Nonuniformity in Stratal Phonology

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OUTLINE OF THE ARGUMENT

§1 This talk addresses **phonological nonuniformity among affixes,**

i.e. two or more affixes induce different phonological behaviours
despite being apparently identical w.r.t. the relevant phonological properties.

E.g.

				stress shift	*spirantization*
democrat	[ˈdɛməˌkɹæt]	*democrac-**y***	[dɪˈmɒkɹəsɪ][†]	to antepenult	yes
		*democrat-**ist***	[dɪˈmɒkɹətɪst]	to antepenult	no
		*democrat-**ic***	[ˌdɛməˈkɹætɪk]	to penult	no
		*democrat-**ish***	[ˈdɛməˌkɹætɪʃ]	no	no

[†] Final /ɪ/ tensed allophonically to short [i] only in some dialects: e.g. not in conservative RP nor in Manchester.

§2 I highlight two useful **comparison criteria** for theories of affixal nonuniformity:

- the division of labour between solutions based on representation, computation, or storage;
- the division of labour between $\left\{\begin{array}{c}\text{architectural}\\ \text{emergent diachronic}\end{array}\right\}$ limits on computational nonuniformity.

§3 The view from **Stratal Phonology**:

(i) *Interstratal computational nonuniformity*

Different strata may be computationally nonuniform,

i.e. domains defined by morphosyntactic constituents of different rank (stems / words / phrases) can be subject to different phonological functions (in OT, to different constraint rankings).

(ii) *Intrastratal computational uniformity* (= *No parallel cophonologies*)

Within the same stratum, all domains are computationally uniform:

i.e. domains defined by morphosyntactic constituents of the same rank are subject to the same phonological function (in OT, the same constraint ranking).

(e.g. Kiparsky 1982a, 1982b, 2000, 2015; Bermúdez-Otero 2010, 2012, 2018c)

§4 *The representational corollary of intrastratal computational uniformity*

Productive nonuniformity among domains of the same rank must be solved representationally: e.g.

- affixation to any bound root defines a stem-level domain, (e.g. Bermúdez-Otero 2018c: 115)
- yet English deradical suffixation shows high metrical nonuniformity: (e.g. Kager 1989: chs 1-2)

	…σ̆+suffix	…σ̄+suffix	
-ic	ˌæn.ˈθɹɒ.pɪ<k>	ˌdaɪ.ˈdæk.tɪ<k>	final consonant extrametricality
-al	ˈnɒ.mɪ.<nl̩>	ɪ.ˈtɜː.<nl̩>	final syllable extrametricality
-oid	ˈhɒ.mə.<ˌnɔɪd>	ə.ˈɹæk.<ˌnɔɪd>	weak retraction before stressed suffix
-able	ɪn.ˈdɒ.mɪ.<tə.bl̩>	ˌɪ.nɪ.ˈlʌk.<tə.bl̩>	weak retraction before unstressed suffix
-ize	ˈgæl.və.<ˌnaɪz>	ˈɹɛ.kəg.<ˌnaɪz>	strong retraction

⇨ This nonuniformity must reflect
differences in the UR of the suffixes, (e.g. Arndt-Lappe & Sanz 2017, Bermúdez-Otero 2018c: 116-7)
and not constraint indexation, (e.g. Pater 2000, 2009)
parallel cophonologies, (e.g. Raffelsiefen 2004, Zamma 2013)
etc.

§5 Stratal Phonology's approach to nonuniformity faces **two challenges**:

(i) *The challenge from the right: not enough restraint!*

Interstratal computational nonuniformity (§3i) is too permissive: (e.g. McCarthy 2007: 42ff)

e.g. it allows metrical incoherence across strata. (Wolf 2012)

(ii) *The challenge from the left: too much restraint!*

Intrastratal computational uniformity (§3ii) is too restrictive: (e.g. Inkelas 2012: 155-6, Sande 2019)

e.g. it cannot cope with English stem-level nonuniformity (§4). (Raffelsiefen 2004: 140)

§6 Answering the challenge from the right: **diachrony**

Restrictions on interstratal computational nonuniformity are 'soft':
i.e. they are not built into the architecture of grammar, but emerge diachronically through change.

- Metrical incoherence, though rare and short-lived, does exist. (Benz 2018, Kaplan 2024)
- Patterns (in OT, constraint rankings) percolate from stratum to stratum:
  - principally, by domain narrowing in their **life cycle**; (e.g. Bermúdez-Otero 2011: §3)
  - ancillarily, by the **Martin Effect**. (Martin 2007, 2011)

☞ No comparable, fully worked-out diachronic solution currently exists for parallel cophonologies.

§7 Answering the challenge from the left: **a case-study of the English stem level (part 1)**

Types of stem-level construction:

monomorphemic stem	one cycle	⟦$_{\mathrm{SL}}$ *albatross*⟧	*álbatròss*	no suffix
root + SL affix		⟦$_{\mathrm{SL}}$ *homin-oid*⟧	*hómin-òid*	suffix
stem + SL affix	two cycles	⟦$_{\mathrm{SL}}$ ⟦$_{\mathrm{SL}}$ *pyramid*⟧ *oid*⟧	*pyrámid-òid*	

Predictions of stem-level computational uniformity:

The same phonotactic possibilities (including metrical structures) are available…

(i) …in one-cycle SL items as in two-cycle SL items **Chung's Generalization**

e.g. σ̆σ̆̀σ̆σ́… cyclically derived in *imàgin-átion* (← *imágine*)
available noncyclically in *apòthe-ósis*, *Epàminóndas*

(ii) …in monomorphemic stems as in stems with SL suffixes **Monomorpheme Generalization**

e.g. …σ̄́σ̄̀ derived by suffixation in *ellíps-òid* (← *ellípse*), *odónt-òid*
available monomorphemically in *Àgamémnòn*

☞ Chung's Generalization is surprising for monostratal OT with OO-correspondence.
The Monomorpheme Generalization is surprising for Cophonology Theory.

