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Root strength as (under)specification: Evidence from root allomorphy in Greek

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Aims

- To highlight the systematic patterns that are attested in a complex morphological system that employs root/stem alternations to encode not only grammatical features such as Voice and Aspect, but also categorizing heads such as *n*.
- To offer an analysis that treats *Readjustment Rules* (RRs) as epiphenomena deriving from the phonological properties of the *Vocabulary Items* (roots and exponents of functional heads) and the application of systematic morphophonological operations.
- To explore the notion of *grammatical strength* by underscoring the importance of phonological factors in determining the strength value of a phonological entity.

1. Focus of the talk

- Root alternations cross-linguistically:

(1) a. *English*

NON PAST	PAST	PAST PART	NOUN
s**i**ng	s**a**ng	s**u**ng	s**o**ng

b. *German*

NON PAST	PAST	PAST PART	NOUN
s**i**ng-e	s**a**ng	ge-s**u**ng-en	Ge-s**a**ng

- Two types of analyses for these alternations:

  - ✓ **A. Stem-listing/spanning analyses** (e.g., Booij 1997; Mascaró 2005; Bermúdez-Otero 2013; see also Siddiqi 2009; Merchant 2015; Haugen & Siddiqi 2016): Root/stem allomorphs are stored as separate entries. E.g.,

(2) a. STEM_1: *sing* [verb, –past], STEM_2: *sang* [verb, +past], etc.

b. *sing*: <$\sqrt{\text{SING}}$, *v*, T[–past]>, *sang*: <$\sqrt{\text{SING}}$, *v*, T[+past]>, etc.

Each entry is grammatically conditioned by the feature specification of the functional environment or from the span it manifests.

- ✓ **B. Readjustment analyses** (e.g., Halle & Marantz 1993; Embick & Halle 2005; Harley & Tubino-Blanco 2013; Arregi & Nevins 2014; Embick 2016): One underlying form that undergoes alternations by means of a RR, which 'readjusts' the phonological shape of the root by changing its core vowel. E.g.,

(3) $\sqrt{\text{SING}}$ ↔ *sang* /_‿ T[+past]
↔ …
↔ *sing* elsewhere

▷ **Proposal**: Focusing on Greek verbs, we will argue that:

- Root/stem alternations are best explained as the result of *Readjustments* applied on a single root/constituent rather than as instantiations of different stems (i.e. root allomorphs).
  - ⇒ Roots are bare indices which acquire not only meaning via grammatical structure (see Arad 2005; Acquaviva 2009; Panagiotidis 2014 among many others) but also phonological information.
  - ⇒ The *VI* of a root may be phonologically *underspecified*.
  - ⇒ Besides segmental strings (i.e. morphs), abstract phonological elements such as (floating) features, accents etc. are also available for syntactic manipulation (cf. Bermúdez-Otero 2012 for a totally different take on the nature of phonological entities accessible to morphology).

▷ **What is new:**

- Readjustments derive from empty elements, and other 'defective' entities, etc. that exercise an effect on neighboring phonological constituents.
- A distinction is drawn between 'strong'/regular and 'weak'/irregular roots which is argued to stem from the phonological shape of the exponents that materialize a root and not from the morphosyntactic status of the root per se.

▷ **Word of caution:**

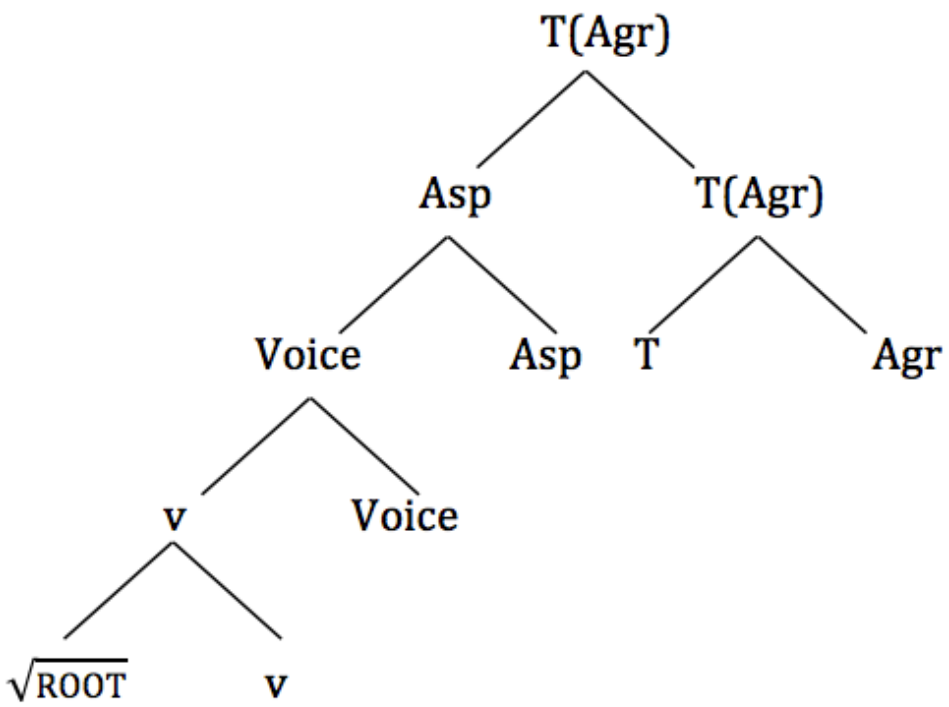
⇒ Our main goal is to unearth and describe hidden, unexplored and not well-discussed regularities in root/stem alternations and not to examine the Greek verbal system in its entirety and with all its complexity (see, for instance, some spurious patterns of inflection class shifting, e.g., ***filá****o,* ***filás****o,* ***filáɣ****o* 'guard', the origins of which should be sought in the long and often tumultuous history of the language, e.g. the archaic/purified vs. demotic language conflict). Here we focus on a specific set of (sub)regularities that involve the realization of aspect and voice.

