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Place of articulation shifts in sound change: A gradual road to the unmarked

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ABSTRACT

This paper investigates place of articulation shifts involving heterosyllabic $C_{[non\text{-}coronal]}C_{[coronal]}$ clusters. Such phenomena are found, among other languages, in the diachrony of Italiot Greek, where three typologically different historical stages are observed: (a) no shifts; (b) *dorsal* > *labial* shift; (c) *dorsal, labial* > *coronal* shift. Drawing on Rice's (1994) model of the Place node and the markedness hierarchy *dorsal* ≺ *labial* ≺ *coronal* (with "≺" denoting 'more marked than') (de Lacy 2002), I maintain that these shifts reduce the markedness of codas. The gradual typological changes are accounted for in terms of *Property Theory* (Alber & Prince 2015).

KEYWORDS

place of articulation shifts, marked place features, diachronic change, typological variation, Property Theory

1. INTRODUCTION

It has been often pointed out in the literature that codas can host a restricted consonant inventory in comparison to onsets (Vennemann 1988; Clements 1990; Lombardi 1991; Zec 1995; Baertsch 2002; VanDam 2004; Green et al. 2014; Krämer & Zec 2019). For example, heterorganic coda–onset clusters are avoided in several languages (Steriade 1982; Itô 1986, 1989; Yip 1991; McCarthy 2008; a.o.). To address these restrictions, Itô (1986, 1989) puts forth the *Coda Filter* (1) (CF), which only allows codas to be occupied by the first part of geminates as well as

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consonants that are homorganic to the following onset. In this way, place specification across heterosyllabic consonants is limited to one value.[1]

(1) *Coda filter* (Itô 1989, 224)
* C]σ
|
[place]

In this vein, the existence of heterorganic clusters in a given language would suggest that such a condition is inactive. If, though, at a more recent historical stage these clusters appear to have been replaced by homorganic clusters or geminates, the assumption would be that the CF has come into play in the language at hand. Consider, for example, the evolution of Italian from Latin, where heterorganic sequences, being no longer immune to the CF, have been replaced by geminates, e.g. o[k.t]o > o[t.t]o 'eight', se[p.t]em > se[t.t]e 'seven', fra[g.m]en > fra[m.m]ento 'fragment' (see Krämer 2009).

One would naturally expect that, if at a certain point a language ceases to tolerate heterorganic clusters owing to the activation of the CF, then these may be repaired via transformation into homorganic ones. Through a place of articulation (PoA) shift lens, the Italian data above are historically transformed as follows: dorsals and labials turn to coronals in a pre-coronal environment, and dorsals become labials before a labial.[2] This prediction, however, is not borne out in those cases where a dorsal preceding a coronal undergoes a shift that results in a labial, instead of the expected, most unmarked coronal. Such a shift is reported in the history of Italiot Greek dialects (IG) (Rohlfs 1950; Karanastassis 1997; Tzitzilis 2004), where etymological dorsal (2a) and labial (2b) were neutralized into a labial.[3] Furthermore, at a later stage, a subsequent *labial* > *coronal* shift took place (3), thus creating clusters that fully comply with the CF requirements outlined above. Moreover, in certain Calabrian IG varieties, a direct shift from both dorsals and labials to coronals is reported (4). Therefore, IG offers an excellent testbed for a typological investigation of PoA shifts in coda position.

(2) a. o[f.t]ó < Medieval Greek o[x.t]ó 'eight'
b. e[f.t]á = Medieval Greek e[f.t]á 'seven'

[1]Similar to the Coda Filter is Yip's *Modified Coda Condition*, which again deprives codas of place features (Yip 1991, 62) (see also Itô (1986, 32), where [nasal] is employed instead of [place]; see also Steriade's (1982) *Coda Rule* stating that "an obstruent can be syllabified in a coda only if it is segmentally linked to the following C"; see also McCarthy (2008, 279) for a slightly different formulation.

[2]The diachronic changes that have affected coda consonants preceding a coronal onset are of particular interest, as they cannot straightforwardly be explained as cases of regressive assimilation. Unlike dorsals and labials, coronals have been widely claimed to be incapable of triggering assimilation, owing to their lacking a place feature that can spread (Rice 1994; Szigetvári 1994; Jun 1995, 2004; a.o.). An approach based on PoA shifts achieves to provide a unified account of these changes, alongside those changes involving pre-dorsal and pre-labial consonants.

[3]A more widely cited case of diachronic *dorsal* > *labial* shift comes from the evolution of several dialects of Romanian, e.g. Latin *no*[k.t]- 'night' > Daco-Romanian/Aromanian *noa*[p.t]*e*, Megleno-Romanian *noa*[p.t]*i* ~ *noa*[f.t]*i*, as well as in Vegliotan Dalmatian, e.g. Latin *o*[k.]*to* > *gua*[p.t]*o* 'eight', and in adapted loanwords from Latin to Albanian, e.g. *lu*[k.t]- > *lu*[f.t]*ë* 'light' (Seigneur & Pagliano 2003 and references therein; Tzitzilis 2004).

(3) a. o[t.t]ó < older IG o[f.t]ó 'eight'
b. e[t.t]á < older IG e[f.t]á 'seven'

(4) a. o[θ.t]ó < Medieval Greek o[x.t]ó 'eight'
b. e[θ.t]á < Medieval Greek e[f.t]á 'seven'

Along the lines of CF, in what remains I argue that gradual PoA shifts that target the first member of heterosyllabic $C_{[non\text{-}coronal]}C_{[coronal]}$ clusters (henceforth XT) aim at balancing the difference in markedness between the coda and the onset. I concur with a substantial body of research maintaining that degrees of markedness are reflected in the hierarchy *dorsal* ≺ *labial* ≺ *coronal* (Itô 1986, 1989; McCarthy 1988; Yip 1991; Lombardi 1991, 2002; de Lacy 2002, 2006; see also Paradis & Prunet 1991 and Walker 2019 for overviews and references; but cf. Trigo 1988; Rice 1996; Hume & Tserdanelis 2002; Hayes & Steriade 2004).[4] I restrict my focus to shifts observed in XT clusters, as this allows for detecting not only a direct change to the unmarked value [coronal], but also the intermediate step *dorsal* > *labial*. Taking IG as a case study, in section 2 I give a detailed description of the diachronic PoA shift phenomena manifested therein. In section 3, I compare two feature geometries representing the Place node and I show that capturing the microtypology across IG varieties presupposes a hierarchical rather than a flat structure, in the spirit of Rice (1994). In light of this, in section 4.1, I present an analysis of the diachronic PoA shifts, based on two modified CFs incorporating Rice's representation of the Place node, within the framework of Optimality Theory (Prince & Smolensky 1993/2004). I offer an account of the conditions that generate the full typology across the dialects comprising IG, formalized as *properties* of the typological system in terms of Property Theory (Alber & Prince 2015; in prep.; Alber et al. 2016) (section 4.2) and I discuss diachronic change by means of minimal switches of the property values (Alber 2015; Alber & Meneguzzo 2016; DelBusso 2018) (section 4.3). I round up with the conclusions (section 5).