§8 Answering the challenge from the left: **a case-study of the English stem level (part 2)**

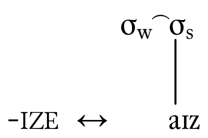
☞ The representational approach to stem-level nonuniformity (§4) explains both major patterns and subtle facts which Cophonology Theory merely stipulates.

(i) **Pervasive weight effects**

The …σ̄́X ~ …σ́σ̆X pattern is common to affixes of the *-al*, *-oid*, and *-able* types, because, in all its domains, the stem-level phonology requires that $\Sigma^{\mathrm{min}} = (\mu\mu)$

(ii) ***-ize:* not so peculiar after all** (cf. Raffelsiefen 2004)

-ize is underlyingly specified as immediately preceded by an unstressed syllable:



This predicts

- metrical idiosyncrasy: strong retraction with bound roots *récogn-ìze, frátern-ìze*
  ineffability with end-stressed stems **Búsh-ìze*, **corrúpt-ìze*
- segmental normalcy: avoids C_iVC_i through root selection like other root-attaching suffixes

e.g. *optimum ~ optim-ize* like *optim-al, optim-ific, optim-ism, optim-ist*, etc.
phenomenon ~ phenomen-ize like *phenomen-al, phenomen-ic, phenomen-ology*, etc.

DEALING WITH AFFIXAL NONUNIFORMITY

The division of labour between representation, computation, and storage

§9 An abstract example of affixal nonuniformity:

	in isolation	with suffix 1	with suffix 2	
stem 1	[...A]	[...A-X...]	[...A-X...]	
stem 2	[...B]	[...B-X...]	$\boxed{\text{[...C-X...]}}$	☜ !!

§10 A representational solution:

lexicon
$$\begin{cases} \text{suffix 1} \leftrightarrow /X.../ \\ \text{suffix 2} \leftrightarrow /^{[+C]}X.../ \end{cases}$$
where $^{[+C]}$ is an accredited phonological object

grammar $B \rightarrow C \;/\; \_\_\,^{[+C]}$

(e.g. Bermúdez-Otero 2012; Scheer 2016; Trommer 2019, 2021, 2024; Zimmermann 2019; *inter multos alios*)

§11 A computational solution:

lexicon
$$\begin{cases} \text{suffix 1} \leftrightarrow /...X/_{\mathscr{P}} \\ \text{suffix 2} \leftrightarrow /...X/_{\mathfrak{Q}} \end{cases}$$
where $_{\mathscr{P}}$ and $_{\mathfrak{Q}}$ are cophonology diacritics

grammar
cophonology $\mathscr{P}$: $B \rightarrow B \;/\; \_\_\,X$
cophonology $\mathfrak{Q}$: $B \rightarrow C \;/\; \_\_\,X$

(e.g. Pater 2009; Inkelas 1998, 2012; Sande & Jenks 2018; *inter multos alios*)

§12 A storage solution:

lexicon
$$\begin{cases} \text{stem 1} \leftrightarrow /...A/ \\ \text{stem 2} \leftrightarrow \{/...B/\,,/...C/\} \end{cases}$$

grammar
$$\begin{cases} \quad B \rightarrow B \;/\; \_\_\,X & \text{in the phonology} \\ \text{but} \quad CX \succ BX & \text{in the morphology or the phonology} \end{cases}$$

(e.g. Mascaró 2007; Bermúdez-Otero 2013, 2022; *inter multos alios*)

§13 A classical division-of-labour problem:

- All three solutions are needed; none can be dispensed with.
- The hard task is to decide which solution should be applied where.

The agenda for today

§14
- I set aside the role of storage by focusing on productive nonuniform patterns that are not circumscribed to a narrow set of stems.
- For the remaining instances, the question boils down to trade-offs between representational and computational solutions.

§15 The Stratal Phonology approach (a reminder):
- interstratal computational nonuniformity (§3i)
- intrastratal computational uniformity (§3ii)
- productive intrastratal nonuniformity is representational (§4)

DIACHRONY MODERATES INTERSTRATAL COMPUTATIONAL NONUNIFORMITY

The challenge from the right (§5i)

§16 *Wolf's Nightmare* (Wolf 2012: 6; see McCarthy 2007: 42ff)

UR		/pitekapu/
𝔖𝔏	trochees, unstressed vowels reduce	(ˈpi.tə)(ˌka.pə)
𝔚𝔏	iambs, segmental faithfulness	(pi.ˈtə)(ka.ˈpə)

☠ Complete subversion of markedness: reduction to schwa in stressed syllables.

⇨ The right's prescription:
- Metrical incoherence across strata must be forbidden.
- This is best done by having no strata at all.

Response 1: metrical incoherence exists (Benz 2018, Kaplan 2024)

§17 Southern Pomo: the pattern (Kaplan 2024)

- Vowel syncope in word-medial odd-numbered input syllables (syllable phonotactics permitting)

  1 2 ③ 4 ⑤ 6
  /ha(ː).ʧa.**t̪a**.lo.**ko**.ʧʼa/
  haː. ʧat̪. lok. ʧʼa

- Stress on every second output syllable counting from the right

  ④ 3 ② 1
  haː. ʧat̪. lok. ʧʼa
  [hàː. ʧat̪. lók. ʧʼa

- Vowels delete that would have been stressed if not syncopated: cf. *[hàː.ʧa.**t̪à**.lo.**kó**.ʧʼa]

  ‘they’re flying out’

§18 Southern Pomo: the analysis (adapted from Kaplan 2024)

UR		/ha(ː).ʧa.**t̪a**.lo.**ko**.ʧʼa/
𝒲ℒ	iambs left-to-right, syncope in word-medial σ_{w}	(haː.ʧá)(**t̪**∅.ló)(**k**∅.ʧʼá)
𝒫ℒ	trochees right-to-left	(hàː.ʧat̪) (lók.ʧʼa)

Corroboration:

- syncope is blind to the phrasal environment;
- surface stress is sensitive to the phrasal environment, including phrasal clitics.

