turn to fine phonetic details

5 Fine Phonetic Details

(22) What can fine phonetic details tell us?

a. Conceptually, it's possible that the phonetics realizes segments differently based on their morphological affiliation

b. Looking for: slight differences in the realization of segments at morphological boundaries (§5.1) or epenthetic segments (no affiliations, §5.2) as compared to non-epenthetic segments or those in different morphological environments[5]

c. Finding any of these would suggest that the phonetics can see morphological structure, and (on basic assumptions) that phonological output must contain morphological structure

(23) A possible alternative explanation for effects of morphology on phonetics

a. We could assume that the output of phonology is not just the "output" part of a winning candidate, but rather the whole candidate (including the input, the output, and some record of changes made)

b. The phonetics would then have access to the phonological *input* , from which it could glean morphological structure

[5]Differing realizations of coalesced segments (multiple affiliations) might also be instructive, but will not be examined here.

c. Makes the prediction that cases of "phonetic opacity" should occur. Since the phonetics can see the various stages of representation encoded in a candidate, phonetic processes should be able to be conditioned by them - a sort of limited serialism in the phonetics

5.1 Morphological Boundaries

(24) If the phonetics can see morphological structure, it should be able to define operations around morphological boundaries

Featural Affixes

(25) By hypothesis, featural affixes have a morphological boundary (at least in the input)

(26) Additionally, if featural affixes are examples of coalescence, segments resulting from featural affixation should have two morphological affiliations

(27) Segments affected by a featural affix, then, are potential sites of phonetic realization of morphological structure for two reasons

(28) I know of no cases where segments that have been affected by a featural affix are realized differently than segments with a similar underlying specification

Bird (2004)

(29) In Lheidli, intervocalic consonants (IVCs) are significantly longer when at a morphological boundary

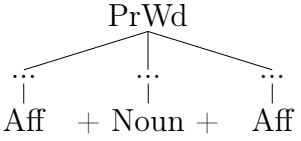
a. IVCs are longer at a prefix-verb boundary than at a noun-suffix, noun-noun, or prefix-noun boundary.

(30) This might suggest that the phonetics can see morphological structure, and lengthens intervocalic consonants at boundaries

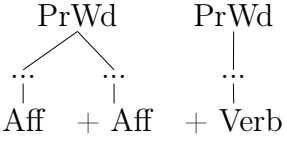
(31) It also might not...

a. A prosodic reanalysis might be tenable - grouping a noun and all of its affixes into a single PrWd, while grouping verbs into separate PrWds from their affixes

i. Nouns:



Verbs:



ii. This would yield a prosodic difference between these cases

iii. Since the phonetics can see prosodic structure, there is no need for it to see morphological structure to account for this case

b. This is part of a larger story about IVCs in Lheidli
   i. Crosslinguistically, singleton IVCs average 70ms, and geminate IVCs average 188ms
   ii. Lheidli singleton IVCs (there are no geminates) average 334ms
   iii. We need to know if the explanation for these details interacts with the details in (29)

(32) So, if we can't explain Lheidli morpheme boundary IVC length with a prosodic analysis, or through a larger picture of general IVC length, we would need to assume that the phonetics has access to morphological structure

Pluymaekers et al. (2006)

(33) Pluymaekers et al. show three related groups of Dutch morphemes[6]
   a. '+igheid' [+əxhɛit]
   b. '+ig+heid' [+əx + hɛit]
   c. '+heid' [+hɛit] (applies after roots ending with 'ig' [əx])

(34) They report a difference in length of the [xh] cluster based on location of the morphological boundary

	Morphological structure	**Example**	**Length**
i.	'+igheid' [əxhɛit]	vast+igheid 'security'	Normal
ii.	'+ig+heid' [əx + hɛit]	baz+ig+heid 'bossiness'	Normal
iii.	'+heid' [+hɛit]	zuinig+heid 'thriftiness'	Long

(35) Possibility of a prosodic approach
   a. They argue that the [h] in the type iii cases ('+heid') is not at the beginning of a prosodic domain, and therefore might be deleted or reduced - not lengthened
   b. It's not entirely clear why this should be different than the type ii ('+ig+heid') cases

(36) Possibility of a morphology-in-phonetics approach
   a. The phonetics sees the morphological boundaries, and acts accordingly
   b. But: why is type ii ('+ig+heid') the same as type i '+igheid'? Shouldn't the morphological boundary (or lack thereof) between [x] and [h] make a difference, as it does in the type iii ('+heid') words?
      i. Possible solution: phonetic processes can target roots vs. non-roots

(37) So, this case doesn't prove either way whether the phonetics needs access to phonological structure

[6]Pluymaekers et al. arrive at this morphological breakdown based on arguments of frequency and lexical access.