2. DIACHRONIC POA SHIFTS IN ITALIOT GREEK

IG (Italiot Greek) is a cover term that refers to two Modern Greek dialects spoken in Southern Italy, in Salento, Apulia and in Bovesia, Calabria. The source language from which both IG dialects descended is considered to be Medieval Greek (MG).[5] Among the phonological changes that clearly show the departure of IG from their ancestor, one notices a series of PoA shifts detectable throughout the history of both dialects. From a chronological point of view, the first PoA shift that occurred in IG was the *dorsal* > *labial* one (Rohlfs 1950; Karanastassis 1997). Manuscripts from the 12th century document forms like *Ψερωσικήα* ([ps]) < *Ξεροσυκία* ([ks]) 'type of fig tree' (Caracausi 1990), thus testifying that labialization of dorsals had already taken place (Tzitzilis 2004, 479). The change is typical of Salentinian Greek (SG); nevertheless, it is also

[4]Cases of debuccalization are not considered.

[5]The question how far back in time dates the origin of IG dialects has sparked hot debates among scholars, the Byzantine/Medieval hypothesis being among the prevailing suggestions (see Manolessou 2005). This contribution does not wish to argue for or against this theory, but, instead, to claim that the two IG dialects are typologically different from their ancestor with respect to the place features they admit in XT.

reported in certain varieties of Calabrian Greek (CG), like Galliciano. Examples from the varieties that have manifested the *dorsal* > *labial* shift before a heterosyllabic coronal[6] (henceforth collectively abbreviated as IG-1) are given in (5) (Rohlfs 1930, 1950; Karanastassis 1984–1992, 1997; Lambrinos 1994):[7,8]

(5)		*MG dorsals*	*IG-1 labials*	
	a.	o[x.t]ó	o[f.t]ó	'eight'
	b.	(e)[ɣ.ð]érno	a[v.d]érro	'I skin'
	c.	é[k.s]i	é[f.s]e ~ é[fts]e (SG); é[f.s]e > é[f.ʃ]e (CG)	'six'
	d.	pi[k.n]ó	pi[f~v.n]ó	'thick'
	e.	té[x.n]i	té[f.n]i ~ té[v.n]i	'art'

Unlike Romanian, most varieties of IG took a step further and turned all pre-coronal labials into coronals (henceforth collectively abbreviated as IG-2).[9] The change affected both former dorsals (6) and etymological labials (7) and resulted in what these dialects sound like today (Rohlfs 1930, 1950; Karanastassis 1984–1992, 1997; Lambrinos 1994; own fieldwork 2019):[10]

(6)		*IG-1 labials*	*IG-2 coronals*	
	a.	o[f.t]ó	o[t.t$^{(h)}$]ó	'eight'
	b.	a[v.d]érro	a[d.d]érro	'I skin'
	c.	é[f.s]e ~ é[fts]e; é[f.ʃ]e	é[s.s]e ~ é[tts]e (SG); é[ʃ.ʃ]e (CG)	'six'
	d.	pi[v.n]ó	pi[n.n]ó	'thick'
	e.	té[f~v.n]i	té[n.n]i	'art'

[6]Evidence from processes occurring at morphological boundaries show that dorsal–labial clusters also ceased to be admitted in IG and have been replaced with a labial geminate, e.g. *aniɣméno* > *animméno* 'opened' (cf. *sperméno* 'sown') (Rohlfs 1930). There is no compelling evidence against analyzing this evolution as assimilation; however, given that it remains consistent with the shift-based account proposed here, it seems redundant to treat specific clusters separately.

[7]All the examples presented here involve intervocalic clusters. The process also affected word-initial clusters, which are again taken to be non-tautosyllabic (Apostolopoulou in prep.). Further discussion on the exact status of these clusters exceeds the goals of the present paper.

[8]The pronunciations [fʃ] and [fts] constitute different evolutions of [fs] documented in certain SG varieties that are now barely preserved (Lambrinos 1994, 27). I assume that the recent [tts] goes back to [fts]. In addition, I stipulated an (unattested) [fʃ] variant also for CG (5c) which was later transformed in the current [ʃʃ] (6c).

[9]Forms with a labial–coronal sequence still survive in certain SG varieties and usually stand in free variation with the more recent coronal–coronal variant, i.e. Martano SG [fs]*eméroma* ~ [ss]*eméroma* < [ks]*iméroma* 'sunrise'; *dá*[ft]*ilo* ~ *dá*[tt]*ilo* < *dá*[xt]*ilo* 'finger'; cf. Sternatia SG [ss~ts]*eméroma*, *dá*[tt]*ilo* (own fieldwork 2019).

[10]In several cases, changes of manner are additionally involved, e.g. fricative–fricative clusters dissimilate (5b), coda stops become fricatives (5c–d). According to Apostolopoulou (in prep.), these changes are in line with the general tendency of the languages at hand to achieve sonority falls across syllable borders (or, at least, minimize the sonority distance in the case of rises, e.g 5d–e; see also Cser 2012, 52, 2020, 68) in the spirit of the *Syllable Contact Law* (Murray & Vennemann 1983; Gouskova 2001). Moreover, in IG-2 nasals emerge before [n] (6d–e, 7d–e), instead of a coronal fricative, as the phonotactics ban sequences like *[sn], *[θn].

(7)		*MG / IG-1 labials*	*IG-2 coronals*	
	a.	e[f.t]á	i[t.t]á	'seven'
	b.	e[v.d]omáda	a[d.d]omá (SG); [d.d]omádi (CG)	'week'
	c.	a[f.s]ári ~ a[fts]ári	a[s.s]ári ~ a[tts]ári (SG)[11]	'fish'
	d.	ka[f~v.n]ó	ka[n.n]ó	'smoke'
	e.	e[v.n]uxízo	a[n.n]uxízo	'I castrate'
	f.	ju[m.n]ó	ju[n.n]ó	'naked'

On the other hand, the CG varieties of Roccaforte (now extinct), Bova, and Roghudi (henceforth BCG) appear to have shifted dorsals and labials directly to coronals in a XT context (Rohlfs 1950). The /xt/ and /ft/ sequences have been shaped as shown in (8) and (9), respectively, whereas the evolution of all other clusters is parallel to IG-2 (but see fn. 11) (Karanastassis 1997, 1984–1991).