§19 But metrical incoherence is short-lived because hard to learn:

see Kaplan (2024: §5) on Southern Pomo,
Bowers (2019) on Nishnaabemwin.

Response 2: the life cycle of phonological processes moderates interstratal nonuniformity

§20 Domain narrowing in the history of English /ŋg/-coalescence

(Garrett & Blevins 2009: 527-528; Bermúdez-Otero 2011: §3,
2015: 383-6;Bermúdez-Otero & Trousdale 2012: §2.3)

- The process as a rule: g → ∅ / ŋ__ $_{\sigma}$]
- First active at the phrase level (𝒫ℒ), then at the word level (𝒲ℒ), then at the stem level (𝒮ℒ).
- At each diachronic step: *ŋg$_{\sigma}$] » MAX enters the higher level, mapping ŋg$_{\sigma}$] to ŋ$_{\sigma}$]
  DEP » *[$_{\sigma}$ŋ enters the lower level, licensing [$_{\sigma}$ŋV

	e-long-ate	*long-ish*	*prolong it*	*long* ‖	*ŋg$_{\sigma}$] » MAX	DEP » *[$_{\sigma}$ŋ
Early Modern	Vŋ.gV	Vŋ.gV	Vŋ.gV	Vŋg		
Elphinston 1	Vŋ.gV	Vŋ.gV	Vŋ.gV	**Vŋ**	𝒫ℒ	
Elphinston 2	Vŋ.gV	Vŋ.gV	**V.ŋV**	**Vŋ**	𝒫ℒ, 𝒲ℒ	𝒫ℒ
Present day	Vŋ.gV	**V.ŋV**	**V.ŋV**	**Vŋ**	𝒫ℒ, 𝒲ℒ, 𝒮ℒ	𝒫ℒ, 𝒲ℒ

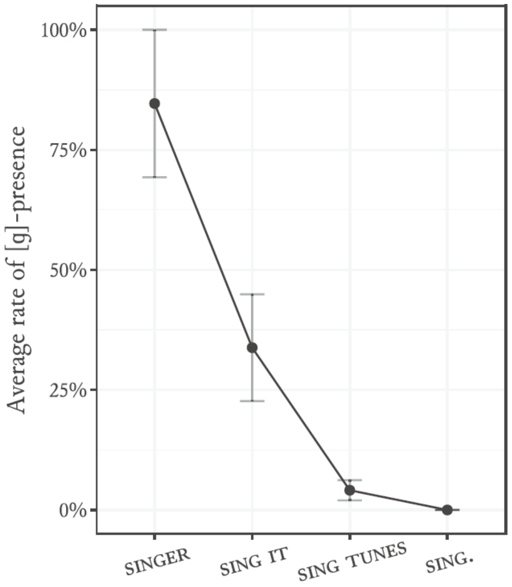
interstratal uniformity restored!

§21 Q. But isn't the ranking *ŋg$_{\sigma}$] » MAX vacuous at all but the highest stratum where it holds?

A. No! At least not while the change is ongoing.

- While /ŋg/-coalescence remains variable, it applies with a certain *p* in each stratum.
- *p* is larger in lower strata, where the process has been active longer (Turton 2016).
- Rates of [g]-presence drop with the number of cycles in which /g/ is in the coda (Guy 1991).

Data from North West England (Bailey 2021):	stem-level *p*	0.18
	word-level *p*	0.30
	phrase-level *p*	0.82



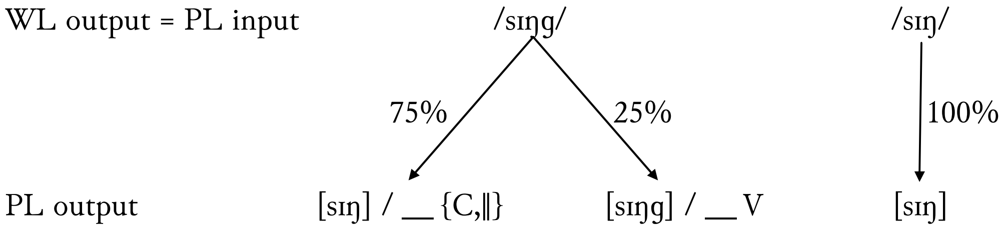
Bailey (2021: Figure 8, p. 483). Rates of [ɡ]-presence by environment for conservative speakers. More innovative speakers exhibit higher rates of [ɡ]-presence in *sing*‖ owing to a newly emergent process of prepausal [ɡ]-insertion.

§22 Domain narrowing is driven by a WYSIWYG-style bias towards the identity map:

Stage 1: input restructuring (Bermúdez-Otero 2003: §4.3-§4.4, 2006: 501-504)

Learners need evidence to derive surface [sɪŋ] from word-level /sɪŋɡ/;
when the evidence is not robust, they default to word-level /sɪŋ/.

(a) Elphinston 1 (b) Elphinston 2



Stage 2: phonotactic innovation

When a learner has posited word-level /sɪŋ/, she will resist abandoning the identity map by inserting [ɡ] before a following vowel, even though her data do not contain [ŋV] sequences.

