Morphological Segment-Zero Alternations in Lardil without Strata or Opacity

Summary

Lardil presents a relatively well known case of subtractive morphology (Hale 1973). This is a counterfeeding relation where the Nominative (NOM) and Vocative (VOC) are marked by final vowel-deletion but the output forms also end in vowels. Moreover, this vowel-deletion transparently feeds a consonant-deletion process. This interaction has been named *Fed Counterfeeding* (Kavitskaya & Staroverov 2010).

The data is taken to be extremely problematic for non-stratal frameworks of Optimality Theory (Staroverov 2015), as the outputs of the consonant deletion rule that is active in the formation of the NOM and VOC produces the structural description that triggers the application of the vowel deletion rule, except that it counterfeeds it.

In this paper, I will show that the problematicity of the data comes entirely as an artefact of the OT world-view. The key problem is that OT cannot impose restrictions on inputs, unlike Strict CV, where each phonological exponent of the vocabulary item of a morpheme can be stored with a distinct phonological shape (a.k.a. a 'morpheme structure constraint'). The challenges of the analysis described in previous OT analyses, such as the opacity and the *prima facie* prediction that /muɾkunima/ 'nulla-nulla' should surface as **[muɾkun], are simply not mispredicted in the first place in this reanalysis. Therefore, there is no need to introduce any theoretical machinery to avoid such outcomes.

The Strict CV reanalysis is derivational and productive but does not require (a) strata or (b) procedural opacity. It is, unlike most other analyses (Staroverov 2015 excepted), purely phonological in nature. It is an analysis fully in keeping with a modular, item-and-arrangement morpho-phonological component.

In this analysis, *Fed Counterfeeding* has no operational significance because the morphological operations that lead to segment-zero alternations are not actually fed by the avoidance of vowel-final strings.

1 Introduction

One of the key dividing lines in our understanding of morphology comes down to what kinds of operational processes we witness in this domain.

The central division lies between *item-and-arrangement* and *item-and-process* (Hockett 1954).

These are competing theories of the mapping between morpho-syntactic objects and a phonological representation.

The former limits itself to the addition/concatenation of exponents: /kæt + z/ > [kæts] ‘cats’ (cf. Distributed Morphology Halle & Marantz (1993); Bonet 2008).

Conversely, the latter is supposed to emerge from items with certain morphological features that are manipulated into an outcome: /kæt(+N, +PL)/ > [kæts] ‘cats’ (Anderson 1992; Aronoff 1994).

Non-concatenative process are traditionally seen to support Item-and-process morphology: morphological patterns based on segmental changes (umlaut, voicing or tone polarity), lengthening, shortening and deletion (subtractive morphology).

However, there is a growing literature based on reanalyzing these non-concatenative patterns using only the tools of Item-and-arrangement morphology: Polarity (Trommer 2008); Umlaut (Lowenstamm 2012); Morphological length manipulation (Zimmermann 2017); Metathesis (Ulfsbjorninn 2019).

The subtractive morphology of Lardil is a prime example of non-concatenative, Item-and-process morphology. It is even referred to as: “*hard, unpleasant facts of phonological life*” (Goldsmith 1993:256).

Though there are (effectively) Item-and-arrangement analyses of this process, they are invariably stratal and opaque; especially from an OT perspective because it seems that a single layer of phonology is never able to optimize through both vowel deletion and consonant deletion (Staroverov 2015) (cf. (Wilkinson 1988; Lakoff 1993; Goldsmith 1993; Blevins 1997; Horwood 2001; Kurisu 2001; Bye 2006; McCarthy 2003, 2006; Prince & Smolensky 2004; Staroverov 2015)).

2 The Language

Lardil is a moribund language ancestrally used by the people of what has been called Mornington Island by the Government of Australia (Klokeid 1968).