(8)		*MG dorsals*	*BCG coronals*	
	a.	o[x.t]o	o[s.t]o	Bova CG
	b.	o[x.t]o	o[θ.t]o	Roccaforte CG, Roghudi CG

(9)		*MG labials*	*BCG coronals*	
	a.	e[f.t]a	e[s.t]a	Bova CG
	b.	e[f.t]a	e[θ.t]a	Roccaforte CG, Roghudi CG

In all cases, a systematic, unidirectional trajectory towards the unmarked extreme of the PoA hierarchy is robustly instantiated. Hence, I maintain that, throughout the history of IG, coda consonants preceding a heterorganic onset that is less marked with respect to PoA were subject to gradual changes, so that conditions along the lines of CF are better satisfied. Notably, the CF was in principle not activated as long as the coda was already less marked in comparison with the onset; consider, for instance, the preservation of (rare) labial–dorsal sequences in *efkaristó* **exxaristó* 'I thank',[12] as well as the abundant cases of etymological coronal–non-coronal clusters, e.g. *spítta* **ppitta* 'spark', *skórdo* **kkórdo* 'garlic', etc. (Rohlfs 1950; Karanastassis 1984–1992).

The striking absence of shifts in *muta cum liquida* clusters, which, thanks to the great sonority distance between their two members, qualify as complex onsets (e.g. Zec 1995), testifies that the process is confined in coda positions, e.g. *á*[.kr]*i* **á*[.pr]*i,* **á*[.tr]*i* 'edge', *a*[.vl]*í* **a*[.ðl]*í* 'porch'; consider also simplex onsets,[13] e.g. [.k]*aló* *[.p]*aló,* *[.t]*aló* 'good', *á*[.x]*aro* **á*[.f]*aro,* **á*[.θa].*ro* 'bad' (Rohlfs 1930, 1950; Karanastassis 1984–1992, 1997).[14]

[11]In Galliciano CG, as well as in Roghudi CG, /ps/ underwent local metathesis, e.g. *spomí* < MG *psomí* 'bread' (Karanastassis 1997, 1984–1991).

[12]The voiced cluster [vɣ] ([vj] before a front vowel), although retained in some – currently extinct – IG varieties and in the speech of certain speakers (own fieldwork 2019), was in general transformed in /g^{w}/, under the pressure of the respective Romance phoneme (see Nicholas 2007 for an overview).

[13]Regarding simplex onsets, non-systematic bidirectional shifts are sporadically mentioned in both IG dialects, with the resulting variants alternating freely, e.g. *xoréggo* ~ *foréggo* 'I dance', *voréa* ~ *xoréa* 'North wind' (the first member of each pair constitutes the etymological variant) (Karanastassis 1984–1991).

[14]A parallel development is found in Romanian, e.g. *a*[.kr]*u* 'sour', [.k]*oastă* 'hill', *pă*[.k]*ură* 'tar' (see discussion in Seigneur & Pagliano 2003 and references therein).

To summarize, in the diachrony of IG, three typologically different languages are distinguished. The initial stage, given here as MG, allows all PoA in a coda before a coronal onset. The next stage, instantiated by IG-1, imposed a limitation: only labials and coronals were admitted in a coda slot. This led to neutralization between dorsals and labials. The final stage (IG-2, BCG) involved greater restrictions. Specifically, codas preceding coronal onsets were capable of accommodating exclusively coronals; thus, a shift of both dorsals and labials to coronals was triggered. The table in (10) summarizes the full typology (henceforth, "K" denotes dorsal segments; "P" denotes labial segments; "T" denotes coronal segments):

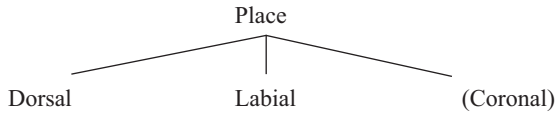
(10) The typology of PoA shifts in IG

		Description	***Languages***
1.	**K.T → K.T** **P.T → P.T** **T.T → T.T**	*All PoA* • *No shift/neutralization occurs*	**MG**
2.	**K.T → K.T** **P.T → P.T** **T.T → T.T**	*Only P and T* • *Ps are either etymological or originate from historical K*	**IG-1**
3.	**K.T → K.T** **P.T → P.T** **T.T → T.T**	*Only T* • *Ts are either etymological or originate from historical K and P*	**IG-2, BCG**

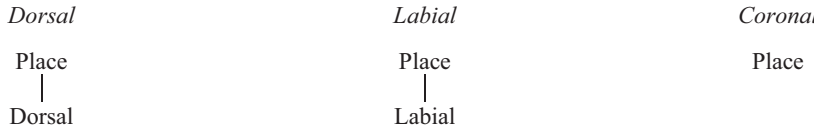
3. THE STRUCTURE OF THE PLACE NODE

In a feature geometry along the lines of Clements (1985), Clements & Hume (1995), Sagey (1986), and McCarthy (1988), the three major articulators are represented as branches dominated by a Place node (11–12). The feature [coronal] is considered absent under the Place node, due to the unmarkedness of T (see Paradis & Prunet 1991; Lahiri & Reetz 2002, 2010).

(11) Place node – flat structure



(12) Major PoA representations – flat structure



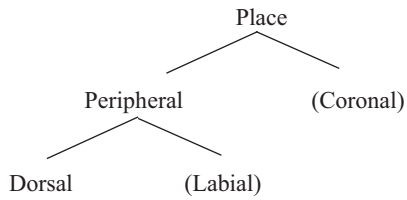
This model predicts that [labial] and/or [dorsal] can delink, which results in the neutralization of P and K to T. Typologically, three possibilities are generated (adapted from Rice 1994, 196):

(13) *Typology – flat structure*

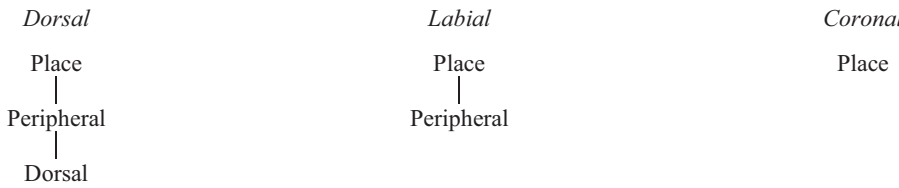
	Process	*Result*	*Description*
1.	Delink [labial]	K, T	P and T merge, K is distinct
2.	Delink [dorsal]	P, T	K and T merge, P is distinct
3.	Delink both [labial] and [dorsal]	T	P, K, and T merge

Rice (1994) (building on ideas proposed by Rice & Avery 1993, based on previous work by Jakobson et al. 1952 and Hyman 1973) notices that K and P can pattern as a class, which cannot be accounted for by means of the above "flat" structure. Thus, she assumes a hierarchical organization within the Place node (14–15). The feature [coronal] is a direct dependent of the Place node, and labial and dorsal group together to form a sister node called the Peripheral node. In this model, the feature [coronal] is unmarked compared to [peripheral], and, within the Peripheral node, the feature [labial] is the unmarked one (indicated by the parentheses) (the geometries are taken from Rice 1994, 192).