(At this second stage, the bias towards the identity map produces a bias against alternation without the need for OO-correspondence constraints; cf. McCarthy 1998; Hayes 2004; Tessier 2006, 2016; Do 2013, 2018.)

§23 We understand some of the factors affecting the probability of domain narrowing (Lignos 2012):

for coda-targeting processes, these include the rate of resyllabification into the onset at each level, which is in turn affected by

- the availability of vowel-initial suffixes at the word level,
- phrasal prosody at the phrase level.

This explains why, historically, word-level coda-targeting processes have been more resistant to domain narrowing in Continental West Germanic than in English (Bermúdez-Otero 2015: 385-6).

A new challenge to the left

§24 Stratal Phonology answers the challenge from the right and dispels Wolf's Nightmare by means of the doctrine of the life cycle, which

- is well-articulated theoretically,
- is well-supported empirically,
- and even makes detailed quantitative predictions (§21).

But the doctrine of the life cycle crucially relies upon the serial relationship between strata.

Therefore,

- the life cycle doctrine is unavailable to monostratal OT with constraint indexation, which must recapture its corroborated empirical content by alternative means;
- the life cycle doctrine is only of partial service to Cophonologies by Phase, since it moderates computational disparity across successive cycles but says nothing about parallel cophonologies for domains of equal size.

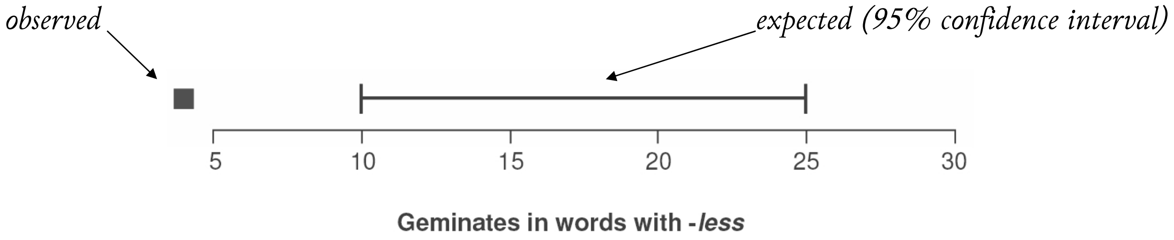
☞ It is incumbent upon theories of the left to specify the diachronic mechanisms that supposedly moderate computational nonuniformity across parallel cophonologies.

Response 3: the Martin Effect (Martin 2007, 2011)

§25 In the life cycle, domain narrowing causes patterns to move upwards, from lower to higher strata.

But there is also a small probabilistic effect of downward leakage: the Martin Effect

e.g. English lower-than-expected frequency of derived geminates (e.g. /l.l/ in *soul-less*)
because the language has no phonemic geminates



Martin (2007: diagram (54), p. 105). Geminates are underrepresented in *-less* suffixed words.

§26 I believe that the Martin Effect will emerge without stipulation in any stochastic version of Stratal Phonology, such as Stratal MaxEnt (e.g. Nazarov & Pater 2017).

E.g.
- Let [A-X] and [B-Y] arise with equal frequency by word-level affixation.
- Let [AX] be permitted, and [BY] forbidden, in the output of the stem level.
- Then, word-level frequency of [AX] > word-level frequency of [BY].
- Then, a frequency-sensitive learner will learn that [AX] ≻ [BY] at the word level.

Computational simulations should be able to establish whether or not this reasoning is correct.

A DEFENCE OF INTRASTRATAL COMPUTATIONAL UNIFORMITY

The challenge from the left

§27 Intrastratal computational uniformity is too restrictive. (e.g. Inkelas 2012: 155-6, Sande 2019)

Parade example: English stem-level suffixation

> "there is clear evidence that every (cohering) affix in English is associated with a distinct ranking of universal constraints" (Raffelsiefen 2004: 140).

Prima facie evidence in §4.

Response 1: same range of metrical possibilities across morphologically heterogeneous items

§28 Three types of stem-level construction: (§7)

monomorphemic stem	one cycle	⟦$_{\text{SL}}$ *albatross*⟧	*álbatròss*	no suffix
root + SL affix		⟦$_{\text{SL}}$ *homin-oid*⟧	*hómin-òid*	suffix
stem + SL affix	two cycles	⟦$_{\text{SL}}$ ⟦$_{\text{SL}}$ *pyramid*⟧ *oid*⟧	*pyrámid-òid*	

- All subject to the same phonology (in OT, the same constraint ranking);

therefore,
- all capable of the same phonotactic range (including metrical structure).

§29 *Chung's Generalization*

Whatever may arise in a two-cycle stem-level derivation e.g. *pyrámid-òid*
is permitted in a one-cycle stem-level item, e.g. *álbatròss, hómin-òid*
and vice versa.

(Bermúdez-Otero 2012: 31, after Chung 1983: 63. See also Bermúdez-Otero and McMahon 2006: 400; Kiparsky 2007; Collie 2007: 252ff, 2008; Bermúdez-Otero 2013).

§30 The logic spelled out optimality-theoretically: (Bermúdez-Otero & McMahon 2006: 400)

(i) Cyclic preservation of the 2$^{\text{nd}}$-syllable stress of *oríginal* in *orìginál-ity* cf. *àbracadábra*
requires FAITH » ALIGN.

[$_\omega$ *o.**rí**.gi.nal*]+/*ity*/	FAITH	ALIGN
[$_\omega$ ***ò**.ri.gi.ná.li.ty*]	*!	
[$_\omega$ *o.**rì**.gi.ná.li.ty*] ☜		*

(ii) But, by Richness of the Base,
FAITH » ALIGN licenses σ̆σ̆̀σ̆σ́... in one-cycle items like *apòthe-ósis* and *Epàminóndas*.