(1) Inventory of Lardil

(a) Vowel inventory (long and short)

i(ː) u(ː)
e(ː)
a(ː)

(b) Consonant Inventory

	Bilabial	Lamino-Dental	Apical Alveolar	Apical Post-Alveolar	Laminal Palato-Alveolar	Dorsal
Stop	p	t̪	t	ʈ	c	k
Nasal	m	n̪	n	ɳ	ɲ	ŋ
Lateral			l	ɭ	ʎ	
Rhotic			ɾ			
Glide	w			ɻ	j	

Only apical consonants are systematically allowed word-finally.

Though there are some instances of Lamino Palato-Alveolar /c/ and /ɲ/, but these are item-specific: [kulkic] 'shark sp.NOM', [palaːɲ] 'fish sp.NOM'.

Stress in Lardil is word-initial and there is a robust bimoraic word-minimality condition; *CV and *CVC are unattested as surface forms, even when they could be predicted to be generated by productive morpho-phonological processes (Hale 1973).

2 The Pattern

2.1 Subtractive morphology

(2) Nominative case allomorphy

a. Vowel deletion (trisyllabic roots)

	UR	NOM	ACC	
i.	/jilijiⁱli/	[jilijiⁱl]	[jilijiⁱli-n]	'oyster sp.'
ii.	/majaɾa/	[majaɾ]	[majaɾa-n]	'rainbow'
iii.	/wiwala/	[wiwal]	[wiwala-n]	'bush mango'

b. Vowel lowering (disyllabic roots)

Root-final /a, u/	>	[a] (i-ii)	
Root-final lamino-alveolar + /i/	>	[a] (iii-iv)	
Elsewhere	>	[e] (v-vii)	

	UR	NOM	
i.	/paɳka/	[paɳk**a**]	‘stone’
ii.	/kaʈu/	[kaʈ**a**]	‘child’
iii.	/pulci/	[pulc**a**]	‘heart’
iv.	/paji/	[paj**a**]	‘anger’
v.	/keɳʈi/	[keɳʈ**e**]	‘wife’
vi.	/ŋiɳi/	[ŋiɳ**e**]	‘skin’
vii.	/papi/	[pap**e**]	‘paternal grandfather’

(3) Consonant deletion in Nominative

a. Final coda deletion

UR	NOM	ACC	
/t̪uɻarɑ**ŋ**/	[t̪uɻarɑ*(ŋ)]	[t̪uɻarɑ**ŋ**-in]	‘shark’

b. Vowel deletion feeding coda deletion

UR	NOM	ACC	
i. /ʈipiʈi**pi**/	[ʈipiʈi*(p)]	[ʈipiʈi**pi**-n]	‘rock cod’
ii. /kaɾwakaɾ**wa**/	[kaɾwakaɾ*(w)]	[kaɾwakaɾ**wa**-n]	‘wattle’
iii. / muɾkuni**ma**/	[muɾkuni*(m)]	[muɾkuni**ma**-n]	‘nulla-nulla’

c. Cluster simplification fed by vowel deletion

UR	NOM	ACC	
/waŋal**k**/	[waŋal*(k)]	[waŋal**k**-in]	‘boomerang’

d. Coda deletion fed by cluster simplification fed by vowel deletion

UR	NOM	ACC	
/muŋkumu**ŋku**/	[muŋkumu*(ŋ)*(k)]	[muŋkumu**ŋku**-n]	‘wooden axe’

Staroverov (2015) points out that the Vocative also undergoes the subtractive process, though it does not undergo vowel lowering (which is specifically an exponent of NOM).

3 Problem for OT

As Staroverov (2015:41) observes. It is difficult for a monostratal version of Optimality Theory to generate these facts.

The main difficulty is that the markedness constraint that drives final vowel deletion (Final-C (Gafos 1998; McCarthy & Prince 1993)) should penalize all vowel-final outputs. However, vowel-final forms produced from final consonant deletion are not penalized.