(14) Place node – peripheral structure



(15) Major PoA representations – peripheral structure



Form this point of view, if [dorsal] delinks, then the consonant becomes a default P, and delinking the whole peripheral node altogether results in a default T. According to Rice, the

generated typology (16) correctly encompasses the cross-linguistically attested shifts.[15] In particular, the peripheral model successfully accounts for the shift K > P, which is unmotivated in terms of the flat structure (13), therefore accurately predicting the IG typology (10).

(16) *Typology – peripheral structure*

	Process	*Result*	*Description*	*IG*
1.	Delink [dorsal]	P, T	K and P merge into P; T are distinct	IG-1
2.	Delink [peripheral]	T	K, P, and T merge into T	IG-2, BCG

4. ANALYSIS

I propose a typological analysis of the above examined PoA shifts, aiming at explaining the stepwise fashion in which these phenomena have occurred diachronically in IG. The hierarchical representation of the Place node is integrated into Itô's (1989) CF, resulting in modified versions of the CF, which take into consideration the place features [dorsal] and [peripheral]. I couch my proposal within Optimality Theory (Prince & Smolensky 1993/2004).

4.1. Phonological computation

The system I investigate includes possible PoA shifts of a K, P, or T coda preceding a T onset. Therefore, word-final codas, loss of the Place node altogether, clusters with a second non-coronal member, or alternative syllabifications are not taken into consideration.[16] This disclaimer leaves us with a simplified GEN consisting of three inputs /KT/, /PT/, and /TT/, and three possible outputs [K.T], [P.T], and [T.T]. Three candidate sets comprised of three candidates each are subsequently formed:

(17) Candidates

/KT/	→ [K.T]	/PT/	→ [K.T]	/TT/	→ [K.T]
	→ [P.T]		→ [P.T]		→ [P.T]
	→ [T.T]		→ [T.T]		→ [T.T]

In light of Rice's (1994) Peripheral Model, I postulate different CFs that are sensitive to particular sub-constituents under the Place node (cf. Itô 1989; Yip 1991; McCarthy 2008). CF1 (18a) prohibits consonants that are specified as [dorsal], i.e. K, before a heterorganic onset.

[15] In order to account for rare cases of P > K shifts (e.g. in Arapaho and Ingalik), Rice (1994, 203) assumes two possible representations, the difference lying in which feature, [dorsal] or [labial] is specified under the Peripheral node. The choice between the two representations is taken to be language-specific.

[16] A higher-ranked constraint evaluating the sonority distance is tacitly taken to eliminate tautosyllabic parsings of the clusters at hand, as a complex onset can only consist of an obstruent and a liquid in the languages under investigation.

Therefore, in an XT context, only PT and TT are admissible. CF2 (18b) has broader scope, as it also bans [peripheral], thus essentially disallowing heterorganic XT clusters.[17]

(18) Coda Filters

a. *CF1*

*C]σ
|
[Dorsal]

b. *CF2*

*C]σ
|
[Peripheral]

In this spirit, I employ the positional markedness constraints *K/Coda (19a) and *KP/Coda (19b) (see Zoll 1996, 1998; see also Krämer & Zec 2019) that essentially encapsulate CF1 and CF2, respectively. The two constraints are in stringency relation (Prince 1997a,b, 1999; de Lacy 2002, 2006; Alber & Meneguzzo 2016; Merchant & Krämer 2018; Krämer & Zec 2019); simply put, a violation of *K/Coda entails a violation of *KP/Coda, but not vice versa.

(19) a. *K/Coda Assign a violation for each output consonant specified as [dorsal] and syllabified as coda
– henceforth abbreviated as *K

b. *KP/Coda Assign a violation for each output consonant specified as [peripheral] and syllabified as coda
– henceforth abbreviated as *KP

Moreover, I use a faithfulness constraint Faith, which penalizes discrepancies between the input and the output with respect to place features (20).

(20) Faith Assign a violation for every place feature ([dorsal], [peripheral]) in the input that has no correspondent in the output and for every place feature in the output that has no correspondent in the input

Shifts involving the delinking of one feature, like K → P (21a) and P → T (21b), incur one violation of Faith, while K → T, which requires the loss of two place features (21c), yields two violations. Similarly, the insertion of feature specification may incur one (22a–b) or two (22c) violations, depending on the number of new place features being linked.

[17] As in the vast majority of cases the result of the final shift, i.e. TT, is a geminate (6–7), the question arises whether an analysis positing deletion followed by compensatory lengthening (CL) is preferable to the postulation of a CF. There are no reasons to believe that CL is motivated in IG. For instance, the shift is not confined in post-tonic positions (e.g. compare 5d–e). Besides, stressed syllables do not need to be closed in IG (Apostolopoulou in prep.). Most importantly, a CL approach overlooks the cases of derived [$T_\alpha T_\beta$] clusters (8–9). On the other hand, CF succeeds to capture the bigger picture, by accommodating both [$T_\alpha T_\beta$] and [$T_\beta T_\beta$] resulting from etymological /KT/ or /PT/. I thank an anonymous reviewer for raising this issue.

(21)

a. ***K → P***

Place
|
Peripheral
⊣
Dorsal

1 violation of FAITH

b. ***P → T***

Place
⊣
Peripheral

1 violation of FAITH

c. ***K → T***

Place
⊣
Peripheral
⊣
Dorsal

2 violations of FAITH

(22)

a. ***P → K***

Place
|
Peripheral
⋮
Dorsal

1 violation of FAITH

b. ***T → P***

Place
⋮
Peripheral

1 violation of FAITH

c. ***T → K***

Place
⋮
Peripheral
⋮
Dorsal

2 violations of FAITH

The set of markedness and faithfulness constraints evaluates the set of candidates defined in (17). Each of the three inputs /KT/, /PT/, and /TT/ may be mapped to one faithful and two unfaithful outputs, whereby some shift has taken place. The tableaux in (23) illustrate the violation profile of each candidate (the constraints are not ranked with respect to each other):[18]

(23) Violation tableaux

input	*output*	*KP	*K	FAITH
/KT/	[K.T]	*	*	
	[P.T]	*		*
	[T.T]			**
/PT/	[K.T]	*	*	*
	[P.T]	*		
	[T.T]			*
/TT/	[K.T]	*	*	**
	[P.T]	*		*
	[T.T]			

Given the above constraint system, the candidates */PT/ → [K.T], */TT/ → [K.T], and */TT/ → [P.T], which are absent in the typology in (10, 16), are *harmonically bounded* (Samek-Lodovici

[18]The tableaux, the factorial typology, as well as the property analysis were automatically calculated with the aid of OTWorkplace (Prince et al. 2017).

