Distributed exponence and the order of morphological operations

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THE PROBLEM

OVERVIEW

- Perfect aspect in Classical Greek is realized by the *combination of*
  - A dedicated set of inflections
  - A reduplicative prefix
  - A suffix and/or special form of the stem

(1) πεπαίδευκα
pe~ paideu **-k** -a
PERF~ teach **-PERF** -1s.PERF.ACT.INDIC
'I have taught'

- Challenges:
  - Neither the reduplicant nor the suffix (?) has an invariant phonological form
  - The perfect meaning is realized in (at least) two places, and on either side of the root—instantiated by more than one piece *together*

How do we deal with this kind of "distributed exponence" (Caballero & Harris 2012) within Distributed Morphology?

Quick answer (best alternative): perfect meaning is split between two heads, a lower verbalizer with an uninterpretable perfect feature and a higher aspect head with an interpretable perfect feature

GREEK

- Classical Attic Greek, ~500-300 BCE
- Verbs inflect for tense, aspect, mood, voice, person, number
- The "thematic" verbs (1st sg. Pres. Act. Indic. -o:) show the following pattern:

T	ASP	ROOT	ASP	T	"THEME"/ MOOD	PERSON/NUMBER/VOICE	
e	le	ly	k		e	men	We had destroyed
		ly		s	o	men	We will destroy
e		ly	s		a	men	We destroyed

FORMS OF THE PERFECT

- Reduplication- + /-k/ ("first perfects") (as in ex. 1; root-final dentals drop)
- Reduplication-, no /-k/ ("second perfects"—but, other changes)
  - Some roots have special stems that only add agreement suffixes
  - Root-final labials often become /p^h/ (ɸ), velars sometimes /k^h/ (χ)

(2) lu-o: 'I destroy' / le~lu-k-a 'I have destroyed' (suffixes /k/)
(3) komizd-o: 'I carry' / ke-komi-k-a 'I have carried' (dental cluster drops)
(4) $grap^h$-o: 'I write' / ge~$grap^h$-a 'I have written'
(5) blep-o: 'I see' / be~$blep^h$-a 'I have seen' (labial becomes p^h)
(6) dio:k-o: 'I pursue' / de~$diok^h$-a 'I have seen' (velar becomes k^h)

Issues to address:

① agreement ② reduplication ③ stem changes and /-k/

ISSUE 1

AGREEMENT MARKING

- Realizations of the agreement suffixes are conditioned by [perfect]
- This is expected if Aspect appeared next to AGR, but Tense sits between the two (no overt realization in the present)
- Embick (2010) for Latin: Tense realized by ∅ is pruned, allowing VIs to refer to [perfect] in their context for insertion. For Greek?

(7) Classical Greek AGR (fragment)
1p ↔ -amen /Asp[perf]⁀__
1p ↔ -omen (⁀ denotes linear precedence)

- Support: Agreement suffixes in the future perfect match present (impfv) forms, not present and past perfect forms
- Difference? Future tense has an overt exponent, so can't be pruned, and [perfect] can't condition the agreement suffixes
- Tense also overt in past perfects; endings may be conditioned by [perfect] and [past]

active indicative -o: verbs				
	present (impfv)	present perfect	past perfect	fut perf
1s	-o:	-a	-e:	-o:
2s	-eis	-as	-e:s	-eis
3s	-ei	-e(n)	-ei(n)	-ei
2d	-eton	-aton	-eton	-eton
3d	-eton	-aton	-ete:n	-eton
1p	-omen	-amen	-emen	-omen
2p	-ete	-ate	-ete	-ete
3p	-ousi(n)	-asi(n)	-esan	-ousi(n)

ISSUE 2

REDUPLICATION

(8) (a) $grap^h$-o: / ge~$grap^h$-a
(b) ^{h}ript-o: / e-rrip^h-a
(c) zde:te-o: / e~zde:te-k-a
(d) t^hu-o: / te~t^hu-k-a
(e) angell-o: / e:~ngel-k-a