In a monostratal version of OT inputs such as: /muɾkuni**ma**/ 'nulla-nulla' should not stop being optimized as: [muɾkuni] because this form would still incur a violation of Final-C which the otherwise identical hypothetical form: ☹[muɾkuni].[1]

In fact, this should apply to every form from the end of the word to the first valid coda consonant: /muŋkumu**ŋku**/ 'wooden axe' ought not to be: [muŋkumu] but: *muŋku~~muŋku~~* ☹[muŋku] (*[muŋk] *[muŋ] *[mu] all

Moreover, in a monostratal OT model there does not seem to be a way to make this analysis apply only in the NOM and VOC without referencing, or indexing the constraints to the NOM suffix (Pater 2007), or some similar strategy.

This is also largely why the process is generally taken to be morphological and not phonological (Hale 1973; McCarthy & Prince 1993; Horwood 2001; Bye 2006; Round 2011; *pace* Staroverov 2015).

3.1 Stratal solution

Staroverov (2015:44-47) shows that serial models of OT such as OT-CC (McCarthy 2007), cannot derived the outputs because the processes of V and C deletion cannot both optimize relative to the same ranking (see also Kavitskaya & Staroverov 2010).

In Lardil, in standard Generative terms, consonant deletion is counterfeeding vowel deletion.

[1] Other ad-hoc solutions could be attempted such as ranking MAX-IO higher and count violations, but this

Counterfeeding opacity can be reanalyzed in terms of Stratal OT (Kiparsky 2000; Bermudez-Otero 2006; 2010).

Staroverov (2015) proposes one such analysis, which unlike most standard accounts of the Lardil phenomenon is 'phonological', except that he has to propose two different phonological grammars/constraint rankings, one at the 'lexical' level and the other at the 'post-lexical' level.

One approach is to assign NOM and VOC to the 'lexical' stratum and the other cases ACC, COM, DAT, GEN (which do not undergo any segment deletion) to the 'post-lexical' stratum.

The ranking for the lexical stratum penalizes "word" final vowels due to a high-ranked FINAL-C (see objection in 3.2 beneath), while the post-lexical stratum more heavily penalizes final consonants (and does not heavy penalize "word"-final vowels) due to its higher ranked CODA-COND.

(4) Key constraints

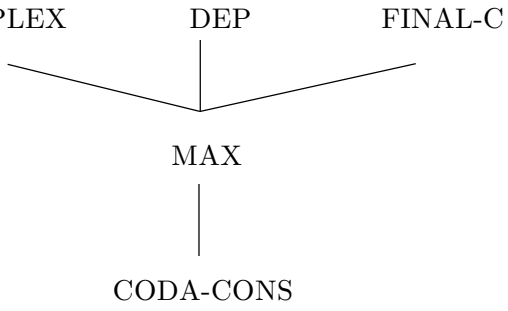
a. **FINAL-C**: Assign a violation mark for every Pr(w) which ends in a vowel.

b. ***COMPLEX**: Assign a violation mark for every complex coda in syllable margin.

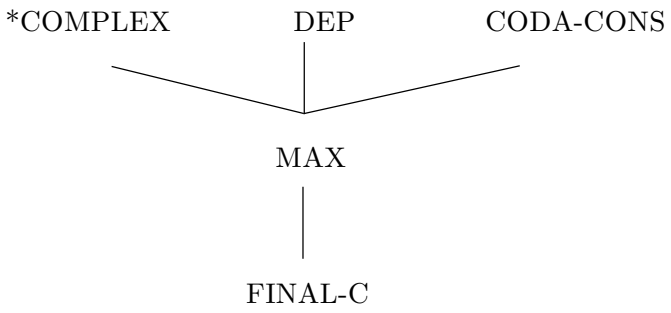
c. **CODA-COND**: Assign a violation mark for every coda consonant which is not apical and is not assimilated in place to the following onset consonant.

(5) Ranking for 'Lexical' and 'Post-lexical' Stratum

a. Lexical Stratum



b. Post-Lexical Stratum



3.2 Problems with the stratal account

The rather ambiguous choice of 'lexical' vs. 'post-lexical' strata mask a problem in the analysis.

