Morphophonemic Gemination in Latin

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ABSTRACT
Latin is well known for its inflectional morphology, but it also contains a wealth of derivational morphology. In this paper, I examine the gemination that occurs with the addition of derivational prefixes to verb roots. An illustrative and amusing example is the addition of the prefix /in-/ to the root /ruktare/ 'belch' to yield /irruktare/ 'to belch at'. I propose an Optimality Theory account of the phenomenon by appealing to positional faithfulness constraints, and identify some complexities for further discussion.

1. Introduction

As we all know, Latin is a thoroughly dead language. But a good linguistic theory ought to be just as good at examining cadavers as it is at vivisection. In other words, given an extensive fossil record of an extinct language, linguists ought to be able to analyze and explain it just as well as any extant tongue. Given this premise, I will attempt to apply the principles of Optimality Theory (henceforth 'OT') to the dead language of Latin.

Latin is an Italic, Indo-European language that was spoken initially by the Roman people several centuries BC, and eventually by many other European peoples certainly into the Renaissance and Reformation eras. It survived as a liturgical and academic language well after it fell out of vernacular use. It is currently in use as the official language of the Vatican. The *Ethnologue* notes that although there is some effort to revive it, so far it is as a second language only—no communities exist that speak Latin in the home (Gordon 2005).

2. Data

Latin is a language rich in morphology, especially inflectional. On the derivational side of morphology, Latin has a number of prefixes that are used to form new verbs from basic roots. The prefixes are mostly directional or spatial, being themselves derived mostly from prepositions. Some interesting morphophonemic alternations can be observed when new consonant clusters are created by the addition of prefixes. As Table 1 shows, a single verb root can give rise to over a dozen derived stems by the addition of various prefixes. The first line shows the basic verb, *ferre* 'to bring', and the rest of the table is verbs derived from it. Each verb in Latin has four 'principal parts', essential forms from which the rest of the inflected forms can be made. This table and those later in the paper show the four principal parts for each verb.

Table 1: *fero*[1]

1.sg.pres.act.indic.	Pres.act.infinitive	1.sg.perf.act.indic	Perf.pass.ptc.m. nom.sg.	English gloss
fero	ferre	tuli	latus	carry
affero	affere	attuli	allatus	carry towards, bring
konfero[2]	konferre	kontuli	kollatus	carry together
infero	inferre	intuli	illatus	carry in, bring
suffero	suffere	subtuli	sublatus	bear, support, endure
offero	offerre	obtuli	oblatus	bring forward, present
prefero	preferre	pretuli	prelatus	carry before, prefer
antefero	anteferre	antetuli	antelatus	carry in front of
profero	proferre	protuli	prolatus	carry forward, extend
defero	deferre	detuli	delatus	carry down from
postfero	postferre	posttuli	postlatus	carry behind
kirkumfero	kirkumferre	kirkumtuli	kirkumlatus	carry around
transfero	transferre	transtuli	translatus	carry across
perfero	perferre	pertuli	perlatus	carry through

Assimilation is one of the most common processes in the languages of the world, both living and dead. Total assimilation, or gemination, is not as common but can be observed in languages such as Hebrew and Arabic. Table 1 shows nearly all the possible prefixed forms of the verb *ferre* 'to carry'. This is a useful verb because its four principal parts are suppletive and have different initial consonants, producing different results of gemination even with the same prefix. The first row in the table shows the original unprefixed form. The rows from *affero* to *offero* show forms with prefixes whose final consonant assimilates totally to the initial consonant of the root. The rows from *prefero* to *postfero* show forms with prefixes in which no gemination takes place, in some cases simply because the prefix ends in a vowel.
Table 1 shows different prefixes with the same root verb. The prefix-final consonants that geminate are [d], [b], and [n]. Table 2, Table 3, and Table 4 show different root verbs with the same prefix segment to demonstrate which root-initial consonants result in gemination.

[1]Data for this paper were gathered from *Langenscheidt's Pocket Latin Dictionary*, and in some cases checked with the *Dictionary of Ecclesiastical Latin*. See References for full citations.

[2]In Latin orthography, the first letter of this word is a 'c'. The data here is represented in IPA equivalents. I follow Lord's conclusions on the pronunciation of 'c' as always [k] (not the affricate [tš] as in later church Latin pronunciation) and 'v' as [w] when in consonantal positions.