& Prince 1999), i.e. they cannot win over their competitors under any ranking. This is rendered clearer with the help of comparative tableaux (Prince 2002). Consider first (24), where the violation profiles of candidates /KT/ → [K.T] and /KT/ → [P.T] are compared.[19] Let's assume that /KT/ → [K.T] is the winner of the competition and /KT/ → [P.T] is the loser. The prerequisite for /KT/ → [K.T] to win a race against /KT/ → [P.T] is that *at least one* constraint preferring [K.T] over [P.T] dominates *all* the constrains preferring [P.T]. In our case, FAITH must outrank *K. Reversely, [P.T] wins if all constraints preferring [K.T] are dominated by at least one constraint preferring [P.T].

(24) Comparative tableau: */KT/ → [K.T] vs. /KT/ → [P.T]*

Input	***Winner***	***Loser***	***KP**	***K**	**FAITH**
/KT/	**[K.T]**	**[P.T]**	**1 vs. 1** **e**	**1 vs. 0** ***L***	**0 vs. 1** ***W***

Let's return to the bounded candidates */PT/ → [K.T] (25), */TT/ → [K.T] (26a), and */TT/ → [P.T] (26b). The absence of Ws in (25–26) renders it evident that no constraint prefers the intended winners. All constraints either prefer the intended loser or remain uninvolved due to the equal violations. This means that, independently of the constraint hierarchy, these outputs cannot be selected, as the decision will always be in favor of some other candidate.

(25) Comparative tableau: harmonically bounded candidates for /PT/

	Input	***Winner***	***Loser***	***KP**	***K**	**FAITH**
a.	**/PT/**	**[K.T]**	**[P.T]**	**1 vs. 1** **e**	**1 vs. 0** **L**	**1 vs. 0** **L**
b.	**/PT/**	**[K.T]**	**[T.T]**	**1 vs. 0** **L**	**1 vs. 0** **L**	**1 vs. 1** **e**

(26) Comparative tableau: harmonically bounded candidates for /TT/

	Input	***Winner***	***Loser***	***KP**	***K**	**FAITH**
a.	**/TT/**	**[K.T]**	**[T.T]**	**1 vs. 0** **L**	**1 vs. 0** **L**	**2 vs. 0** **L**
b.	**/TT/**	**[P.T]**	**[T.T]**	**1 vs. 0** **L**	**0 vs. 0** **e**	**1 vs. 0** **L**

[19]Each column corresponding to a constraint contains the number of violations each candidate incurs with respect to that constraint. In the lower row, 'W' indicates that the constraint in that column prefers the intended winner [K.T]; 'L' indicates that this constraint prefers the loser [P.T]; 'e' stands for 'equal', in the sense that this constraint prefers neither the winner nor the loser (because they incur the same amount of violations).

Remarkably, the harmonically bounded candidates are those involving insertion of features: *PT → [K.T] requires the linking of [dorsal], *TT → [P.T] the linking of [peripheral], and *TT → [K.T] the linking of both [dorsal] and [peripheral]. Presumably, if a degree of markedness *n* is intolerably marked in a language, then any degree of markedness higher than *n* is also disallowed. In simple words, if P is banned, then K is not allowed either. In light of this, if an input contains an inadmissible structure and thus needs to change its place features, then it must improve its degree of markedness in the output. In conclusion, adding specification is never an option in our typology; the only viable change is the deletion of one or more features under the Place node, aiming at an output that is less marked than the faithful one.

The generated factorial typology is comprised of three languages, dubbed L(kpt), L(pt), and L(t), corresponding to the stages witnessed in the diachrony of IG. In L(kpt) (i.e. MG), wherein every PoA is admitted, FAITH dominates both markedness constraints, thus ruling out any unfaithful candidates, i.e. those candidates involving PoA shifts. In L(pt) (i.e. IG-1), *K outranks FAITH, which eliminates K in an XT context, but *KP is still dominated, thus leaving room for PT. Essentially, in XT clusters, both consonants share the property of not being specified as [dorsal], thus satisfying CF1 (18a). Finally, in L(t) (i.e. IG-2, BCG), *KP is ranked higher than FAITH, thus disallowing [peripheral] – and, subsequently, [dorsal]; therefore, all places neutralize to T so that XT clusters satisfy CF2 (18b). The ranking of *K is not important in L(t), given the stringency relation. The typology and the constraint hierarchies are demonstrated below:

(27) Factorial typology

		Ranking	***Stages of IG***
L(kpt)	**/KT/ → [K.T]**	**FAITH >> *K, KP**	**MG**
	/PT/ → [P.T]		
	/TT/ → [T.T]		
L(pt)	**/KT/ → [P.T]**	***K >> FAITH >> *KP**	**IG-1**
	/PT/ → [P.T]		
	/TT/ → [T.T]		
L(t)	**/KT/ → [T.T]**	***KP >>FAITH (*K)**	**IG-2, BCG**
	/PT/ → [T.T]		
	/TT/ → [T.T]		

4.2. Typological Analysis

The cross-linguistic variation as well as the diachronic evolution of each language is formalized in terms of *Property Theory* (PT, Alber & Prince 2015; in prep.; Alber 2015; Alber et al. 2016; Alber & Meneguzzo 2016; Danis 2017; Merchant & Krämer 2018; DelBusso 2018). In a nutshell, a typological system is defined by *properties*, which are the crucial ranking conditions that freely combine to generate every language of the system. A property is represented as X <> Y, with X and Y standing for constraints or constraint sets, and may take two values *a* and *b*, depending on which side dominates, with value *a* corresponding to X >> Y and

value *b* to Y >> X. Every language in the typological system is assigned a value for every property co-defining the system. In some cases, though, a language can be *moot* with respect to a property, i.e. the particular ranking is irrelevant in the language at hand in the sense that it does not determine the optima. Differences between historically or geographically adjacent grammars represent *minimal* switches of the typological property values, the possibilities being the following: *a* to *b*; *b* to *a*; mootness to value; value to mootness (Alber 2015; Alber & Meneguzzo 2016; DelBusso 2018). In other words, historical change as well as diatopic microvariation result from minimal changes that are formalized as the reversion of a single crucial ranking.[20] Contrary to Alber (2015), I put forward that the switch from a value to mootness for a property A does not constitute an additional change, but rather it may follow from a reversion of a different property B.[21] Consequently, typological changes involving one switch between values and one change from a value to mootness still counts as minimal.