Strata in Stratal OT ought to be 'sparse' and cross-linguistically constrained, for instance Bermudez-Otero's (2006:238): roots are not cyclic, some stems are sometimes cyclic, word-level and utterance-level strata are always/usually cyclic.

In Lardil, there seems to be no independent motivation for assigning NOM and VOC to the 'lexical' stratum and the other cases ACC, COM, DAT, INS, GEN to the 'post-lexical' stratum.

All the cases (NOM, VOC, ACC, COM, DAT, INS, GEN...) are part of the word constituent, which is generally anterior to post-lexical phonology.

There is no indication that the case affixes begin a new word-level stress domain, and the case suffixes are all too small to be minimal words of the language (a few examples are shown here: *yadaman-**nge*** horse-LOC/ *kela-**a*** beach-LOC, parnga-**r** 'stone-INS', *yadaman-**ngun*** 'horse-COM' (Klockeid 1968:60, 62)).

So, if the case affixes are not prosodic words on their own, it is not clear in what way they could be 'post-lexical'.[2]

Nevertheless, Staroverov (2015) uses constraints that are defined at the level of the word such as FINAL-C. Therefore, if all case suffixes are contained by the prosodic constituent (*w*), then the final vowel deletion rules ought also to apply at this domain. In OT terms, it would create a

[2] Unlike phase-based computational models (like Kaye 1995; Samuels 2010; Scheer 2012), Stratal OT does allow you to form the same word-constituent in two cycles. So there can be stratum 1 word-level phonology and stratum 2 word-level phonology that applies to the same prosodic word.

ranking paradox.

Even assuming that someone could redefine FINAL-C in order to allow the ranking to work (which to me seems actually non-trivial), the division into lexical and post-lexical appears arbitrary, if it is to include only NOM and VOC and not the other cases.

Since word-level affixation (which here includes all the cases) is not generally post-lexical, then in a constrained Stratal OT analysis it ought to apply to some specific prosodic constituent. Since it does not apply uniformly at the word level, one simply has to split word-level phonology into the NOM & VOC (why this pairing? cf. Caha for a case hierarchy (2009)).

It seems to me that arbitrary stratal analyses have no conceptual advantage over extrinsic rule ordering (see 6) in which coda deletion counterfeeds vowel deletion. What this account clearly lacks is an explanation for why it occurs only in NOM and VOC.

(6) Serial Rule Based Derivation with extrinsic ordering[3]

UR	/ʈipiʈipi/	/t̪uɻaraŋ/	/waŋalk/	/muŋkumuŋku/
V –> Ø / _#$^{NOM/VOC}$	ʈipiʈipi	...	...	muŋkumuŋku
Non-Apical deletion	ʈipiʈipi	t̪uɻaraŋ	waŋalk	muŋkumuŋk
Output	[ʈipiʈi] ‘rock cod’	[t̪uɻara] ‘shark’	[waŋal] ‘boomerang’	[muŋkumu] ‘wooden axe’

4 Strict CV Solution

(7) Shapes of exponents (Bendjaballah & Haiden 2008; Faust et al. 2018)

a. Fixed	b. Floating Melody	c. Empty Skeleton	d. Unfixed
C V | | α β	α	C V	C V α β

[3] Disyllabic nouns don’t undergo these rules due to their potential outputs violating word-minimality. Possibly all NOM also undergo a vowel insertion rule (which is bled by vowel-deletion in polysyllabic nouns). If this rules does apply to all nouns (as I strongly suspect) it would have to be ordered before final-vowel deletion.

