Being deficient in a gradient way: Root allomorphy in Greek

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This paper aims at providing a novel perspective on the notion of deficiency by focusing on patterns of root allomorphy in Greek. The main claim is that root allomorphy emerges with root *Vocabulary Items* (VIs) that are deficient in the sense that they include segments with a reduced level of strength in the underlying structure. We formalize this approach by adopting Smolensky & Goldrick's (2016) *Gradient Symbolic Representations* (GSR) notion, which allows us to capture the full spectrum of deficient structures.

Greek verb morphology is predominantly concatenative, so that inflectional forms result from the linear combination of a root with overt or zero exponents that realize the following morphosyntactic structure (Philippaki–Warburton 1998; Merchant 2015):

(1) [T(Agr) [Asp [Voice [v √ v] Voice] Asp] T Agr]]

However, many verbs realize Asp, Voice, and Tense by (also) affecting the phonological shape of the root, resulting in root allomorphy. Leaving aside suppletion and some unpredictable changes, this root allomorphy presents some systematic patterns of consonant and vowel alternation and omission/addition of consonants, as can be seen by the data in (2).

(2)	[ACT/PASS, IMPFV]	[ACT, PFV]	[ACT, PFV, PST]	[PASS, PFV, PST]	ROOT	
a.	aníɣ-o/-ome	aníɣ-s-o [ks]	ánik-s-a	aníx-θ-ik-a [xt]	√aniɣ	'open'
b.	alá**z**-o/-ome	aláɣ-s-o [ks]	álaɣ-s-a	aláɣ-θ-ik-a [xt]	√alaɣ	'change'
c.	kalíp**t**-o/-ome	kalíp-s-o	kálip-s-a	kalíp-θ-ik-a [ft]	√kalip	'cover'
d.	psáx**n**-o/-ome	psáx-s-o [ks]	é-psax-s-a	psáx-θ-ik-a [xt]	√psax	'search'
e.	vréx-o/-ome	vréx-s-o [ks]	é-vrex-s-a	vr**á**x-ik-a	√vrex	'wet'
f.	s**é**r**n**-o/-ome	sír-o	é-sir-a	sír-θ-ik-a	√sir	'drag'
g.	ɣð**é**r**n**-o/-ome	ɣðár-o	é-ɣðar-a	ɣðár-θ-ik-a	√ɣðar	'scratch'
h.	p**é**r**n**-o/-ome	pár-o	p**í**r-a	pár-θ-ik-a	√par	'take'
i.	st**é**l**n**-o/-ome	st**í**l-o	é-st**i**l-a	stál-θ-ik-a	√stil	'send'

The examples in (2b–d) show that consonant changes emerge only in the environment of imperfective: while regular verbs exhibit a zero imperfective exponent (e.g., *aníɣ-Ø-o*), certain verbs either undergo a change in the final dorsal consonant (2b) or have an additional consonant that is absent in other environments (2c–d). In both cases, the outcome is the emergence of a coronal sound ([z, t, n]), which leads us to conclude that the exponence of IMPFV is associated with this particular place of articulation. Building on Borer's (2013) notion of *phonological index*, we thus propose that the IMPFV exponent in these cases is a coronal feature, which interacts with the features of the root segments and is eventually manifested as [z], [t] or [n].

(3) [CORONAL] ⇔ [IMPERFECTIVE]

In vowel alternation cases (2e–i), the root vowel of the imperfective forms is always /e/ and the root is usually followed by a coronal /n/ (2f–i), which disappears in perfective forms. Passive perfective forms have the underlying root vowel /i/ (2f) or /a/ (2g–i), as evident from the root shape of the corresponding nominalizations (*s**í**r-sim-o* 'dragging', *ɣð**á**r-sim-o* 'scratch', *p**á**r-sim-o* 'taking', *st**á**l-sim-o* 'sending'), except from verbs like (2e) in which the root vowel appears as /a/ (cf. *vr**é**k-sim-o* 'wetting') and it is followed directly by the Tense exponent /-ik/ without the passive perfective exponent /-θ/. The underlying root vowel appears also in all active perfective forms, except from (2i) where it is replaced by /i/. Finally, in certain

verbs the past tense may be realized by changing the root vowel into /i/ (2h), instead of employing the prefixal augment /e-/.