⇒ We will also not address the issue of stress, although it is significant, since root/stem alternations are also attested in this respect too (see Revithiadou & Spyropoulos 2016 for the role of stress in determining the phonological properties of a root).

2. A brief overview of Greek verbal morphology

The morphosyntactic structure of the verbal head after verb movement (Philippaki-Warburton 1998; Philippaki-Warburton & Spyropoulos 1999 among others):

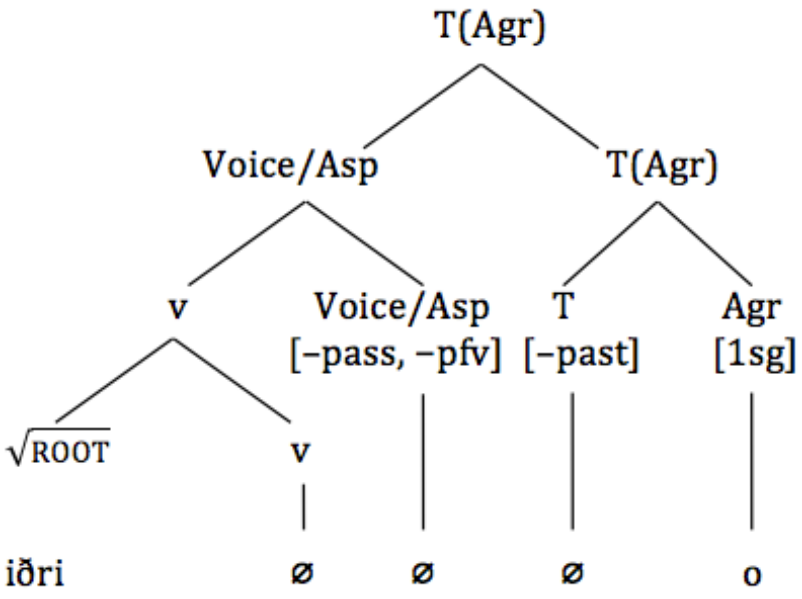
(4)



2.1. Regular/strong verbs

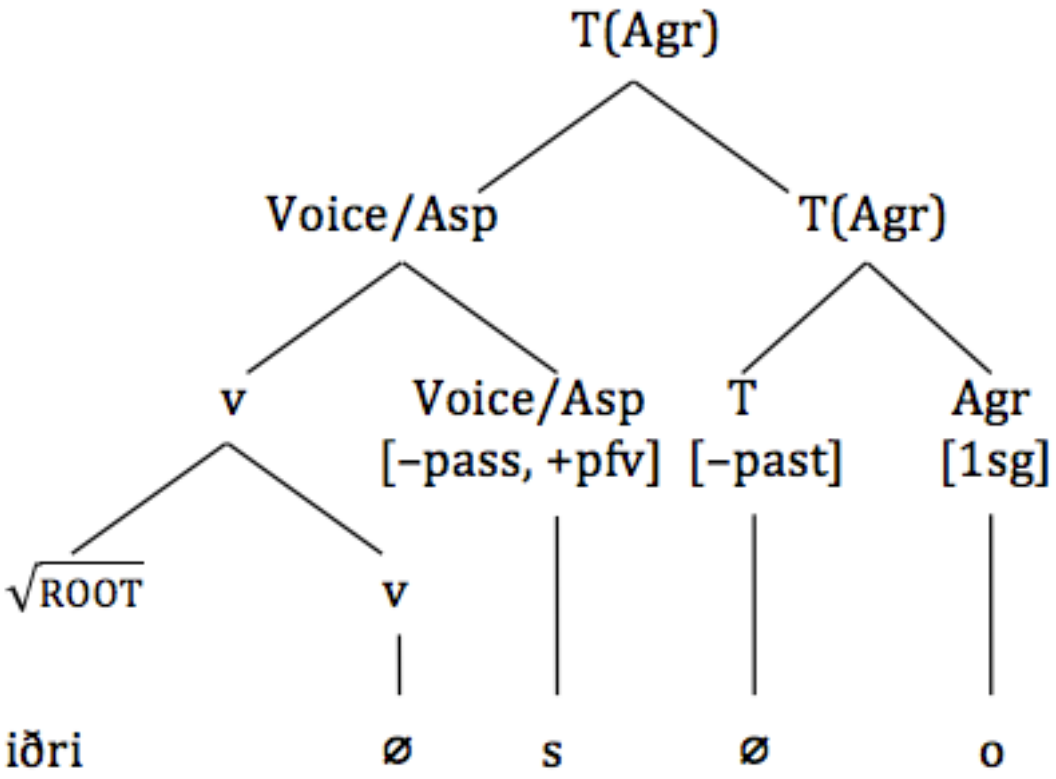
- Vowel-ending roots; there are no (morpho)phonological rules affecting the segments of the morphological constituents:

(5) *Active imperfective form*



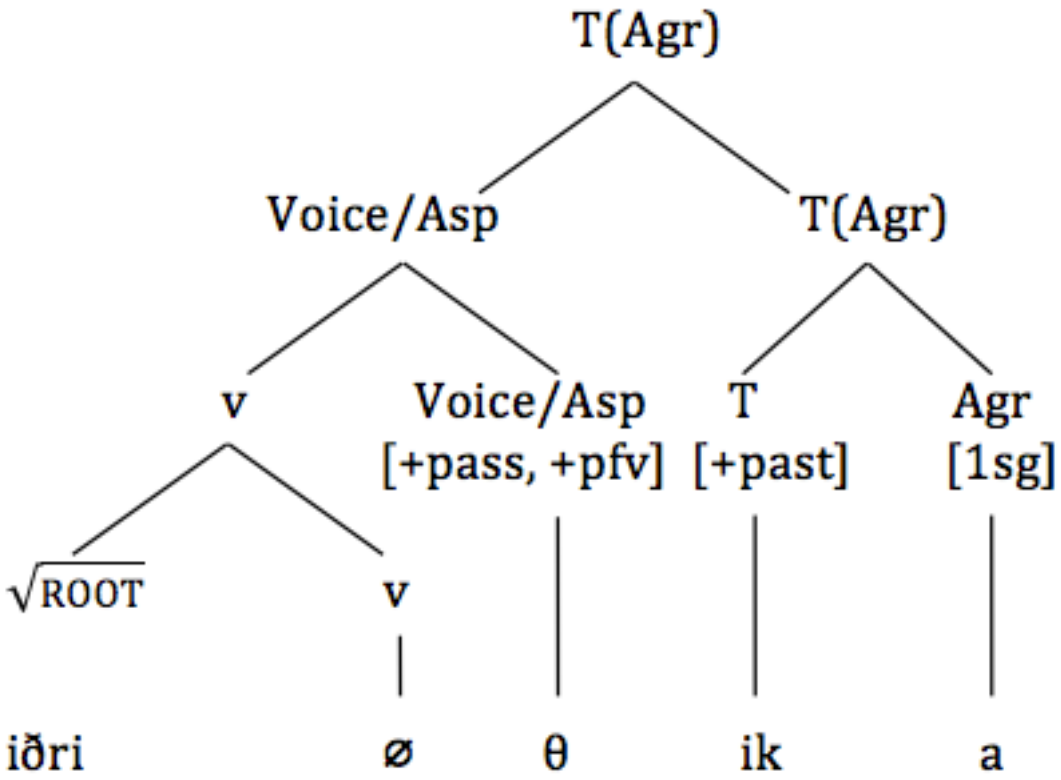
iðrío 'I establish'

(6) *Active perfective form*



iðríso 'I establish'

(7) *Passive imperfective form (Past)*



iðríθika 'I was established'

- Consonant-ending roots; several morphophonological rules operate at the borders of the morphological constituents (e.g., voice assimilation (VA), manner dissimilation (MD)).

(8) *aníɣo* (*ανοίγω*) 'I open' (Root: $\sqrt{\text{ANIɣ}}$)

a. *active imperfective form*

aníɣo aniɣ √] -∅ v] -∅ Voice/Asp] -∅ T] -o Agr] → aníɣo

b. *active perfective form*

aníkso aniɣ √] -∅ v] -s Voice/Asp] -∅ T] -o Agr] → aníkso

($ɣ \rightarrow k$ by VA & MD)

c. *passive perfective form*

aníxtika aniɣ √] -∅ v] -θ Voice/Asp] -ik T] -a Agr] → aníxtika

($ɣ \rightarrow x$ by VA, $\theta \rightarrow t$ by MD)

2.2. Irregular/weak verbs

- Voice, aspect and tense may also be realized by affecting the phonological shape of the root/stem.
  - Roots/stems undergo phonological reshaping, expressed in certain roots as vowel alternation (with or without a segmental affix) and in others as consonant change. Interestingly, reshaping follows systematic patterns. For instance, /e/ is found in [–pfv] environments, and /i/ in [+pfv] ones.
  - The changes may affect not only the root but also verbalizers.
  - Similar root/stem alternations are also observed in nominal formations from these roots/stems.

Table 1. An overview of systematic alternations

i. V- and C-ending roots

		[–pass, –pfv]	[+pass, –pfv]	[–pass, +pfv]	[+pass, +pfv]	*n*
Regular V-ending roots	1	iðrí-o	iðrí-ome	íðri-s-a	iðrí-θ-ik-a	íðri-s-i
Regular C-ending roots	2	aníɣ-o	aníɣ-ome	ánik-s-a	aníx-θ-ik-a	ánik-s-i
Roots with V-alternations	3	st**é**l**n**-o	st**é**l**n**-ome	é-st**i**l-a	st**á**l-θ-ik-a	(apo-)st**o**l-í
	4	ɣð**é**r**n**-o	ɣð**é**r**n**-ome	é-ɣð**a**r-a	ɣð**á**r-θ-ik-a	e-kð**o**r-á
	5	s**é**r**n**-o	s**é**r**n**-ome	é-s**i**r-a	s**í**r-θ-ik-a	s**í**r-tis
Roots with C-alternations	6	alá**z**-o	alá**z**-ome	ála**k**-s-a	alá**x**-θ-ik-a	ala**ɣ**-í

1: *iðrío* 'I establish', 2: *aníɣo* 'I open', 3: *stélno* 'I send', 4: *ɣðérno* 'I skin', 5: *sérno* 'I drag', 6: *alázo* 'I change'

ii. Verbalizers with V- and C-alternations

		[−pass, −pfv]	[+pass, −pfv]	[−pass, +pfv]	[+pass, +pfv]	*n*
Verbalizers with V-alternations	1	elafr-**é**n-o	elafr-**é**n-ome	eláfr-**i**n-a	elafr-**í**n-θ-ik-a	eláfr-**i**n-s-i
Verbalizers with C-alternations	2	stiv-á**z**-o	stiv-á**z**-ome	stív-a**k**-s-a	stiv-á**x**-θ-ik-a	stív-a**ɣ**-m-a

1: *elafréno* 'I lighten', 2: *stivázo* 'I pile'

▷ **Desiderata:**

- A descriptively adequate account for the systematicity of such alternations in a constrained way.