In the case of PoA shifts in IG, what determines each language type is the combinations of the values of property FAITH <> *KP, on the one hand, and property FAITH <> *K, on the other hand (28). Essentially, FAITH <> *KP decides whether a language allows the peripheral node, and FAITH <> *K whether it (additionally) allows [dorsal]. The two possible values are henceforth given as value *yes* and value *no*.

(28) Properties

Properties		***yes***	***no***
PERIPHERAL:	**FAITH <> *KP**	**FAITH >> *KP**	***KP >> FAITH**
DORSAL:	**FAITH <> *K**	**FAITH >> *K**	***K >> FAITH**

Property PERIPHERAL is set to value *yes* for both L(kpt) and L(pt), which allow peripheral segments (henceforth K&P) in XT, and to value *no* for L(t), which does not. Property DORSAL is set to value *yes* for L(kpt), which admits K in a XT context, and to value *no* for L(pt), which does not. L(t) is moot with respect to DORSAL: given that L(t) does not allow a peripheral node, it cannot accommodate additional specification. Therefore, the ranking of *K with respect to FAITH plays no role in the selection of the optima. The table in (29) illustrates the property analysis.

[20]In theory, changes can happen in any direction. However, if a value switch brings about material loss in the diachronic dimension, it seems uncertain that there is a way back. For instance, let's assume that a language initially possessing both feature A and feature B loses A, due to a value change that triggers neutralization of the distinction between the two features, thus allowing only B to emerge in context of C. Provided that the neutralization is not involved in morphophonological alternations, which would guarantee the visibility of the mapping of certain Bs onto an underlying A, the grammar may replace A with B in the relevant context. Consequently, in the occasion of re-reversing the property at hand, becoming faithful to A is no longer an option. Therefore, unless loans have provided the necessary material, the reversion fails to be visible (Alber 2015). I thank an anonymous reviewer for raising this issue.

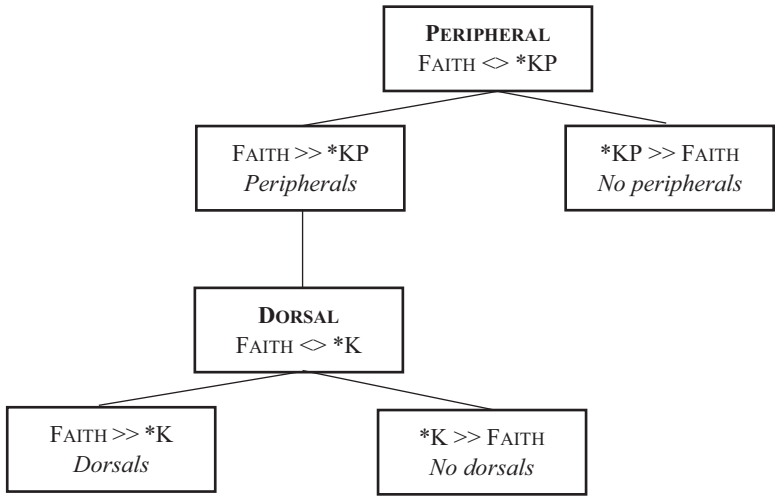
[21]In this paper, I remain agnostic as to whether a change from mootness to a value counts as an additional switch.

(29) Property analysis

	PERIPHERAL FAITH <> *KP	DORSAL FAITH <> *K	*IG*
L(kpt)	yes	yes	MG
L(pt)	yes	no	IG-1
L(t)	no	moot	IG-2, BCG

The scope of the above properties is neatly represented with the help of the property treeoid in (30). Each property has scope over the set of nodes it c-commands in the treeoid (Alber & Prince, in prep.). PERIPHERAL has wide scope, i.e. it is relevant to all the languages in the typological system, i.e. L(kpt), L(pt), L(t). DORSAL, on the other hand, has narrower scope, as it branches below the value *yes* of PERIPHERAL and serves to distinguish further between the languages allowing K&P, and more specifically between those allowing K, i.e. L(kpt) (*yes*), and those prohibiting it, i.e. L(pt) (*no*). As mentioned above, as soon as [peripheral] is removed from the picture, the need for another property to determine whether or not [dorsal] is allowed becomes redundant. Hence, L(t) can be defined simply by the value *no* of PERIPHERAL, whereas DORSAL is not relevant.

(30) Property treeoid



4.3. Language change in PT

In order to gain a better understanding of how diachronic change can be formulated in PT terms, let's consult the various IG stages. L(kpt), an instantiation of which is MG, admits all PoAs in XT and blocks any place shift. The faithfulness constraint is ranked above the

markedness constraints; in other words, for each property, DORSAL and PERIPHERAL, L(kpt) takes the value *yes*.

When MG evolved to IG-1, the linguistic system stopped tolerating K in XT clusters, but continued parsing P as coda, since faithfulness to [peripheral] was still respected. In other words, *K got promoted and outranked FAITH, hence the switching of the value of DORSAL to *no*, whereas *KP remained at the bottom of the hierarchy, thus PERIPHERAL retained the value *yes* (31).

(31) Language change L(kpt) > L(pt)

	PERIPHERAL FAITH <> *KP	DORSAL FAITH <> *K
L(kpt) = MG	**yes**	**yes**
L(pt) = IG-1	**yes**	**no**

The most recent evolution of IG-1 (L(pt)) to IG-2 (L(t)) was achieved through the resetting of the value of PERIPHERAL from *yes* to *no*. *KP prevails over FAITH, therefore K&P are no longer allowed. Thus, in the new stage of the language, only T emerges in XT. DORSAL is not relevant in L(t), since the prohibition of K&P entails the prohibition of K. Hence, the mootness with respect to DORSAL is, so to speak, a "side effect" of the change in PERIPHERAL (32).

(32) Language change L(pt) > L(t)

	PERIPHERAL FAITH <> *KP	DORSAL FAITH <> *K
L(pt) = IG-1	**yes**	**no**
L(t) = IG-2	**no**	**moot**

Recall that the BCG dialects banned all [peripheral] consonants and turned them to T. This again entails a change of the value of PERIPHERAL from *yes* to *no*, which accounts for the banning of K&P in the language. As mentioned above, L(t) is moot with respect to DORSAL. Essentially, switching PERIPHERAL to *no* is all that is needed for any language to disallow all feature specification under the Place node and admit exclusively T (33).

