

## F as in *fricative* or as in *fortis*? Or both?

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Segments that normally have the same phonetic realization may often behave differently in certain environments. Consider, for instance, the phonological behavior of *n*'s in the example set in (1) from Menomini: *n* in (1a) alternates with *s* before non-low front vowels, while *n* in (1b) does not. Such examples have led phonologists to propose that the surface sound corresponds to two different segments underlyingly (Kenstowicz & Kisseberth 1979: 208–209; see also Hyman's 1970 account of Nupe).

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|-----|----|-----------------------|---------------|------------------------|-----------------|
| (1) | a. | w-e: <b>n</b> -owawan | ‘their heads’ | w-e: <b>s</b> /w-en-e/ | ‘his head’      |
|     | b. | ko: <b>n</b>          | ‘snow’        | ko: <b>n</b> -e:wew    | ‘it is snowing’ |

A long-standing debate in phonological theory is whether examples like (1) above can be accounted for as lexical exceptions subject either to a different phonological grammar (e.g., Orgun 1996), in which case each *n*-bearing item is assigned to a different co-phonology, or to a grammar that employs lexically-indexed constraints (e.g., Itô & Mester 1999), in which case each type of *n* is subject to item-specific faithfulness constraints. Alternatively, cases where one sound exhibits different behavior in the same phonological environment can be viewed as a manifestation of a deeper difference in the underlying structure of that sound, in the sense that two different underlying segments can share the same phonetic realization in some but not all environments. Such a difference in underlying representations bears upon Kiparsky's (1973 [1968]) well-known question as to how abstract phonological representations can/should be in order to capture the different phonological behavior of identical output segments. In this paper, we argue in favor of an analysis that posits different underlying representations for the type of sounds in question, by focusing on the variable realizations of /fs/ and /vs/ (henceforth /Fs/) sequences in Greek. In order to avoid the postulation of too abstract phonemes, we employ the notion of *Gradient Symbolic Representations* (GSR, Smolensky & Goldrick 2016) and we pinpoint the observed variation on the gradient representation of the feature [cont].

Greek has a dissimilation process that turns /Fs/ sequences into [ps]. Interestingly, not all /F/ sounds are uniformly affected by dissimilation: /F/ spelled with *phi* ( $\phi$ ) or *beta* ( $\beta$ ), henceforth phi-/beta-F, always dissimilates before /s/ (2a–b). On the other hand, /F/ spelled with *psilon* ( $\upsilon$ ) (originating from the Ancient Greek diphthongs /aw/ ( $\alpha\upsilon$ ) and /ew/ ( $\epsilon\upsilon$ )), henceforth epsilon-F, exhibits variation, in the sense that it may resist dissimilation (3a), have faithful and dissimilated realizations (3b) or surface as a stop (3c).

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|-----|----|-----------------|---------------------------------|-------------------|------------|
| (2) | a. | /ɣraf-s-o/      | [ˈɣrapso]                       | ‘write-PFV-1SG’   | γραφ-      |
|     | b. | /klev-s-o/      | [ˈklepsɔ]                       | ‘steal-PFV-1SG’   | κλεβ-      |
| (3) | a. | /vravev-s-o/    | [vraˈvefso]                     | ‘award-PFV-1SG’   | βραβευ-    |
|     | b. | /prostavev-s-o/ | [prostaˈtefso] ~ [prostaˈtepsɔ] | ‘protect-PFV-1SG’ | προστατευ- |
|     | c. | /ðulev-s-o/     | [ðuˈlepsɔ]                      | ‘work-PFV-1SG’    | δουλευ-    |

To account for the difference in the application of dissimilation, we propose that epsilon-F and phi-/beta-F have different representations. In particular, the difference lies in the representation of the [cont] feature: instead of being binary-valued as +/-, [cont] may have

different *activity levels* ( $a$ ) ranging from 0 to 1. We take the [cont] feature of ypsilon-F to have  $a(1)$  and phi-/beta-F to have an activity below 1, namely  $a(0.3-0.5)$ . Within a harmonic grammar framework that manipulates GSRs (*Gradient Harmonic Grammar*, Smolensky & Goldrick 2016) and considers deletion of a low activity [cont] to be less costly than insertion of the missing activity, the defective continuant phi-/beta-F will dissimilate to a stop before an /s/ (2a–b), whereas the strong continuant ypsilon-F will resist dissimilation and will be realized faithfully (3a).

Following Anastassiadis–Symeonidis & Fliatouras (2004, 2018), we also propose that, due to diachronic factors, the Greek vocabulary is organized along a *continuum of learnedness/formality* and that the variable activity level of [cont] corresponds to different zones of this continuum. More specifically, /F/'s with very low (0.3–0.5) or very high activity (0.8–1) for [cont] are associated with the [–learned] and [+learned] ends of the continuum, respectively, yielding categorical outputs with surface [p] (2a–b) or [f] (3a). Variation (as in 3b) arises when the vocabulary item ypsilon-F belongs to has shifted in the middle area between the [+learned] and [–learned] part of the axis, which translates to an  $a(0.6-0.7)$  for the [cont] feature of ypsilon-F. Items that have gradually lost their [+learned] status and have moved all the way to the [–learned] zone (3c) have the same representation for ypsilon- and phi-/beta-/F/. An important gain of the proposed analysis at the empirical level is that it explains why /F/'s with low activity [cont] behave like stops and drop before certain consonants, e.g., /ɣraf-men-os/ → [ɣra'menos] 'written', /klev-men-os/ → [kle'menos] 'stolen', /ðulev-men-os/ → [ðule'menos] '(well-)worked', (cf. /en-katalip-men-os/ → [e<sup>n</sup>gatali'menos] 'abandoned'), whereas /F/'s with strong [cont], which are prototypically fricative, do not, e.g., /vravev-men-os/ → [vravev'menos] 'award-winning'.

At the theoretical level, we show that the proposed analysis can aptly account for various levels of gradient well-formedness, as opposed to alternatives that make use of indexed constraints or co-phonologies. The former approach, by embracing an interactive relation between the phonological grammar and the lexicon, allows the lexicon to exercise an effect on the emergence of variable processes but cannot account for the type of lexical variation demonstrated by examples such as (3b), i.e., the scenario where ypsilon-F both undergoes dissimilation and remains faithful. Assuming a grammar where \*Fs (a special case of OCP) is ranked below IDENT[+cont]<sub>Learned</sub> and above IDENT[+cont]<sub>Non-Learned</sub>, the lexical item /prostavev-s-o/ can never yield both [fs] and [ps] outputs as optimal because it cannot be associated simultaneously to both types of vocabulary and hence be appropriately evaluated by both faithfulness constraints. The co-phonology approach, on the other hand, predicts variation to arise by partially ordered constraints (IDENT[+cont], \*Fs) and categorical outputs by total rankings (IDENT[+cont] >> \*Fs and \*Fs >> IDENT[+cont]), but falls short in explaining why non-learned items never exhibit variation and, moreover, why they team up with stops by always dropping their fricative in participial constructions.

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