  ⇒ Stem listing misses a great deal of this systematicity and it is highly redundant (see discussion in §6).

  ⇒ RRs are more promising in this respect.

- A constrained theory of RRs, which predicts the existing regularities/patterns by means of well established phonological operations.

  ⇒ RRs as exponents and epiphenomena of phonological deficiency/ underspecification

3. Irregular/weak verbs with V alternations

Proposal: Certain roots (e.g. *aniɣ-, ɣraf-*) appear to be 'strong' in the sense that they are invariant in all contexts (á la Inkelas 2015). Roots such as the ones in Table 1i are 'weak' in the sense that they exhibit V alternations.

- We do not concur with proposals that attribute the susceptibility to change of weak roots to the reduced strength feature values on their vocalic segment (as a reflection of the frequency and/or the regularity with which a given phonological entity is produced/perceived, see Inkelas's 2015 *confidence scale*).

- We propose instead that the strong/weak split reflects differences in the phonological specification of the exponents of a root:

(9) *Three types of root specification*

fully-specified	*defective*	
	with an empty V	*with a floating V*
a. √ɣraf	b. √stVl	c. √sVr √ɣðVr
		i a
‘write’	‘send’	‘drag’ ‘skin’

☞ The phonological profile of the root is crucial for the realization of the Voice/Asp and *n* heads:

- fully-specified roots are selected by fully-specified affixal exponents (e.g., -*s*)
- defective roots are selected by phonologically defective exponents

⇒ The distribution of allomorphs depends on the full vs. defective root specification

3.1. Alternations in defective roots with an empty V(12b)

(10)	a.	st**é**l**n**-o	'I send'
	b.	é-st**i**l-a	'I sent'
	c.	st**á**l-θ-ik-a	'I was sent'
	d.	apo-st**o**l-í	'dispatch'

Table 2. Vowel alternations in roots with an empty V

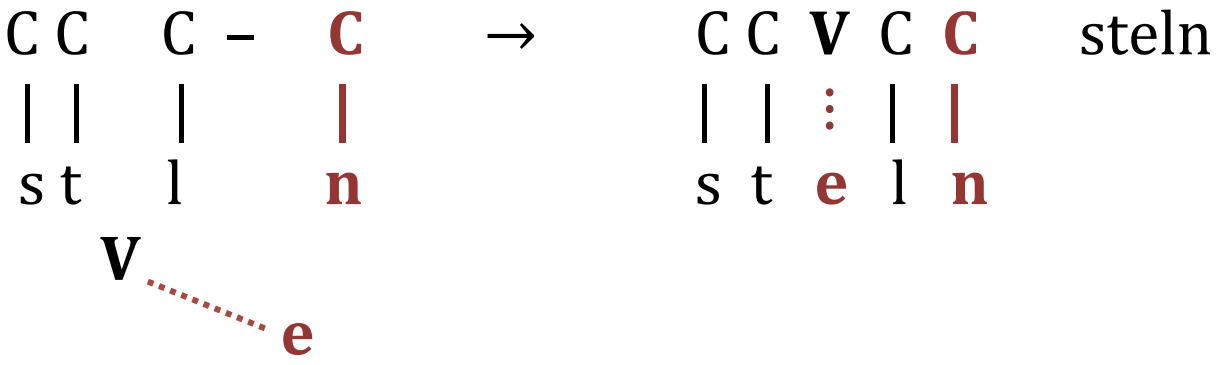
UR	[–pass, –pfv]	[–pass, +pfv]	[+pass, +pfv]	*n*
√STVL	stél-n-o 'I send'	é-stil-a 'I sent'	stál-θ-ik-a 'I was sent'	apo-stol-í 'dispatch'
√MVN	para-mé(n)-n-o 'I stay'	par-é-min-a 'I stayed'	–	para-mon-í 'stay'