/*a**pò**theosis*/	FAITH	ALIGN
[$_\omega$ ***à**.po.the.ó.sis*]	*!	
[$_\omega$ *a.**pò**.the.ó.sis*] ☜		*

§31 A few more metrical examples: (much longer list in Sanz Álvarez 2017)

(i)	σ̄̀σ̄σ́(...)	derived in two cycles	*cómp*[ə]*nsàte* → *còmp*[ə]*nsátion*	
		derived in one cycle	*cònst*[ə]*rn-átion*, *Gòrg*[ə]*nzóla*	
vs	σ̄̀σ̄̀σ́(...)	derived in two cycles	*condénse* → *cònd*[ɛ̀]*nsátion*	
		derived in one cycle	*òst*[ɛ̀]*nt-átion*, *chìmp*[æ̀]*nzée*	

(Kiparsky 2007: 26-27, Bermúdez-Otero 2012: 35)

(ii)	σ̄́σ̄̀	derived in two cycles	*tòrmént*$_{\text{V}}$ → *tórm*[ɛ̀]*nt*$_{\text{N}}$	cf. *cýpr*[ə]*ss*
		derived in one cycle	*cónt-òid*, *wís*[ɛ̀]*nt*	

(Bermúdez-Otero 2012: 74)

(iii)	σ́σ̆σ̆σ̀(...)	derived in two cycles	*régulàte* → *régulat-òry* (Am.) cf. *infláme* → *inflám-atòry*	
		derived in one cycle	*véterin-àry* (Am.), *cátamaràn*	cf. [sə.ˈskæ.ʧə.ˌwɒn]

(Sanz Álvarez 2017)

§32 A problem for theories combining cophonologies with OO-correspondence (e.g. Raffelsiefen 2004):

such theories predict that what is licensing by high-ranking OO-correspondence
may not be licensed by high-ranking IO-faithfulness.

§33 *The Monomorpheme Generalization* (Bermúdez-Otero 2017, 2018b)

Whatever may arise through faithfulness to the specifications of an affix e.g. *hómin-òid*
may arise through faithfulness to the specifications of a monomorphemic stem, e.g. *álbatròss*
and vice versa.

§34 We have already seen a great deal of evidence for this: (§30-§31)

(i)	σ̆σ̆̀σ̆σ́(...)	in suffixed forms	*apòthe-ósis*, *imàgin-átion* (← *imágine*)	
		in monomorphemes	*Epàminóndas*	cf. *àbracadábra*
(ii)	σ̄̀σ̄σ́(...)	in suffixed forms	*cònst*[ə]*rn-átion*, *còmp*[ə]*nsátion* (← *cómp*[ə]*nsàte*)	
		in monomorphemes	*Gòrg*[ə]*nzóla*	
vs	σ̄̀σ̄̀σ́(...)	in suffixed forms	*òst*[ɛ̀]*nt-átion*, *cònd*[ɛ̀]*nsátion* (← *condénse*)	
		in monomorphemes	*chìmp*[æ̀]*nzée*	
(iii)	σ̄́σ̄̀	in suffixed forms	*cónt-òid*, *tórm*[ɛ̀]*nt*-$\varnothing_{\mathrm{N}}$ (← *tòrmént*$_{\mathrm{V}}$)	
		in monomorphemes	*wís*[ɛ̀]*nt*	cf. *cýpr*[ə]*ss*
(iv)	σ́σ̆σ̆σ̀(...)	in suffixed forms	*véterin-àry* (Am.), *régulat-òry* (← *régulàte*, Am.)	
		in monomorphemes	*cátamaràn*	cf. [sə.ˈskæ.ʧə.ˌwɒn]

§35 A problem for *all* theories countenancing parallel cophonologies:

such theories predict that phonotactic options may be sequestered in affix-specific cophonologies and so not available elsewhere in the language.

§36 *Three apparent counterexamples to Chung's and/or the Monomorpheme Generalization*

(i)	(...)σ́σ̆σσ	by suffixation	*indómĭt-able*, *pársim*[ə]*n-y* (RP),
		in monomorphemes?	very few examples: *párticiple* for some RP speakers

(cf. Hammond 1999: 271-2)

(ii)	σσ̄̀σ́(...)	derived in two cycles	*depárment* → *d*[ɪ]*pàrméntal* (more often *d*[ìː]*pàrméntal*)
		derived in one cycle?	apparently never

(Dabouis 2017)

(iii)	σ́σ̆σ̆σ̆σ̆	derived in two cycles	*régulàte* → [ˈrɛgjələtərɪ] (ultra-conservative RP)
		derived in one cycle?	apparently never

§37 Q. How problematic is this counterevidence?

A. Not very. All three patterns are rare or obsolescent anyway.

(i) *-able*$_{\mathrm{SL}}$ is losing its weak-retraction behaviour:

e.g. *fórmid-able* > *formíd-able*, *déspic-able* > *despíc-able* (Wells 2008: s.v.)

(ii) most stem-level cyclic derivations (≈81%) have clash resolution; *adóre* → *àdor-átion*

in the remaining cases, clash resolution occurs variably. *d*[ɪ]*pàrméntal* ~ *d*[ìː]*pàrméntal*

(Dabouis 2017)

(iii) [ˈrɛgjələtərɪ] is dying out; the majority RP option today is [ˌrɛgjəˈleɪtəɹɪ]. (Wells 2008: s.v.)

§38 So we don't need a grammar that allows (…)σ́σ̆σσ by suffixation, but not in monomorphemes,
or σ́σ̆σ̆σ̆σ̆ cyclically, but not in one-cycle forms.