4.2 Expressing Floating segments

(8) Floating vowels and segment-zero alternations

a. UR with a floating vowel

C1	V1	C2	V2
|	|	|	
x	y	z	t

b. Floating vowel not attached to skeleton (grey highlight for unparsed segment)

C1	V1	C2	V2	
|	|	|		
x	y	z	t	Phonetic interpretation: [xyz]

c. Floating vowel attached to skeleton (dashed line showing post-lexical association)

C1	V1	C2	V2	
|	|	|	⋮	
x	y	z	t	Phonetic interpretation: [xyz**t**]

(9) Silencing of empty positions

a. Domain-Final Parameter (DFP) (based on Kaye 1990)

Domain-final empty V slots are silenced (receive no phonetic interpretation)

C1	V1	C2	V2
|	|	|	
x	*y*	*z*	

b. Gov(ernment) (based on Charette 1991)

An empty V-slot can be silenced by Gov *iff* it is followed by a V-slot that is **not** itself silenced.

There is a natural interaction between the silencing of empty positions and the interpretation of floating segments.
In GP it has long been supposed that floating segments link to empty positions (Charette 1991), however, *floating* segments do **not** link to silenced positions (Pagliano 2003; Barillot et al. 2017; Faust et al. 2018).

Importantly, the condition in (9a) says that if a language allows final empty V-slots (FEN) to be licensed by the domain-final parameter, then these forms will never be linked to floating vowels.

Consequently, in absolute final position, in languages that allow word-final consonants any lexically floating vowels will not surface (Ulfsbjorninn under review).[4]

(10) Final floating vowels in FEN languages (see also Rotuman (Ulfsbjorninn under review))

a. UR with a floating vowel /futi/ ‘banana’

C1	V1	C2	V2
|	|	|	
f	u	t	i

b. Computed form (grey shade shows stray erasure)[5]

C1	V1	C2	V2	DFP
|	|	|		
f	u	t	i	

Lardil has an extra condition however related to word-minimality.

(11) “Word”-minima for English *[ni] vs. [nɪt] ‘knit’

a.

	*	
C	V	
|	|	
n	i[6]	

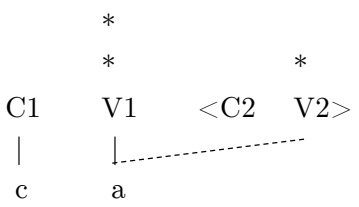
b.

	*	*	
C	V	C	V
|	|	|	
n	ɪ	t	

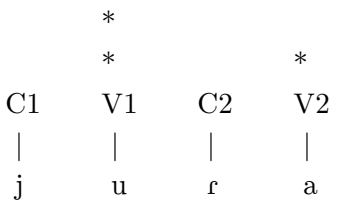
[4] Effectively, the phonological computation treats the final empty skeletal position for what it is (an empty position) and if it is part of its operational component to silence it, it will do so. Since Strict CV is non teleological, the counterfactual (but the position could have been filled) does not register.
[5] In Rotuman the floating /i/ coalesces with V1 to form [y].
[6] cf. [mʌ.**ni**] ‘money’ vs. [**niː**] ‘knee’.

(12) "Word"-minima in Lardil and some Root shapes

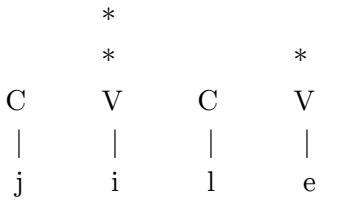
a. CV /ca/ 'foot' > [caː] (cf. [cajin] 'foot-ACC')



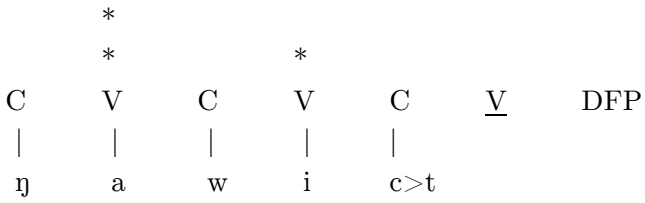
b. CVC /juɾ/ 'body' > [juɾa] (nb. ɾ is permitted word-finally)