Table 3. Exponents in formations with empty V roots

[–pfv]	[–pass, +pfv]	[+pass, +pfv]	*n*
CeC-n	CiC	CaC-θ	CoC
CeC-n	CiC	–	CoC

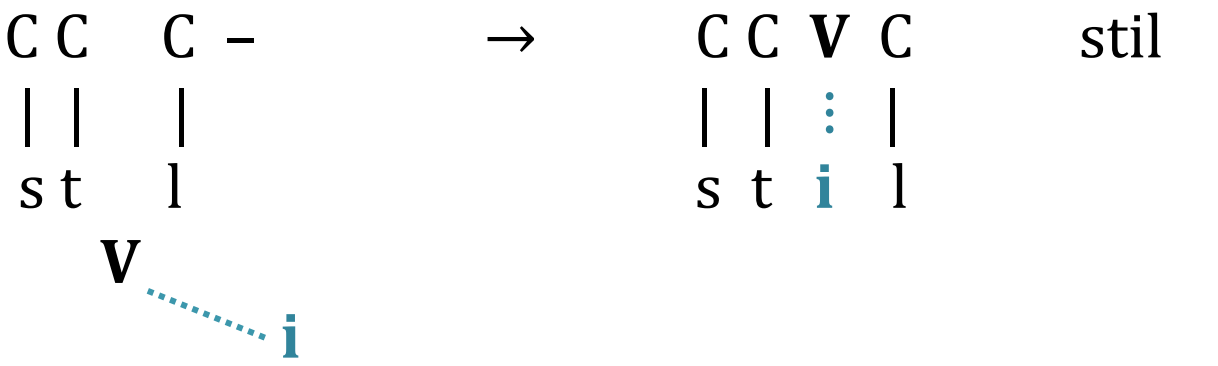
The elements *e…n, i, a…θ, o* that are exponents of Voice/Aspect and *n* all involve defective vowels. The root vowel changes depending on which affixal vowel is licensed in the available V-slot. E.g.:

(11) a.



steln

b.



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Comments:

- For the ease of exposition, in the autosegmental representations in (11) we have omitted some details of our analysis.
- Cs are fully specified segments in the sense that are associated with fully specified FEATURE ROOT NODES (•F-Rt).
- The empty V-slot dominates only a [–cons] feature.
- The floating /e/ is a defective •F-Rt node specified only for PL[COR] and Aperture[–hi, –lo].

3.2. Alternations in defective roots with a floating V(12c)

(12)	a.	s**é**r-**n**-o	'I drag'
	b.	é-s**i**r-a	'I dragged'
	c.	s**í**r-θ-ik-a	'I was dragged'
	d.	s**í**r-t-is	'latch'

(13)	a.	ɣð**é**r-**n**-o	'I skin'
	b.	é-ɣð**a**r-a	'I skinned'
	c.	ɣð**á**r-θ-ik-a	'I was skinned'
	d.	ɣð**á**r-simo	'skinning'
	e.	ekð**o**r-á	'abrasion'

Table 4. Vowel alternations in roots with a floating V

	UR	[–pass, –pfv]	[–pass, +pfv]	[+pass, +pfv]	*n*
1	$\sqrt{\text{SVR}}$ i	sér-n-o	é-sir-a	sír-θ-ik-a	sír-t-is
2	$\sqrt{\text{ɣðVR}}$ a	ɣðér-n-o	é-ɣðar-a	ɣðár-θ-ik-a	ɣðár-simo ekðor-á

Interestingly, the same pattern is followed by verbs shaped with highly productive verbalizers:

Table 5. Vowel alternations in overt verbalizers

UR	[–pass, –pfv]	[–pass, +pfv]	[+pass, +pfv]	*n*
-**V**n i [en]	elafr-én-(n)-o 'I lighten'	eláfr-in-a 'I lightened'	elafr-ín-θ-ik-a 'I was lightened'	eláfr-in-s-i 'relief'
-**V**n a [en]	θerm-én-(n)-o 'I make s.o./sth warm'	θérm-an-a 'I made s.o./sth warm'	θerm-án-θ-ik-a 'I was warmed up'	θérm-an-s-i 'heating'

Table 6. Exponents in formations with a floating V

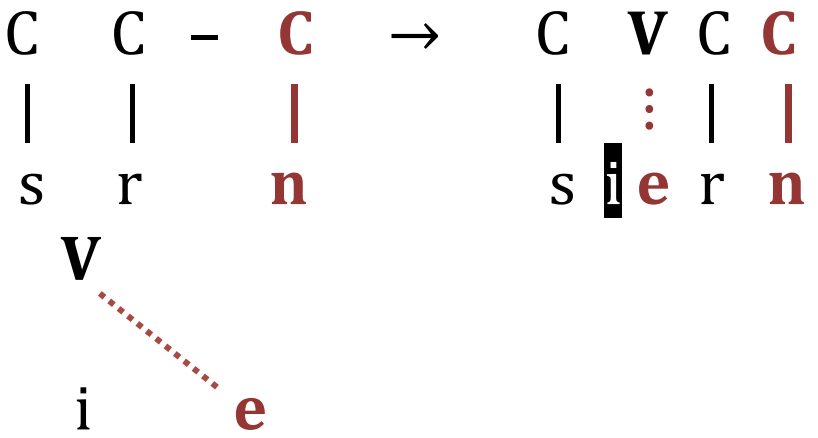
[−pfv]	[−pass, +pfv]	[+pass, +pfv]	*n*
CeC-n	CiC-ø	CiC-θ	CiC-t(is)
CeC-n	CaC-ø	CaC-θ	CaC-sim(o) CoC

Roots (/verbalizers) carrying a floating vowel themselves show only partial vowel alternation. For these verbs [+pfv] is not discharged by a specific VI, thus Aspect is realized by the elsewhere exponent ø (see list of exponents in 15–18).