Rather, it is best to have a grammar that designates these options as supermarked everywhere;

then, learning theory independently predicts that listed exceptions are vulnerable to lexically gradual diachronic loss according to this scale:

monomorphemes > one-cycle affixed forms > two-cycle affixed forms

Response 2: predictions of a representational approach to English stem-level nonuniformity

§39 *Pervasive weight effects*

A second look at metrical nonuniformity among English stem-level affixes: (§4)

		…σ̆+suffix	…σ̄+suffix	
(i)	*-ic*	ˌæn.ˈθɹɒ.pɪ<k>	ˌdaɪ.ˈdæk.tɪ<k>	final consonant extrametricality
(ii)	*-al*	ˈnɒ.mɪ.<nl̩>	ɪ.ˈtɜː.<nl̩>	final syllable extrametricality
(iii)	*-oid*	ˈhɒ.mə.<ˌnɔɪd>	ə.ˈɹæk.<ˌnɔɪd>	weak retraction before stressed suffix
(iv)	*-able*	ɪn.ˈdɒ.mɪ.<tə.bl̩>	ˌɪ.nɪ.ˈlʌk.<tə.bl̩>	weak retraction before unstressed suffix
(v)	*-ize*	ˈgæl.və.<ˌnaɪz>	ˈɹɛ.kəg.<ˌnaɪz>	strong retraction

§40 Behaviours (i) to (iv) all involve the following pattern:

…σ̄́X ~ …σ́σ̆X Ignore some string X at the right edge of the domain;
then, build a right-aligned bimoric trochee over the remainder.

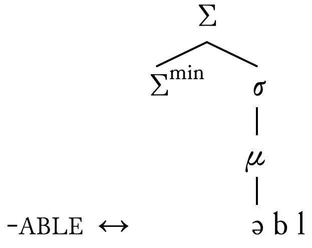
This is consistent with other evidence that, in English, Σ^{min} = (μμ) (Bermúdez-Otero 2018a)

e.g. default σ̆̀σ̆σ̆σ́… *àbracadábra, Wìnnepesáukee*
default σ̆σ̆̀σ̆σ́… *Anàximánder, Monòngahéla* (Dabouis, Fournier & Girard 2017)

§41 Analysis : metrical prespecification (Bermúdez-Otero 2018c: 116-117)

IDENT-σ⁀Σ°:
If a σ is sister to Σ^{min} in the input,
its output correspondent is sister to Σ^{min}.

And the regular phonology
controls the size of Σ^{min}.



-ize *isn't so peculiar after all* (cf. Raffelsiefen 2004)

§42 Strong retraction can be handled through metrical prespecification too: (§8ii)

$$\begin{array}{ccc} & & \sigma_w{}^\frown\sigma_s \\ & & \quad | \\ \text{-IZE} & \leftrightarrow & \text{aɪz} \end{array}$$

§43 What the representational analysis gets right:

- metrical idiosyncrasy: strong retraction with bound roots *récogn-ìze, frátern-ìze*
  ineffability with end-stressed stems **Búsh-ìze*, **corrúpt-ìze*
- segmental normalcy: avoids C_iVC_i through root selection like other root-attaching suffixes
  e.g. *optimum ~ optim-ize* like *optim-al, optim-ific, optim-ism, optim-ist*, etc.
  phenomenon ~ phenomen-ize like *phenomen-al, phenomen-ic, phenomen-ology*, etc.

§44 Comparison with Raffelsiefen (2004):

- metrical behaviour handled through the ranking of CLASH in an affix-specific cophonology;
- segmental behaviour handled through the ranking of SHELL in an affix-specific cophonology.

The cophonology analysis fails to distinguish what is idiosyncratic and what is regular about *-ize*; the representational solution in §42, in contrast, predicts this distinction.

CONCLUSION

§45 (i) Representational, computational, and storage solutions for nonuniformity are all needed. The hard task is to decide which solution should be applied where.

(ii) Stratal Phonology provides clear guidance on how to draw the division of labour:

- interstratal computational nonuniformity
- intrastratal computational uniformity
- productive intrastratal nonuniformity is representational

(iii) Stratal Phonology has a full theory of how diachrony moderates interstratal nonuniformity.

Nothing comparable exists, at present, for parallel cophonologies.

(iv) Stratal Phonology's representational approach to English stem-level nonuniformity makes several correct predictions:

- Chung's Generalization
- the Monomorpheme Generalization

- pervasive weight effects
- the metrical idiosyncrasy but segmental normalcy of *-ize*

These facts are either merely stipulated or not captured at all in theories with parallel cophonologies.

REFERENCES

Arndt-Lappe, Sabine & Javier Sanz. 2017. Stress variation in English complex adjectives: markedness, faithfulness and frequency. Paper presented at the 25th Manchester Phonology Meeting, Manchester, 25 May 2017.

Bailey, George. 2021. Insertion and deletion in Northern English (ng): interacting innovations in the life cycle of phonological processes. *Journal of Linguistics* 57 (3), 465-497.

Benz, Johanna. 2018. Metrical incoherence: different metrical structure at different strata. Paper presented at the 26th Manchester Phonology Meeting (26mfm), Manchester, 24 May 2018. https://www.johannabenz.com/uploads/1/2/1/3/121373044/mfm18.pdf.

Bermúdez-Otero, Ricardo. 2003. The acquisition of phonological opacity. In Jennifer Spenader, Anders Eriksson & Östen Dahl (eds.), *Variation within Optimality Theory: Proceedings of the Stockholm Workshop on 'Variation within Optimality Theory'*, 25-36. Stockholm: Department of Linguistics, Stockholm University.