- Adopting Haugen's (2008) RED Vocabulary Item

If the root begins in...		Reduplicant is...	
Aspirated stop C	C_1^h	Unaspirated stop + /e/	C_1/e/
Stop + liquid/nasal	C_1C_2	The stop + /e/	C_1/e/
Other C cluster	C_1C_2	/e/	/e/
$/^{(h)}r/$	$^{(h)}C_1$	/e/ + doubled C	/e/C_1
Other single C	C_1	That C + /e/	C_1/e/
A vowel	V_1	Lengthened vowel	V_1:

- Location determined by the syntax; phonological realization comes from the base
- The morphosyntactic 'target' of reduplication: the verb stem (not the word)

(9) epi-krate-o: 'I rule over' / epi-ke~krate:-ka 'I have ruled over' *e~epi-krate:-ka

- Phonological 'base' is not the whole stem (as predicted by Haugen 2009; contra Marantz 1982, McCarthy and Prince 1993, Inkelas & Zoll 2005)
  - Form of RED always determinable from first one OR two consonants
- PROPOSAL: base is always the first segment; RED is realized as (C)V–an optional, single-articulation C plus a V. If the first segment is...
  - A V: copied, output is that V
  - A single-articulation C: copied, V slot filled with epenthetic /e/
  - A double articulation: cannot be accommodated in C slot; only /e/ surfaces
- V-initial roots support this proposal: short vowels lengthen; diphthongs lengthen FIRST vowel; long vowels don't change (1st segment copied but resulting double long vowel 'contracts' as seen elsewhere in the language)
- Zukoff 2017 proposes an OT analysis of these patterns
  - But, proposes that the /e/ is a separate morpheme from the reduplicant; this would introduce yet another instantiation of [perfect]
  - His analysis involves a REALIZE constraint; without this, the extra morpheme would be unnecessary (to be continued...)

ISSUE 3: ALTERNATIVE 1

A DEDICATED MECHANISM

- Solution I: There are really two instances of the feature [perfect], and each one is instantiated by a different piece: RED- and an abstract consonantal suffix ("-K")
- Problem: The Subset Principle cannot choose between the two Vocabulary Items: neither is more "qualified" than the other
- Fission (Noyer 1992) is not enough to yield this output: instead of having multiple features to be realized by different strings, two strings must realize a single feature
- SOLUTION: Müller's (2007) Enrichment doubles a feature after syntax, before VI
  A. Enrichment doubles [perfect] (∅ → [perfect] / [perfect] ____)
  B. Vocabulary Insertion begins; one VI is inserted (RED- or -K abstract consonant mutation morpheme)
  C. Fission is triggered, creating a new Position of Exponence; second VI inserted

(10) [perfect] ↔ /-k-/ / Voice[active]___, / [-labial, -velar] ___
∅ / elsewhere

- But a number of roots undergo a different mutation or none at all; dentals are deleted
- Negative: Root-specific readjustment rules would be necessary, e.g.:

(11) √ [-syllabic, +labial]#→ [p^h] / √BLEP, √...___ [perfect]

- Linearization happens late and establishes the relative order of the two halves of the Asp head; Local Dislocation is responsible for moving RED- to the left side
  - Pro: Appearance of /-k-/ across different forms accounted for
  - Con: Stretches intended application of Fission; lots of machinery

ALTERNATIVE 2

STEM LISTING

- Another possibility: [perfect] is instantiated directly only once (by RED-); stem changes are not the result of a separate VI
- ANSWER: The root undergoes contextual allomorphy in the context of [perfect] and [active] (e.g. stem listing accounts of Bermúdez-Otero 2013, Haugen 2016)

(12) $[BLEP]_V$ 'SEE' →/$blep^h$/ /___[perfect][active]
→/blep/ / elsewhere

- Pros: Doesn't require Enrichment or Readjustment Rules; maintains original vision for Fission; might not require Local Dislocation
- Cons: Appearance of /-k/ across most roots must be accidental. (Haugen 2016: Where is the line between regular and irregular?)