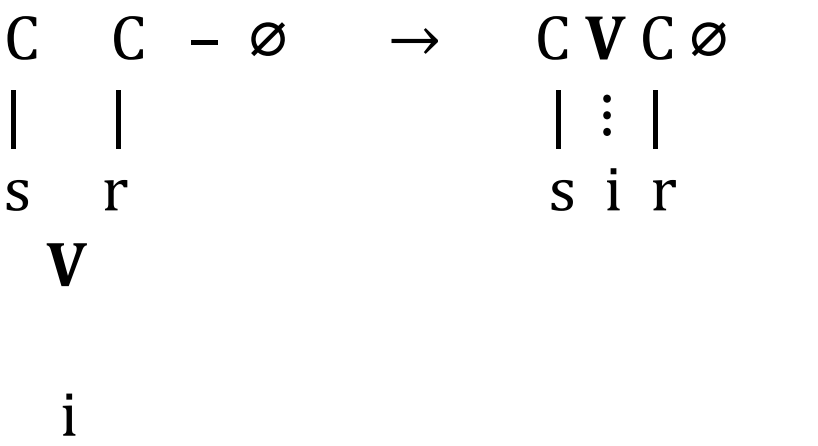
⇒ In [+pfv] environments, where no affixal defective vowel is available, the unlinked root vowel is realized on the V-slot of its sponsor (14a).

⇒ In all other environments (e.g., [−pfv], *n*) the affixal defective vowel is realized instead (14b).

(14) a.



b.



3.3. Interim recapitulation

On the list of exponents:

- The distribution of the exponents is locally determined (in terms of linear adjacency). More specifically, the selection of the particular exponent hinges on the exact make up of the base/root at the point where VI takes place.

(15)			C			C	**V**	C
[–pfv]	↔	•	|	/	C**V**C⁀__, where C**V**C =	|		|
		e	n			•F-Rt	**(•F-Rt)**	•F-Rt

(16) [+pfv]	↔	• i	/	C**V**C⌒__, where C**V**C =	C | •F-Rt	**V**	C | •F-Rt
	↔	C | s	/	CVC⌒__, where CVC =	C | •F-Rt	V | •F-Rt	C | •F-Rt
(17) [+pass, +pfv]	↔	C • | a θ	/	C**V**C⌒__, where C**V**C =	C | •F-Rt	**V**	C | •F-Rt
	↔	C | θ	/	CVC⌒__, where CVC =	C | •F-Rt	V (|) •F-Rt	C | •F-Rt
(18) [*α* pfv]	↔	∅	elsewhere				
(19) *n*	↔	• o	/	C**V**C⌒__, where C**V**C =	C | •F-Rt	**V** **(•F-Rt)**	C | •F-Rt

On root alternations:

- Root alternations are due to (a) root underspecification and (b) the exponence of the Voice-Asp and *n* nodes in the form of defective •F-Rts.

On readjustments:

- Readjustments are viewed as effects exercised by exponents on the phonological shape of adjacent elements (i.e. roots and verbalizers) as a result of their phonological defectiveness. *Readjustment Rules* – RRs will henceforth be used as a cover term to refer to these effects.

On the dynamics of RRs:

- Adaptation of loanwords to Greek verbal morphology
  Initial stages [±pfv] *parkáro* 'I park'
  Advanced stages [−pfv] *parkérno* vs. [+pfv] *parkáro*

On the root-affix dynamics:

- Underspecified roots integrate (segmental and/or defective) affixal material at the expense of their own unassociated •F-Rt nodes.

4. The realization of defective elements

We adopt Zimmerman's (2017, esp. ch 2) *Prosodically Defective Morphemes* (PMD) framework and especially the following assumptions:

1. Nothing is deleted from the input (*Containment*, Prince & Smolensky 1993/2002 and esp. *Colored containment*, van Oostendorp 2006, 2007, 2008; Revithiadou 2007; Trommer 2011a et seq.; Trommer & Zimmerman 2014). Phonology can see colors.

   (*Note*: All epenthetic material is colorless)

2. There exist different types of association lines:
   - Underlying/morphological association lines (visible or invisible)
   - Epenthetic/phonetic association lines (visible or invisible)

(20)	morphological	epenthetic
visible	a. x | A	b. y ⋮ B

The focus will mainly be on epenthetic association lines (20b). Other instantiations of invisibility (e.g., silenced morphological and/ or phonetic associations) fall outside the scope of the present discussion.

3. Exponents may be prosodically defective *in the input*
   - Phonological entities that are not dominated by a higher node on the Prosodic Hierarchy, and/or
   - Phonological entities that do not dominate a lower node on the Prosodic Hierarchy

E.g.,

(21) a.

x
|
A

A is dominated by higher x; x dominates A

b.

x_1 x_2

A

A is not dominated by higher x; x_1, x_2 do not dominate anything → defective

We diverge from the PMD framework by extending domination relations to V and •F-Rt nodes (see, e.g., de Lacy 2012 for the representation of defective segments in Dholuo; also Bye & Svenonius 2012 and especially Trommer 2011ab et seq.; Trommer & Zimmerman 2014).

Two types of defective structures underlyingly:

(22) a. V b. V

•F-Rt

Following Trommer (2011a), we assume that segmental and defective elements cannot phonologically form together a single exponent, hence *e…n, a…θ* constitute multiple exponents with different linearization specifications: the exponent •F-Rt[COR, –hi, –lo] is specified to be suffixed to the rightmost V node of the base, whereas the exponent /n/ is specified to be suffixed to the rightmost segmental node of its base:

(23) [–pfv] ↔ (•, $\bullet^{V}{}_{r}$ __) ⊕ (C , $\bullet_{r}$ __)

[COR] |

[–hi, –lo] n

All exponents of the same VI share the same morphological affiliation/color.

(24) *Unified Color Exponence Hypothesis* (Trommer 2011a: 34): Exponents of the same vocabulary item have the same morphological affiliation/color.

We adopt the following constraints (based on Zimmerman 2017: 42, 48, 51, 57):

(25) a. V > DO_p > •F-RT: A V should phonetically dominate a •F-Rt node.