Given that the attested vowel alternations are conditioned by Voice/Aspect and Tense, we propose that they are a means of realizing specific features of these syntactic heads; in other words, the vowels that replace the underlying root vowels are Voice/Aspect and Tense exponents. Furthermore, drawing on previous work on non-linear affixation (Trommer 2011; Bermúdez-Otero 2012; Bye & Svenonius 2012; Trommer & Zimmermann 2014, a.o.), we suggest that these vowels are underlyingly floating (i.e., they have no association with the CV tier) and dock on the vowel slot of the root. They may also combine with a suffixal exponent yielding a dissociated morpheme with two distinct parts, as in the case of the IMPFV /^{e}…n/:

(4) a. /^{e}…n/ ⇔ [IMPFV] b. /^{i}/ ⇔ [PFV] c. /^{a}/ ⇔ [PASS, PFV] d. /^{i}/ ⇔ [PST]

Crucially, these "irregular" exponents compete with the suffixal realizations of the relevant functional heads that appear in "regular" verbs (/-s/ ⇔ [PFV], /-θ/ ⇔ [PASS, PFV], Ø ⇔ IMPFV), resulting in a gradient system of root allomorphy (RA) ~ suffixal exponence (SE):

(5) No RA (2a) > RA in IMPFV or PASS.PFV, SE elsewhere (2b–e) > RA in IMPFV, SE in PASS.PFV (2f–g) > RA in IMPFV, ACT.PFV.PST, SE in PASS.PFV (2h) > RA in IMPFV, ACT.PFV, ACT.PFV.PST, SE in PASS.PFV (2i)

The issue that arises at this point is what determines the emergence of this gradient system. We propose that the answer lies in the phonological shape of the VIs that realize the roots and the f-morphemes. These VIs may be weak, in the sense that they involve phonologically deficient elements, so that the weaker a root VI is, the more likely it is to combine with a deficient exponent of an f-morpheme. In order to formalize deficiency and account for the resulting patterns of allomorphy, we adopt GSR theory, according to which phonological representations consist of entities that have a numerical value, called *Activity Level* (AL), which basically encodes their relative strength (see also Rosen 2016; Faust & Smolensky 2017; Zimmermann 2018). Only elements with output AL=1 are pronounced; deficient segments with AL<1 will not be realized, unless they are provided with epenthetic activity. We will propose that deficient VIs involve phonological segments with an AL<1; thus V-alternations are allowed only with root VIs that involve a partially active vowel, whereas C-alternations are attested with root VIs that end in a partially active consonant. In other words, the featural and floating exponents given in (3) and (4) are more likely to be preferred over the fully active suffixal manifestations of the relevant functional heads when combined with weak root VIs, because in that case they optimally complement the low strength value of the segments involved in the derivation.

Gradience is, therefore, a matter of the phonological scale in which the root VIs appear according to the AL of their segments and the various allomorphic patterns result from the phonological computation of the VIs involved: from all available exponents of a given functional head, the one that optimally complements the strength value of the VI of a given root will eventually surface, including zero manifestation (*conspiratory null exponence*; Trommer 2012). Thus, the exponent /^{e}…n/ of the imperfective is not phonologically realized when combined with root VIs with a high AL vowel and surfaces only in root VIs with low AL vowels. The situation is similar in active perfective, where the suffixal /-s/ surfaces only with root VIs with high AL vowels, whereas in root VIs with low AL vowels either the floating vowel /^{i}/ docks on or no exponent materialize, depending on the AL of the relevant vowel.

Selected references: (1) Bermúdez-Otero, R. 2012. The architecture of grammar and the division of labour in exponence. In J. Trommer (ed.), *The Morphology and Phonology of Exponence*. 8–83. Oxford: OUP. (2) Borer, H. 2013. *Taking Form: Structuring Sense Volume III.* Oxford: OUP. (3) Philippaki-Warburton, I. 1998. Functional categories and Modern Greek syntax. *The Linguistic Review* 15: 158–186. (4) Smolensky, P. & M. Goldrick. 2016. Gradient symbolic representations in grammar: The case of French liaison. ROA-1286.