(33) Language change L(kpt) > L(t)

	PERIPHERAL FAITH <> *KP	DORSAL FAITH <> *K
L(kpt) = MG	**yes**	**yes**
L(t) = BCG	**no**	**moot**

It should be clarified that alternative property analyses are possible. For instance, one could posit two wide scope properties FAITH <> {*K, *KP}.dom (i.e. the *dominant* member of the class given in {}), which decides whether there is neutralization, and FAITH <> *KP, which determines the existence of K&P. The values are presented in (34). This set of crucial rankings, though, predicts that the passage from L(kpt) to L(t) must go through L(pt): one change brings neutralization into play, and another step eliminates K&P. According to this analysis, a direct change from L(kpt) to L(t), as it seems to have happened in the case of BCG, is not predicted, because it is not minimal, as it involves switches in the values of both properties. Although one could not exclude an undocumented intermediate step of the L(pt) type that emerged between MG (L(kpt)) and BCG (L(t)), the analysis in (29) is superior to the one in (34), as it encompasses both this hypothetical possibility and the path suggested by the available data.

(34) Alternative property analysis

	NEUTRALIZATION FAITH <> {*K, *KP}. dom	PERIPHERAL FAITH <> *KP
L(kpt)	no	yes
L(pt)	yes	yes
L(t)	yes	*no*

5. CONCLUSIONS

I explored diachronic PoA shift phenomena occurring in a XT context, and, specifically, the manifestation of such phenomena in the history of the IG dialects. I provided supporting evidence for Rice's (1994) model of a hierarchically organized Place node over a flat structure and showed that it is essential to assume a peripheral node in order to capture the observed PoA shift typology. Through this lens, I offered a typologically oriented OT analysis which showed that the PoA shifts at hand display a directionality from the marked to the unmarked, while the reverse change is impermissible. Crucially, the road to the unmarked can be gradual. For instance, a K segment, which is taken to be marked, does not necessarily need to lose all of its place specifications in order to surface as a default T. Delinking one PoA feature, i.e. [dorsal], suffices to shift to a default peripheral, i.e. P, which is already less marked.

In terms of PT, I extracted the properties that define the generated typological system. The crucial condition that allows or blocks the presence of K in a language was shown to be the ranking between FAITH, on the one hand, and *K, on the other hand (property DORSAL). Moreover, the property PERIPHERAL, that determines the presence or absence of K&P, results from the ranking FAITH <> *KP. In terms of PT, the gradual diachronic change advances by minimal changes of single property values. Specifically, L(kpt) changes to L(pt) by switching the value of DORSAL from *yes* to *no*, and L(pt) changes further to L(t) by resetting PERIPHERAL from *yes* to *no*. Sometimes, one change entails mootness of another property, as in the case of the change from L(kpt) to L(t) with respect to DORSAL.

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REFERENCES

Alber, Birgit. 2015. Microvariation and typological properties. Paper presented at the Workshop on the Formal Structure of OT Typologies, Rutgers University, 29–30 May 2015.

Alber, Birgit, Natalie DelBusso and Alan Prince. 2016. From intensional properties to universal support. Language 92. 88–116.

Alber, Birgit and Marta Meneguzzo. 2016. Germanic and Romance onset clusters – how to account for microvariation. In E. Bidese, F. Cognola and M. Moroni (eds.) Theoretical approaches to linguistic variation. Amsterdam: John Benjamins. 25–51.

Alber, Birgit and Alan Prince. 2015. Outline of Property Theory. Ms. UniVR, Verona / Rutgers University, New Brunswick, NJ.

Alber, Birgit and Alan Prince. in prep. The structure of OT typologies. Ms. UniVR, Verona / Rutgers University, New Brunswick, NJ. (ROA-1381).

Apostolopoulou, Eirini. in prep. Formalizing change and variation in language-contact contexts: Phonological analysis of Italiot Greek. Doctoral dissertation. University of Verona, Verona, Italy/UiT The Arctic University of Norway, Tromsø.

Baertsch, Karen. 2002. An Optimality Theoretic approach to syllable structure: The split margin hierarchy. Doctoral dissertation. Indiana University, Bloomington.

Caracausi, Girolamo. 1990. Lessico Greco della Sicilia e dell'Italia meridionale [Dictionary of Sicilian and Southern-Italian Greek]. Palermo: Centro di studi filologici e linguistici siciliani.

Clements, George N. 1985. The geometry of phonological features. Phonology Yearbook 2. 223–252.

Clements, George N. 1990. The role of the sonority cycle in core syllabification. In J. Kingston and M. Beckman (eds.) Papers in laboratory phonology I: Between the grammar and physics of speech. Cambridge: Cambridge University Press. 283–333.

Clements, George N. and Elizabeth Hume. 1995. The internal organization of speech sounds. In J. Goldsmith (ed.) A handbook of phonological theory. Oxford: Blackwell. 245–307.

Cser, András. 2012. The role of sonority in the phonology of Latin. In S. Parker (ed.) The sonority controversy. Berlin: De Gruyter. 39–63.

Cser, András. 2020. The phonology of classical Latin. Transactions of the Philological Society 118(S1). 1–218.

Danis, Nick. 2017. Complex place and place identity. Doctoral dissertation. Rutgers University, New Brunswick, NJ.

de Lacy, Paul. 2002. The formal expression of markedness. Doctoral dissertation. University of Massachusetts, Amherst, MA.

de Lacy, Paul. 2006. Markedness: Reduction and preservation in phonology. Cambridge: Cambridge University Press.

DelBusso, Natalie. 2018. Typological structure and properties of property theory. Doctoral dissertation. Rutgers University, New Brunswick, NJ.

Green, Christopher, Stuart Davis, Doubacar Diakite and Karen Baertsch. 2014. On the role of margin phonotactics in Colloquial Bamana complex syllables. Natural Language and Linguistic Theory 32(2). 499–536.

Gouskova, Maria. 2001. Falling sonority onsets, loanwords, and syllable contact. In M. Andronis, C. Ball, H. Elston and S. Neuvel (eds.) CLS 37: The main session. Chicago, IL: Chicago Linguistic Society. 175–185.

Hayes, Bruce and Donca Steriade. 2004. The phonetic bases of phonological markedness. In B. Hayes, R. Kirchner and D. Steriade (eds.) Phonetically based phonology. Cambridge: Cambridge University Press. 1–33.

Hume, Elizabeth and Georgios Tserdanelis. 2002. Labial unmarkedness in Sri Lankan Portuguese creole. Phonology 19. 441–458.

Hyman, Larry 1973 The feature [grave] in phonological theory. Journal of Phonetics 1. 329–337.

Itô, Junko. 1986, Syllable theory in prosodic phonology. Doctoral dissertation. University of Massachusetts, Amherst. Published 1988, New York: Garland Publishers.