(Penalizes empty segments)

b. COL!•$_{F\text{-}Rt}$: A •F-Rt should be licensed by morphological color.

(Penalizes epenthetic •F-Rts)

c. PVIS•$_{F\text{-}Rt}$: A •F-Rt node should be phonetically visible.

(Penalizes silenced •F-Rts)

d. INVARIANCE[•F-RT_{α}/V_{α}]: A •F-Rt node of color α that is not morphologically associated with any V of color α should not be phonetically associated with it either.

(Penalizes tautomorphemic phonetic association of floating elements; it forces them to be realized across morpheme boundaries)

steln-

(T1)	s_α t_α l_α n_β | | | | $C_\alpha C_\alpha$ V_α C_α – C_β $\bullet_\beta$ e	V > DO_p > •F-RT	COL!$_{\bullet F\text{-}Rt}$	PVIS$_{\bullet F\text{-}Rt}$
☞	a. stVl-n | e [steln]			
	b. stVl-n e [stln]	*!		*
	c. stVl-n e e [steln]		*!	*

sern-

(T2)	s_α r_α n_β | | | $C_\alpha V_\alpha C_\alpha$ – C_β $\bullet_\alpha$ $\bullet_\beta$ i e	V > DO_p > •F-RT	COL!$_{\bullet F\text{-}Rt}$	PVIS$_{\bullet F\text{-}Rt}$	INVAR[•F-RT$_\alpha$/V$_\alpha$]
☞	a. sVr-n i e [sern]			*	
	b. sVr-n i e [sirn]			*	*!
	c. sVr-n i e e [sern]		*!	**!	

sir-

(T3)

	$s_\alpha \quad r_\alpha$ | | $C_\alpha V_\alpha C_\alpha - \varnothing_\beta$ $\bullet_\alpha$ i	V > DO_p > •F-RT	COL!$_{\bullet F\text{-}Rt}$	INVAR[•F-RT$_\alpha$/V$_\alpha$]
☞	a. sVr- ⋮ i [sir]			*
	b. sVr- ⋮ i e [ser]		*!	

5. Irregular verbs with C alternations

For a group of latent [DOR] roots (of Ancient Greek stock) and verbalizers, e.g. *-az* (*-άζω*), a $C_{[COR]}$ /z/ surfaces in all forms but the imperfective ones:

Table 7. Roots with a latent [DOR]

UR	[–pass, –pfv]	[–pass, +pfv]	[+pass, +pfv]	*n*
√ALAC ɣ	alá-**z**-o 'I change'	ála**k**-s-a 'I changed'	alá**x**-θ-ik-a 'I was changed'	ala**ɣ**-í 'change'
√XARAC k	xará-**z**-o 'I engrave'	xára**k**-s-a 'I engraved'	xará**x**-θ-ik-a 'I was engraved'	xára**k**-as 'ruler'
-aC ɣ [az] (*-άζω*)	stiv-á-**z**-o 'I pile'	stív-a**k**-s-a 'I piled'	stiv-á**x**-θ-ik-a 'I was piled'	stív-a**ɣ**-m-a 'piling'

A defective root plus a ‘defective’/floating coronal obstruent yields the above patterns:

(26) *defective root and defective [–pfv] exponent*

a. $V_\alpha C_\alpha V_\alpha \mathbf{C}_\alpha$ – [alaz]

| | | •α •β

a_α l_α a_α **ɣ** **z**

b. $C_\alpha V_\alpha C_\alpha V_\alpha \mathbf{C}_\alpha$ – [xaraz]

| | | | •α •β

x_α a_α r_α a_α $\mathbf{k}_\alpha$ $\mathbf{z}_\beta$

ala-z-

(T4)	$a_\alpha\ l_\alpha\ a_\alpha$ | | | $V_\alpha C_\alpha V_\alpha \mathbf{C}_\alpha$ – $\bullet_\alpha$ $\bullet_\beta$ ɣ z	C > Do_p > •F-RT	COL!$_{\bullet\text{F-RT}}$	INVAR[•F-RT$_\alpha$/C$_\alpha$]
☞	a. alaC- ɣ z [alaz]			
	b. alaC- ɣ z [alaɣ]			*!
	c. alaC- ɣ z t [alat]		*!	
	d. alaC- ɣ z [ala]	*!		

6. Theoretical issues

6.1. Readjustment analyses vs. Stem-listing analyses

Stem/span listing	**Readjustments**
Separate stored entries that are assigned to morphosyntactic feature bundles	A single underlying representation that undergoes alternations according to the morphosyntactic environment
e.g. *steln-*: <$\sqrt{\text{ROOT}}$, v, [–pfv]> *stil-*: <$\sqrt{\text{ROOT}}$, v, [–pass], [+pfv]> *stalθ-*: <$\sqrt{\text{ROOT}}$, v, [+pass], [+pfv]> *stol-*: <$\sqrt{\text{ROOT}}$, n>	e.g. UR: $\sqrt{\text{STVL}}$ $\sqrt{\text{STVL}}$ ⌒ [–pfv] → ***steln*** $\sqrt{\text{STVL}}$ ⌒ [+pfv] → ***stil*** $\sqrt{\text{STVL}}$ ⌒ [+pass, +pfv] → ***stalθ*** $\sqrt{\text{STVL}}$ ⌒ *n* → ***stol***

- Explanatory power: Readjustment analyses can capture:
  ⇒ alternation patterns that have gone unnoticed in stem/span-listing approaches, e.g. the consistent emergence of /e…n/ in imperfective forms,
  ⇒ regularities, e.g. the way Voice/Aspect conditioned alternations pattern together with alternations in nominalizations.