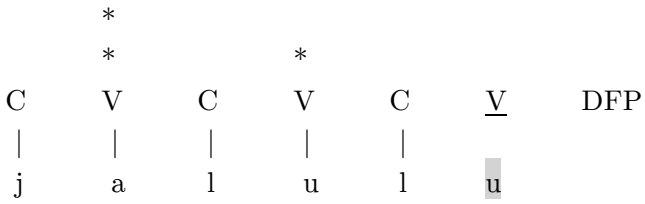
c. CVCV /jile/ 'shell sp.' > [jile] (nb. l is permitted word-finally)



d. CVCVC /ŋawic/ 'stomach' > [ŋawit][7] (cf. [ŋawiciŋun] COM)



e. CVCVCV /jalulu/ 'flame' > [jalul] (cf. [jalulu-n] ACC) (K:46)



[7] Final /c/ becomes [t] (Staroverov 2015:443).

One way to interpret these root-shapes is to say that the "word" of Lardil is made up of a left-aligned binary relationship that is obligatorily composed of two V slots attached to segments.

Roots can be long if they are vowel-final, they will always end in a floating vowel.

4.4 Vowel deletion or Why NOM and VOC look subtractive

NOM and VOC both share something in difference to all the other cases (Klokeid 1968). They are segmentally and skeletally empty.

In fact, NOM does have underlying phonological content, but it is exponed simply by a floating segment (that coalesces with root-final vowels). It is not unlike a 'featural affix' (cf. Mak 1953; Trommer 2017).[8]

This floating segment, that I will label for convenience just as [A.I], is the only phonological object exponing NOM, while VOC does not even have this.

(13) Derivation of NOM (Disyllabic noun)

/ɲedi/ > [ɲede] (cf. [ɲedi-ŋad] NF) (K:37)

i. UR /ɲedi + A.I/ 'mother's mother + NOM'

```
        *
        *           *
C1      V1    C2    V2    +
|       |     |     |
ɲ       e     d     i           A.I
```

ii. Root-final V is fixed (non-deletable)
Coalescence

```
        *
        *           *
C1      V1    C2    V2    +
|       |     |     |     ·····
ɲ       e     d     i           e
```

[8] https://home.uni-leipzig.de/jtrommer/featuralaffixes.html

iii. Output: [ɲede]

```
        *
        *           *
C1      V1    C2    V2    +
|       |     |     ⋮
ɲ       e     d     e
```

(14) Derivation of NOM (Polysyllabic noun)

/manija**da**/ 'white porpoise' [manija**d**] (cf. [manija**da**-ŋad] (K:46)

a. UR /manija**da** + A.I/ 'white porpoise + NOM'

```
C1  V1  C2  V2  C3  V3  C4  V4  +
|   |   |   |   |   |   |
m   a   n   i   j   a   d   a       A.I
```

b. DFP silences domain-final FEN (V4)

```
C1  V1  C2  V2  C3  V3  C4  V4 DFP  +
|   |   |   |   |   |   |
m   a   n   i   j   a   d   a       A.I
```

c. Output: [manijad]

```
C1  V1  C2  V2  C3  V3  C4  V4  +
|   |   |   |   |   |   |
m   a   n   i   j   a   d   a       A.I
```

So far I have shown vowel 'deletion' for forms where this results in a licit consonant-final form.

In Strict CV there can be positional restrictions on certain consonants. Specifically, in order to be linked to the skeleton, non-apical consonants need to be Lic(ensed).

This is a phonological force/environment provided exclusively by filled V slots. For more on the mechanism of Licensing see Scheer (2004); Scheer & Ziková (2010).

(15) Place Licensing

Non-apical consonants are delinked

This condition leads to the following derivation. In Strict CV this will be a transparent feeding operation and there's absolutely no mystery why only certain segments delete.

Final Vowel deletion is not caused by a well-formedness constraint against final vowels, therefore non-apical deletion does not counterfeed V-deletion.

This representational solution eliminates the opacity of in the data.