Itô, Junko. 1989. A prosodic theory of epenthesis. Natural Language and Linguistic Theory 7. 217–259.

Jakobson, Roman, C. Gunnar, M. Fant and Morris Halle. 1952. Preliminaries to speech analysis: The distinctive features and their correlates. Cambridge, MA: MIT.

Jun, Jongho. 1995. Perceptual and articulatory factors in place assimilation: An optimality theoretic approach. Doctoral dissertation. UCLA, Los Angeles, CA.

Jun, Jongho. 2004. Place assimilation. In B. Hayes, R. Kirchner and D. Steriade (eds.) Phonetically based phonology. Cambridge: Cambridge University Press. 58–86.

Karanastasis, Anastassios. 1997. A grammar of the Greek varieties of Southern Italy. Athens: Academy of Athens.

Karanastassis, Anastassios. 1984–1992. Historical dictionary of the dialects of Southern Italy. Athens: Academy of Athens.

Krämer, Martin. 2009. The phonology of Italian. Oxford: Oxford University Press.

Krämer, Martin and Draga Zec. 2019. Coda manners and hierarchies. Ms. University of Tromsø, Tromsø / Cornell University, Ithaca, NY.

Lahiri, Aditi and Henning Reetz. 2002. Underspecified recognition. Laboratory Phonology 7. 637–675.

Lahiri, Aditi and Henning Reetz. 2010. Distinctive features: Phonological underspecification in representation and processing. Journal of Phonetics 38. 44–59.

Lambrinos, Stephanos. 1994. Il dialetto greco salentino nelle poesie locali: testi – note grammaticali – vocabolario etimologico [The Salentinian Greek dialect in the local poems: texts – grammar notes – etymological vocabulary]. Doctoral dissertation. Aristotle University of Thessaloniki, Thessaloniki.

Lombardi, Linda. 1991. Laryngeal features and laryngeal neutralization. Doctoral dissertation. University of Massachusetts, Amherst, MA.

Lombardi, Linda. 2002. Coronal epenthesis and markedness. Phonology 19. 219–251.

Manolessou, Io. 2005. The Greek dialects of Southern Italy: An overview. ΚΑΜΠΟΣ: Cambridge Papers in Modern Greek 13. 103–125.

McCarthy, John. 1988. Feature geometry and dependency. Phonetica 43. 84–108.

McCarthy, John. 2008. The gradual path to cluster simplification. Phonology 84. 271–319.

Merchant, Nazarré and Martin Krämer. 2018. The Holographic Principle: Typological analysis using lower dimensions. In G. Galagher, M. Gouskova and S. Yin (eds.) Proceedings of the 2017 Annual Meeting on Phonology. Washington, DC: Linguistic Society of America.

Murray, Robert W. and Theo Vennemann. 1983. Sound change and syllable structure in Germanic phonology. Language 59. 514–528.

Nicholas, Nick. 2007. The Greek cluster *vɣ* in Southern Italy. Glotta 83. 192–221.
Paradis, Carole and Jean-François Prunet. 1991. Phonetics and phonology 2: The special status of coronals, internal and external evidence. San Diego, New York & Boston: Academic Press.
Prince, Alan. 1997a. Stringency and anti-Paninian hierarchies. Paper presented at LSA Linguistic Institute.
Prince, Alan. 1997b. Endogenous constraints on Optimality Theory. Paper presented at LSA Linguistic Institute.
Prince, Alan. 1999. Paninian relations. Handout from talk at the University of Marburg.
Prince, Alan. 2002. Entailed ranking arguments. Technical report. Rutgers University, New Brunswick, NJ. (ROA-500).
Prince, Alan and Paul Smolensky. 2004. Optimality Theory: Constraint interaction in generative grammar. Malden, MA: Blackwell.
Prince, Alan, Bruce Tesar and Nazarré Merchant. 2017. OTWorkplace. https://sites.google.com/site/otworkplace/home.
Rice, Keren. 1994. Peripheral in consonants. Canadian Journal of Linguistics 39. 191–216.
Rice, Keren. 1996. Default variability: The coronal–velar relationship. Natural Language and Linguistic Theory 14(3). 493–543.
Rice, Keren and Peter Avery. 1993. Segmental complexity and the structure of inventories. Toronto Working Papers in Linguistics 12(2). 131–153.
Rohlfs, Gerhard. 1930. Etymologisches Wörterbuch der unteritalienischen Gräzität. Halle, Saale: Niemeyer.
Rohlfs, Gerhard. 1950. Historisches Grammatik der Unteritalienischen Gräzität. Munich: H. Beck.
Sagey, Elizabeth. 1986. The representation of features and relations in non-linear phonology. Doctoral dissertation. MIT, Cambridge, MA.
Samek-Lodovici, Vieri and Alan Prince. 1999. Optima. Ms. UCL, London / Rutgers University, New Brunswick, NJ. (ROA-363).
Seigneur, Delphine and Claudine Pagliano. 2003. On the Rumanian Kt > Pt shift: Coda lenition or melodic contamination? In T. Geerts, I. van Ginneken and H. Jacobs (eds.) Romance languages and linguistic theory. Amsterdam and Philadelphia: John Benjamins. 327–342.
Steriade, Donca. 1982. Greek prosodies and the nature of syllabification. Doctoral dissertation. MIT, Cambridge, MA.
Szigetvári, Péter. 1994. Coronality, velarity and why they are special. The Even Yearbook 1. 185–224.
Trigo, Lauren. 1988. On the phonological deviation and behavior of nasal glides. Doctoral dissertation. MIT, Cambridge, MA.
Tzitzilis, Christos. 2004. Das Mittelgriechische in Süditalien und das Problem der Herkunft der neugriechischen Dialekte Süditaliens. Byzantina et Neograeca Vindobonensia 24. 464–482.
VanDam, Mark. 2004. Word final coda typology. Journal of Universal Language 5. 119–148.
Vennemann, Theo. 1988. Preference laws for syllable structure and the explanation of sound change: With special reference to German, Germanic, Italian, and Latin. Berlin: Mouton de Gruyter.
Walker, Rachel. 2019. Gradient feature activation and the special status of coronals. Paper presented at the Princeton Phonology Forum, Princeton, NJ, 5 April 2019.
Yip, Moira. 1991. Coronals, clusters, and the coda condition. In C. Paradis and J.-F. Prunet (1991, 61–78).
Zec, Draga. 1995. Sonority constraints on syllable structure. Phonology 12. 85–129.
Zoll, Cheryl. 1996. Parsing below the segment in a constraint based framework. Doctoral dissertation. University of California, Berkeley, CA.
Zoll, Cheryl. 1998. Positional asymmetries and licensing. Ms. MIT, Cambridge, MA.