- Predictability: The RRs presented above are employed by speakers for the adaptation of loanwords to Greek verbal morphology (e.g., [±pfv] *parkáro* 'I park' → [−pfv] *parkérno* vs. [+pfv] *parkáro*).

- Economy: Stem/span-listing analyses need to postulate many different listed allomorphs for each of the alternations discussed above, which will multiply if we consider the effect of stress (e.g. √STVL 'send' would have as many as 5 stem/span allomorphs: *stel-, stil-, stal-, stál-, stol-*).

6.2. Grammatical strength

- In the analyses that construe grammatical strength as a structure-dependent property, the focus so far has been on differences across morphological categories and particularly on the root-affix asymmetry; see, for instance, the well-known metaconstraint RootFaith >> AffixFaith (McCarthy & Prince 1995; Urbanczyk 2001, a.o.).

Cf. Modern Hebrew (Ussishkin & Wedel 2002): Roots require higher levels of phonemic contrastiveness compared to affixes and are thus less susceptible to phonological changes.

However…

- As the Greek data suggest, it is not enough for an element to be labeled a 'root' in order to be attributed a special status; phonologically underspecified roots are also 'weak' in the sense that they acquire their full phonological content from neighboring affixes.

  ⇒ Strength asymmetries are attested not only *across* but also *within* morphological categories.

Cross-linguistic evidence: Strength asymmetries may derive from differences in:

– Segmental composition – existence of vowels:

Modern Hebrew (Arad 2005)

- Consonantal vs. syllabic roots; only the former are subjected to pattern/templatic morphology in order to take the form of a continuous string (yielding mišqalic nouns).

– Segmental composition – number of vowels:

Chukchansi Yokuts (Guekguezian 2017)

- Subminimal roots (with one underlying vowel) are augmented to satisfy minimality by undergoing templatic morphology; they form an $(LH)_{\omega}$ sequence when a triggering suffix (=a syntactically cyclic phase head) attaches.
- Roots with more than one underlying vowel do not undergo templatic changes; they surface with their underlying shape.

⇒ Grammatical strength is **phonologically** grounded

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Appendix

The functional categories and their exponents:

- Verbalizer *v*: Mainly null. It may be also realized with overt suffixes (e.g., *-ev*, *-iz*, etc.) or with an empty vocalic segment, which results in the second conjugational pattern (see Spyropoulos et al. 2015 for details).

(27) *The exponents of v*

a. *v* ↔ -□$_V$ / {$\sqrt{\text{AɣAP}}$, $\sqrt{\text{STER}}$, …} ___

b. *v* ↔ -ar / {$\sqrt{\text{FRESK}}$, …} ___
-iz / {$\sqrt{\text{KOKIN}}$, …} ___
-ev / {$\sqrt{\text{ðISKOL}}$, …} ___
…

c. *v* ↔ -∅ / {$\sqrt{\text{VAF}}$, $\sqrt{\text{AKU}}$, …}

- Voice [±passive] and Aspect [±perfective]. These two functional categories highly interact in their exponence, so that we take them to be fused (see below for arguments on why fusion is empirically superior than spanning).

(28) *The exponents of Voice/Aspect*

a. /-s/ ↔ [+pfv]
b. /-θ/ ↔ [+pass (+pfv)] (/ [+pfv])
c. /-ús/ ↔ [−pfv] / {$\sqrt{\text{AYAP}}$, $\sqrt{\text{STER}}$, …} ___[+past]
d. ∅ ↔ elsewhere

- Tense [±past]: It is mainly encoded in the choice of the agreement suffix. [+past] is also encoded by the suffix /-ik/ and the augment (a stressed empty vocalic prefix, which creates an antepenultimate stress pattern and surfaces as /e-/ when the verb form consists of less than three syllables; see Spyropoulos & Revithiadou 2009), which are in complementary distribution, in the environment of [+perfective].

(29) *The exponents of Tense*

a. /V́-/ ↔ [+past]
b. /-ik/ ↔ [+past] / [+pfv] ___
c. ∅ ↔ [elsewhere]

- Agreement: Sets of 6 suffixes that are conditioned mainly by tense; in passive voice, they may also encode/be conditioned by Voice [+pass] and Aspect [−pfv]:

Table 8. Agreement suffixes

	−PAST			+PAST
	1	2A	2B	
1SG	-o	-ó / -áo	-ó	-a
2SG	-is	-ás	-ís	-es
3SG	-i	-ái / -á	-í	-e
1PL	-ume	-áme / -úme	-úme	-ame
2PL	-ete	-áte	-íte	-ate
3PL	-un(e)	-án(e) / -ún(e)	-ún(e)	-an(e)

	−PAST, +PASS			+PAST, +PASS		
	1	2A	2B	1	2A	2B
1SG	-ome	-iéme	-úme	-ómun(a)	-iómun(a)	-úmun
2SG	-ese	-iése	-íse	-ósun(a)	-iósun(a)	-úsun
3SG	-ete	-iéte	-íte	-ótan(e)	-iótan(e)	-úndan
1PL	-omaste	-iómaste	-ímaste	-ómastan	-iómastan	-úmastan
2PL	-este	-iéste	-íste	-ósastan	-iósastan	-úsastan
3PL	-onde	-iúnde	-únde	-óndan / -óndusan	-iúndan / -ióndusan	-úndan