(16) Counterfeeding (Rule ordering)

UR	/ʈipiʈipi/	/ʈ̪uɻaraŋ/	/waŋalk/	/muŋkumuŋku/
V –> Ø / _#	ʈipiʈipi	...	...	muŋkumuŋku
Non-Apical deletion	ʈipiʈipi	ʈ̪uɻaraŋ	waŋalk	muŋkumuŋk
Output	[ʈipiʈi] ‘rock cod’	[ʈ̪uɻara] ‘shark’	[waŋal] ‘boomerang’	[muŋkumu] ‘wooden axe’

(17) Feeding (Strict CV)

a. UR /ʈipiʈipi/ ‘rock cod’

C1	V1	C2	V2	C3	V3	C4	V4
|	|	|	|	|	|	|	
ʈ	i	p	i	ʈ	i	p	i

a’. Computed form [ʈipiʈi]

C1	V1	C2	V2	C3	V3	C4	V4	DFP
|	|	|	|	|	|			
ʈ	i	p	i	ʈ	i	p	i	

b. UR /t̪uɻaɾaŋ/ ‘shark’

C1	V1	C2	V2	C3	V3	C4	V4
|	|	|	|	|	|	|	
t̪	u	ɻ	a	ɾ	a	ŋ	

b’. Computed form [t̪uɻaɾa]

C1	V1	C2	V2	C3	V3	C4	V4
|	|	|	|	|	|		
t̪	u	ɻ	a	ɾ	a	ŋ	

c. UR /waŋalk/

C1	V1	C2	V2	C3	V3	C4	V4
|	|	|	|	|		|	
w	a	ŋ	a	l		k	

c’. Computed form [waŋal]

C1	V1	C2	V2	C3	V3	~~C4~~	~~V4~~
|	|	|	|	|			
w	a	ŋ	a	l		k	

d. UR /muŋkumuŋku/

...C1	V1	C2	V2	C3	V3
|	|	|		|	
m	u	ŋ		k	u

d’ Computed form [muŋkumu]

...C1	V1	~~C2~~	~~V2~~	~~C3~~	~~V3~~
|	|				
m	u	ŋ		k	u

References

Anderson, S. R. 1992. *A-Morphous Morphology*. Cambridge: Cambridge University Press.

Aronoff, M. 1994. *Morphology by Itself. Stems and Inflectional Classes*. Cambridge (Mass.): MIT Press.

Barillot, X., Bendjaballah, S. & N. Lampitelli. 2017. Verbal classes in Somali: Allomorphy has no classificatory function. *Journal of Linguistics*, 54(1): 3-43.

Blevins, J. 1997. Rules in Optimality Theory: Two Case Studies. In: Roca, I. (ed.), *Derivations and Constraints in Phonology*. Oxford: Clarendon Press. pp. 227–260.

Bye, P. 2006. Subtraction, Optimality and the Combinatorial Lexicon. (ms.), University of Tromsø.

Charette, M. 1991. *Conditions on Phonological Government*. Cambridge: CUP.

Faust, N., Lampitelli, N. & S. Ulfsbjorninn. 2018. Articles of Italian Unite: Italian definite articles without allomorphy. *Canadian Journal of Linguistics*, 63(3):1-27.

Goldsmith, J. 1993. Phonology as an intelligent system. In: Napoli, D. J. and J. Kegl (eds.), Bridges between Psychology and Linguistics: A Swarthmore Festschrift for Lila Gleitman. New York: Lawrence Erlbaum Associates. pp. 247–267.

Hale, K. 1973. Deep-surface canonical disparities in relation to an analysis and change: an Australian example. In: Sebeok (ed.), *Current Trends in Linguistics*. The Hague: Mouton.

Halle, M. & A. Marantz. 1993. Distributed Morphology and the Pieces of Inflection. In Hale, K. and S. J. Keyser (eds.), *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger*. Cambridge (Mass.): The MIT Press, pp. 111-176.

Hockett, C. F. 1954. Two models of grammatical description. *Word*, 10:210-234.