Bermúdez-Otero, Ricardo. 2006. Phonological change in Optimality Theory. In Keith Brown (ed.), *Encyclopedia of language and linguistics*, 2 edn, vol. 9, 497-505. Oxford: Elsevier.

Bermúdez-Otero, Ricardo. 2010. Stratal Optimality Theory: an overview. http://www.bermudez-otero.com/Stratal_Optimality_Theory.htm.

Bermúdez-Otero, Ricardo. 2011. Cyclicity. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell companion to phonology*, vol. 4: *Phonological interfaces*, 2019-2048. Malden, MA: Wiley-Blackwell.

Bermúdez-Otero, Ricardo. 2012. The architecture of grammar and the division of labour in exponence. In Jochen Trommer (ed.), *The morphology and phonology of exponence* (Oxford Studies in Theoretical Linguistics 41), 8-83. Oxford: Oxford University Press.

Bermúdez-Otero, Ricardo. 2013. The stem-level syndrome. Paper presented at the Speaker Series of the University of Pennsylvania Linguistics Department, Philadelphia, 11 April 2013. Handout available at http://www.bermudez-otero.com/stemlevel.pdf.

Bermúdez-Otero, Ricardo. 2015. Amphichronic explanation and the life cycle of phonological processes. In Patrick Honeybone & Joseph C. Salmons (eds.), *The Oxford handbook of historical phonology*, 374-399. Oxford: Oxford University Press.

Bermúdez-Otero, Ricardo. 2017. Two letters to Ingo Plag. Ms, University of Manchester.

Bermúdez-Otero, Ricardo. 2018a. Diagnostics of the moraic trochee from Proto-Germanic to present-day English. Paper presented at Workshop on the Foot in the Phonological History of English, 20th International Conference on English Historical Linguistics (ICEHL XX), Edinburgh. http://www.bermudez-otero.com/20icehl.pdf.

Bermúdez-Otero, Ricardo. 2018b. Nonuniformity in cyclic phonological frameworks: strata vs cophonologies. Paper presented at the Micro-Workshop on Cyclic Optimization, Leipzig, 18 May 2018.

Bermúdez-Otero, Ricardo. 2018c. Stratal Phonology. In S.J. Hannahs & Anna R. K. Bosch (eds.), *The Routledge handbook of phonological theory*, 100-134. Abingdon: Routledge.

Bermúdez-Otero, Ricardo. 2022. Lexically restricted phonological alternation: the case for via-rules. Paper presented at 20th International Morphology Meeting, Budapest, 1 September 2022. http://www.bermudez-otero.com/Budapest.pdf.

Bermúdez-Otero, Ricardo & April McMahon. 2006. English phonology and morphology. In Bas Aarts & April McMahon (eds.), *The handbook of English linguistics*, 382-410. Oxford: Blackwell.

Bermúdez-Otero, Ricardo & Graeme Trousdale. 2012. Cycles and continua: On unidirectionality and gradualness in language change. In Terttu Nevalainen & Elizabeth Closs Traugott (eds.), *The Oxford handbook of the history of English*, 691-720. New York: Oxford University Press.

Bowers, Dustin. 2019. The Nishnaabemwin restructuring controversy: new empirical evidence. *Phonology* 36 (2), 187-224.

Chung, Sandra. 1983. Transderivational constraints in Chamorro phonology. *Language* 59 (1), 35-66.

Collie, Sarah. 2007. *English stress-preservation and Stratal Optimality Theory*. Edinburgh: PhD thesis, University of Edinburgh. Available as ROA-965-0408, Rutgers Optimality Archive, http://roa.rutgers.edu.

Collie, Sarah. 2008. English stress preservation: the case for "fake cyclicity". *English Language and Linguistics* 12 (3), 505-532.

Dabouis, Quentin. 2017. When accent preservation leads to clash. *English Language and Linguistics* 23 (2), 363-404.

Dabouis, Quentin, Jean-Michel Fournier & Isabelle Girard. 2017. Ternarity is not an issue: secondary stress is left edge marking. Paper presented at the 25mfm fringe meeting - PTA workshop 'Ternarity in English', Manchester, 24 May 2017.

Do, Young Ah. 2013. *Biased learning of phonological alternations*. Doctoral thesis, MIT.

Do, Young Ah. 2018. Paradigm uniformity bias in the learning of Korean verbal inflections. *Phonology* 35 (4), 547-575.

Garrett, Andrew & Juliette Blevins. 2009. Analogical morphophonology. In Kristin Hanson & Sharon Inkelas (eds.), *The nature of the word: essays in honor of Paul Kiparsky*, 527-545. Cambridge, MA: The MIT Press.

Guy, Gregory R. 1991. Explanation in variable phonology: an exponential model of morphological constraints. *Language Variation and Change* 3 (1), 1-22.

Hammond, Michael. 1999. *The phonology of English: a prosodic optimality-theoretic approach* (The Phonology of the World's Languages). Oxford: Oxford University Press.

Hayes, Bruce. 2004. Phonological acquisition in Optimality Theory: the early stages. In René Kager, Joe Pater & Wim Zonneveld (eds.), *Constraints in phonological acquisition*, 158-203. Cambridge: Cambridge University Press.

Inkelas, Sharon. 1998. The theoretical status of morphologically conditioned phonology: a case study of dominance effects. In Geert Booij & Jaap van Merle (eds.), *Yearbook of Morphology 1997*, 121-155. Dordrecht: Kluwer.

Inkelas, Sharon. 2012. The morphology-phonology connection. In Sarah Berson et al. (eds.), *Proceedings of the Thirty-Fourth Annual Meeting of the Berkeley Linguistics Society*, 145-162. Berkeley, CA: Berkeley Linguistics Society.