Summary: Morphological Boundaries

(38) No cases presented in this section provide conclusive evidence as to the existence of morphological structure in the output

(39) A convincing example needs to avoid the possibility of a prosodic reanalysis, and also provide a significantly more detailed (and higher quality) data

5.2 Epenthetic Segments

(40) If the phonetics can see morphological structure, we might expect some evidence of this to show up on epenthetic segments, since they have no morphological affiliation

McCarthy 1993

(41) Boston dialect of English has epenthetic intervocalic [ɹ]

a. He put the tuna**[ɹ]** away

b. I saw**[ɹ]** eels at the fish market

(42) If this [ɹ] is epenthetic, it has no morphological affiliations, and it might possibly be realized differently from underlying /ɹ/ by the phonetics, if the phonetics can indeed see morphological structure

(43) Epenthetic [ɹ] is "considerably more vocalic, with more energy at all frequencies" than underlying /ɹ/

(44) But: *underlying* /ɹ/ in this dialect surfaces only in onsets

a. McCarthy argues that the epenthetic [ɹ] is actually ambisyllabic

b. We know that coda [ɹ] in other English dialects is realized as slightly more vocalic than onset [ɹ]

c. We therefore have an entirely plausible prosodic explanation for this difference - meaning this cannot serve as evidence for access to morphological structure by the phonetics

5.3 Summary: Fine Phonetic Details

(45) Differences in the fine phonetic details of units differing only with respect to morphological affiliation would serve as good evidence for morphological structure in the phonological output

(46) Each of the cases presented here has some confound that prevents a convincing argument - the possibility of prosodic reanalysis seems to be the biggest obstacle to this view

6 Conclusions and Concluding Questions

(47) We had back luck using Consistency of Exponence as a guide to whether there is morphological structure in the phonological output - a "reference" view can capture CoE without output morphological structure

(48) Differences in fine phonetic details conditioned by morphological structure fares a little better, but more cases are needed, as well as further examination of existing cases

(49) How can we construct examples such that prosodic structure cannot serve as a proxy to morphological structure?

(50) What other morphological phenomena might show up in fine phonetic details?

(51) What other places might we look for evidence?

References

Bird, Sonya (2004). *Lheidli Intervocalic Consonants: Phonetic and Morphological Effects. Journal of the International Phonetic Association* 34(1) pp. 69–91.

Fourakis, Marios and R. Port (1986). *Stop Epenthesis in English. Journal of Phonetics* 14(2) pp. 197–221.

Keer, Edward (1999). *Geminates, The OCP, and the Nature of* Con. Ph.D. thesis, Rutgers University. `ROA 350`.

Łubowicz, Ania (2008). *Infixation as Morpheme Absorption.* In Steve Parker (ed.), *Phonological Argumentation: Essays on Evidence and Motivation.* Equinox Books. `ROA 773`.

McCarthy, John J. (1993). *A Case of Surface Constraint Violation. Canadian Journal of Linguistics* 38 pp. 169–195.

McCarthy, John J. and Alan Prince (1993). *Prosodic Morphology: Constraint Interaction and Satisfaction.* `ROA 482`. RuCCS-TR-3.

Ohala, John J. (2004). *Phonetic Explanations for Sound Patterns: Implications of Grammars of Competence.* In William J. Hardcastle and Janet Mackenzie Beck (eds.), *A Figure of Speech: A Festschrift for John Laver*, chapter 2. Lawrence Erlbaum Associates Inc., Mahwah, NJ.

van Oostendorp, Marc (2006). *Derived Environment Effects and Consistency of Exponence.* `ROA 853`. Version of chapter in Blaho et al. (eds) Freedom of Analysis (2007).

Pluymaekers, Mark, Mirjam Ernestus, et al. (2006). *Effects of Morphological Structure on Fine Phonetic Details: The Case of Dutch -igheid.* In *10th Conference on Laboratory Phonology*, pp. 53–54. `http://www.lpl.univ-aix.fr/~labphon10/abstracts/162.pdf`.

Prince, Alan and Paul Smolensky (1993). *Optimality Theory: Constraint Interaction in Generative Grammar.* `ROA 537`. RuCCS-TR-2.

Walker, Rachel and Bella Feng (2004). *A Ternary Model of Morphology-Phonology Correspondence.* In Vineeta Chand, Ann Kelleher, Angelo J. Rodríguez, and Benjamin Schmeiser (eds.), *Proceedings of WCCFL 23*, pp. 773–786. Cascadilla Press. `ROA 772`.

Warner, Natasha (2002). *The Phonology of Epenthetic Stops: Implications for the Phonetics-Phonology Interface in Optimality Theory. Linguistics* 40(1) pp. 1–27.