Horwood, G. 2001. Anti-faithfulness and Subtractive Morphology. (ms.), Rutgers University. ROA-466.

Kavitskaya, D. & P. Staroverov. 2010. When an interaction is both opaque and transparent: the paradox of fed counterfeeding. *Phonology*, 27:255–288.

Kaye, J. D. 1990. 'Coda'-licensing. *Phonology*, 7(2):301-330.

Kaye, J., Lowenstamm, J. and J-R. Vergnaud. 1990. Constituent Structure and Government in Phonology. *Phonology,* 7:193-231.

Kiparsky, P. to appear. Outward Sensitive Allomorphy in Nez Perce? In: Newell, H. & S. Ulfsbjorninn (eds.), Phonological Solutions to Morphological Problems. Special issue of *The Linguistic Review.*

Kurisu, K. 2001. The Phonology of Morpheme Realization. PhD thesis, UCSC.

Lakoff, G. 1993. Cognitive phonology. In: Goldsmith, J. (ed.), *The Last Phonological Rule.* University of Chicago Press, Chicago, pp. 117–145.

Lowenstamm, J. 1996. CV as the only syllable type. In: Durand, J. & B. Laks (eds.), *Current Trends in Phonology. Models and Methods*, 419-441. Salford, Manchester:ESRI.

Lowenstamm, J. 2012. German Umlaut, an Outline of a Minimalist Account. University of Paris 7.https://www.academia.edu/34636498/German_Umlaut_an_Outline_of_a_Minimalist_Account_1

Mak, C. 1953. A comparison of two Mixtec tonemic systems. IJAL 19.85-100. Pike, E. V. & K. Wistrand. [1974]. Step-up terrace tone in Acatlán Mixtec. In Ruth Brend (ed.), *Advances in Tagmemics*, 83-104. Amsterdam: North-Holland Publishing Company.

McCarthy, J. J. 2003. Comparative markedness. *Theoretical Linguistics*, 29:1–51.

McCarthy, J. J. 2006. Restraint of analysis. In: Baković, E., Itô, J., and J. J. McCarthy (eds.), *Wondering at the Natural Fecundity of Things: Essays in Honor of Alan Prince.* Santa Cruz, CA: Linguistics Research Center. pp. 213–239.

Pagliano, C. 2003. L'épenthèse consonantique en français. Ce que la syntaxe, la sémantique et la morphologie peuvent faire à la phonologie: parles-en de ta numérotation ?impossible. Thèse de doctorat, Nice.

Pater, J. 2007. The Locus of Exceptionality: Morpheme-Specific Phonology as Constraint Indexation. In Bateman, L., O'Keefe, M., Reilly, E. and A. Werle (eds.), *University of Massachusetts Occasional Papers in Linguistics 32, Papers in Optimality Theory III.* Amherst: GLSA. pp. 259-296. https://rucore.libraries.rutgers.edu/rutgers-lib/42029/

Prince, A. & P. Smolensky. 2004. Optimality Theory. *Constraint Interaction in Generative Grammar.* Malden MA: Blackwell.

Staroverov, P. 2015. Opacity in Lardil: stratal vs. serial derivations in OT. In Assmann, A., Bank,

S., Georgi, D., Klein, T., Weisser, P. & E. Zimmermann (eds.) *Linguistische Arbeitsberichte* 92:33-63.

Trommer, J. 2008. Voicing Polarity in Luo. University of Leipzig. https://pdfs.semanticscholar.org/71e9/3cdff008d985e10b03b01ee10f270656e340.pdf

Ulfsbjorninn, S. 2018. Floating Melody and Empty Structure in Rotuman. University of Deusto. https://ling.auf.net/lingbuzz/004628.

Wilkinson, Karina (1988): 'Prosodic structure and Lardil phonology', Linguistic Inquiry 19, 325–334.

Zimmermann, E. 2017. *Morphological Length and Prosodically Defective Morphemes*. Oxford: Oxford University Press.