Kager, René. 1989. *A metrical theory of stress and destressing in English and Dutch*. Dordrecht: Foris.

Kaplan, Max J. 2024. Stratal overgeneration is necessary: metrically incoherent syncope in Southern Pomo. *Phonology*. http://dx.doi.org/10.1017/S0952675723000234.

Kiparsky, Paul. 1982a. From Cyclic Phonology to Lexical Phonology. In Harry van der Hulst & Norval Smith (eds.), *The structure of phonological representations*, vol. 1, 131-175. Dordrecht: Foris.

Kiparsky, Paul. 1982b. Lexical Morphology and Phonology. In In-Seok Yang for the Linguistic Society of Korea (ed.), *Linguistics in the morning calm: selected papers from SICOL-1981*, vol. 1, 3-91. Seoul: Hanshin Publishing Company.

Kiparsky, Paul. 2000. Opacity and cyclicity. *The Linguistic Review* 17 (2-4), 351-365.

Kiparsky, Paul. 2007. Description and explanation: English revisited. Paper presented at the 81st Annual Meeting of the Linguistic Society of America, Anaheim, 5 January 2007. Slides available at http://www.stanford.edu/~kiparsky/Papers/lsa2007.1.pdf.

Kiparsky, Paul. 2015. Stratal OT: a synopsis and FAQs. In Yuchau E. Hsiao & Lian-Hee Wee (eds.), *Capturing phonological shades within and across languages*, 2-44. Newcastle upon Tyne: Cambridge Scholars Publishing.

Lignos, Constantine. 2012. Productivity in analogical change. Paper presented at the Manchester and Salford New Researchers Forum in Linguistics, Manchester, 3 November 2012. Slides available at https://lignos.org/talks/MancSalFiL_Postnasal_Deletion_Lignos_web.pdf.

Martin, Andrew. 2007. *The evolving lexicon*. Los Angeles: Doctoral dissertation, University of California.

Martin, Andrew. 2011. Grammars leak: modeling how phonotactic generalizations interact within the grammar. *Language* 87 (4), 751-770.

Mascaró, Joan. 2007. External allomorphy and lexical representation. *Linguistic Inquiry* 38 (4), 715-735.

McCarthy, John J. 1998. Morpheme structure constraints and paradigm occultation. In M. Catherine Gruber, Derrick Higgins, Kenneth Olson & Tamra Wysocki (eds.), *CLS 32, Part 2: The Panels*, 123-150. Chicago, IL: Chicago Linguistic Society.

McCarthy, John J. 2007. *Hidden generalizations: phonological opacity in Optimality Theory*. London: Equinox Publishing.

Nazarov, Aleksei & Joe Pater. 2017. Learning opacity in Stratal Maximum Entropy Grammar. *Phonology* 34 (2), 299-324.

Pater, Joe. 2000. Nonuniformity in English secondary stress: the role of ranked and lexically specific constraints. *Phonology* 17, 237-274.

Pater, Joe. 2009. Morpheme-specific phonology: constraint indexation and inconsistency resolution. In Steve Parker (ed.), *Phonological argumentation: essays on evidence and motivation* (Advances in Optimality Theory), 123-154. London: Equinox Publishing.

Raffelsiefen, Renate. 2004. Absolute ill-formedness and other morphophonological effects. *Phonology* 21 (1), 91-142.

Sande, Hannah. 2019. A unified account of conditioned phonological alternations: evidence from Guébie. *Language* 95 (3), 456-497.

Sande, Hannah & Peter Jenks. 2018. Cophonologies by phase. *NELS: Proceedings of the Annual Neeting of the North East Linguistic Society* 48, 39-52.

Sanz Álvarez, Javier. 2017. Chung's Generalization predicts long retraction in English non-derived words. Paper presented at GDRI PTA Dataset Workshop on 'Ternarity in English', mfm25 Fringe Meeting, Manchester, 24 May 2017.

Scheer, Tobias. 2016. Melody-free syntax and phonologically conditioned allomorphy. *Morphology* 26 (3), 341-378.

Tessier, Anne-Michelle. 2006. *Biases and stages in phonological acquisition*. Amherst, MA: Doctoral dissertation, University of Massachusetts. Available as ROA-883-1106, Rutgers Optimality Archive, http://roa.rutgers.edu.

Tessier, Anne-Michelle. 2016. *Phonological acquisition: child language and constraint-based grammar*. London: Palgrave.

Trommer, Jochen. 2019. Rich representations: a tonal view on lexical exceptionality. Paper presented at the 27th Manchester Phonology Meeting, Manchester, 24 May 2019.

Trommer, Jochen. 2021. The subsegmental structure of German plural allomorphy. *Natural Language & Linguistic Theory* 39, 601-656.

Trommer, Jochen. 2024. The stratal structure of Kuria morphological tone. *Phonology*. https://doi.org/10.1017/S0952675723000180.

Turton, Danielle. 2016. Synchronic stratum-specific rates of application reflect diachronic change: morphosyntactic conditioning of variation in English /l/-darkening. *Papers in Historical Phonology* 1, 130-165.

Wells, J. C. 2008. *Longman pronunciation dictionary*, 3rd edn. Harlow: Longman.

Wolf, Matthew. 2012. Inversion of stress-conditioned phonology in Stratal OT. Ms, Yale University. https://ling.auf.net/lingbuzz/001547.

Zamma, Hideki. 2013. *Patterns and categories in English suffixation and stress placement: a theoretical and quantitative study*. Tokyo: Kaitakusha.

Zimmermann, Eva. 2019. Gradient symbolic representations and the typology of ghost segments. In Katherine Hout et al. (eds.), *Proceedings of the Annual Meeting on Phonology 2018*. Washington, DC: Linguistic Society of America.