ISSUE 3: ALTERNATIVE 3

TWO PROJECTIONS

- A third possibility: the reduplication and /-k/ suffix are instantiations of two separate heads
- Possible solution: Kramer (2016) proposes for Amharic that plurality is divided between a Num head and a special nominalizer, accounting for various phenomena including double plural markings. Only one number feature is interpretable.
- PROPOSAL FOR GREEK:
  - RED- is an instantiation of the Asp head with an *i*[perfect] feature
  - /-k/ instantiates a lower verbalizing (*v*) head with a *u*[perfect] feature (unvalued features crash the derivation, not uninterpretable ones)
  - Some roots would still need to undergo root-specific contextual allomorphy
- This accords with the facts we see
  - All roots undergo reduplication, but not all show a change on the right side
  - Perfects with "double" marking do not differ in their semantics from those that only show reduplication
- PROS:
  - No dedicated mechanism or Readjustment Rules or Local Dislocation required
  - Explains the wide appearance of /-k/
- CON (?):
  - Still leaves some of the work to the root level: requires a specialized *v* that selects for certain roots

IMPLICATIONS

- The data provide:
  - Evidence against reduplication being limited to the copying of constituents larger than a segment (e.g. Shaw 2005)
  - Evidence against 'Black Box Phonology' (e.g. Embick 2010), in which the morphological component deals extremely locally, and cannot "see inside" phonological surface forms
  - Evidence for the (extreme) lateness of the assignment of phonological output forms
  - Insight into the interface between the narrow syntax (structure-building) and the morphology proper (structure-adjusting)
- The first analysis points towards:
  - Necessity of a counterpart for Impoverishment
  - Late linearization: after Vocabulary Insertion (Linearization applies to the two halves of the Fissioned head; Fission is triggered by Vocabulary Insertion)
  - Enrichment/(Impoverishment) → Fission/(Fusion) → Linearization → Local Dislocation → Readjustment Rules
- In this case, a circumfix as a kind of morphological primitive seems to be unnecessary
- Outstanding questions:
  - How much (specialized) Morphology does Distributed Exponence require?
  - How much work does the root do?

WORKS CITED

Works Cited
Bermúdez-Otero, Ricardo. 2013. The Spanish lexicon stores stems with theme vowels, not roots with inflectional class features. *Probus* 25(1): 3 – 103.
Embick, David. 2010. *Localism versus globalism in morphology and phonology (Vol. 60)*. Cambridge, MA: MIT Press.
Haugen, Jason D. 2009. What is the base for reduplication? *Linguistic Inquiry* 40(3), 505–514.
Haugen, Jason D. 2016. Readjustment: Rejected? In *Morphological Metatheory 229*: 303.
Inkelas, Sharon, & Cheryl Zoll. 2005. *Reduplication: Doubling in Morphology.* Vol. 106. Cambridge: Cambridge UP.
Kramer, Ruth. 2016. A split analysis of plurality: Number in Amharic. *Linguistic Inquiry* 47:3.
Marantz, Alec. 1982. Re reduplication. *Linguistic Inquiry* 13, 435–82.
McCarthy, John J. & Alan S. Prince. 1993. Prosodic Morphology I: Constraint interaction and satisfaction. Ms., University of Massachusetts, Amherst and Rutgers University.
Müller, Gereon. 2007. Extended exponence by enrichment: Argument encoding in German, Archi, and Timucua. In Tatjana Scheffler, Joshua Tauberer, Aviad Eilam, & Laia Mayol (eds.), *Proceedings of the 30th annual Penn linguistics colloquium*, 253–266. Philadelphia: University of Pennsylvania.
Noyer, Rolf. 1992. *Features, positions and affixes in autonomous morphological structure*. Ph.D. Dissertation, MIT (Published by Garland, New York, 1997).
Shaw, Patricia A. 2005. Non-adjacency in reduplication. In Bernhard Hurch (ed.), *Studies on Reduplication*, 161–210. Berlin: Mouton de Gruyter.
Zukoff, Sam. 2017. The reduplicative system of Ancient Greek and a new analysis of Attic reduplication. *LI* 48:3.
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