Table 2: Prefixes ending in [b]

Underlying	1.sg.pres.act.indic.	Pres.act.infinitive	1.sg.perf.act.indic	Perf.pass.ptc.m. nom.sg.	English
sub+mitto	summitto	summittere	summisi	summissus	put down, to place under
sub+kurro	sukkurro	sukkurrere	sukkurri	sukkursus	run under, support
sub+gredior	suggredior	suggredi	suggressus sum	(no form)[3]	approach
sub+pliko	suppliko	supplikare	supplikawi	supplikatus	bow down to, worship
sub+fero	suffero	suffere	subtuli	sublatus	bear, support, endure
ob+fero	offero	offerre	obtuli	oblatus	bring forward, present
ob+kurro	okkurro	okkurrere	okkurri	okkursus	to run to meet, attack
ob+gannio	ogganio	oggannire	ogganiwi	ogganitus	to growl at
ob+pono	oppono	opponere	opposui	oppositus	to set against, to oppose

[3]This verb is deponent, so the perfect passive participle is actually used to form the 1st person perfect active indicative in the previous column.

Table 3: Prefixes ending in [d]

Underlying	1.sg.pres.act.indic.	Pres.act.infinitive	1.sg.perf.act.indic	Perf.pass.ptc.m. nom.sg.	English
ad+narro	annarro	annarrare	annarrawi	annarratus	relate (a story)
ad+porto	apporto	apportare	apportawi	apportatus	carry towards
ad+klamo	akklamo	akklamare	akklamawi	akklamatus	shout at
ad+kwiesko	akkwiesko	akkwieskere	akkwiewi	akkwietus	come to rest, be content
ad+gredior	aggredior	aggredi	aggressus sum	(no form)[4]	approach, attack
ad+signo	assigno	assignare	assignawi	assignatus	assign, commit
ad+rideo	arrideo	arridere	arrisi	arrisus	laugh at
ad+sum	assum	adesse	adfui	(no form)[5]	be present
ad+fero	affero	affere	attuli	allatus	carry towards, bring

[4]This verb is deponent.

[5]It is difficult for me to conceive the meaning of a passive form for a verb of being like /adsum/ . Whether for this reason or for others, it was grammatically impossible for the Romans to produce such a form; hence this cell in the table is empty.

Table 4: Prefixes ending in [n]

Underlying	1.sg.pres.act.indic.	Pres.act.infinitive	1.sg.perf.act.indic	Perf.pass.ptc.m. nom.sg.	English gloss
in+fero	infero	inferre	intuli	illatus	carry in, bring
in+rukto	irrukto	irruktare	irruktawi	irruktatus	belch at
in+porto	importo	importare	importawi	importatus	carry in
kon+latro	kollatro	kollatrare	kollatrawi	kollatratus	to bark at, abuse
kon+rideo	korrideo	korridere	korrisi	korrisus	laugh about
kon+puto	komputo	komputare	komputawi	komputatus	sum up
kon+memoro	kommemoro	kommemorare	kommemorawi	kommemoratus	to keep in mind

These tables show that the [d] in *ad-* assimilates totally before the root consonants [f], [g], [k], [l], [n], [p], [r], [s], and [t]. The [b] at the end of *sub-* and *ob-* assimilates before the root consonants [f], [g], [k], [m], and [p]. The [n] at the end of *in-* and *kon-* assimilates totally before only [r] and [l], and assimilates in place to other nasals.

3. OT Account of Gemination

OT accounts for phonological processes using crucially ranked constraints that filter out output candidates until the correct one is selected. The Obligatory Contour Principle discourages geminates across the world's languages. A constraint *GEMINATE, basically stating that geminates are bad, can be used to capture this trend. In Latin, however, this constraint is obviously dominated by some other constraint because the geminates do in fact occur in the output. This role can be filled by a constraint AGREE(F). AGREE in general is typically used to motivate assimilation of a certain feature within a cluster (see Lombardi 1999). Here, though, it needs to address all the features, since the process at hand is one of total assimilation, not just voicing or place. AGREE(F) is violated any time a consonant cluster occurs in which the consonants are not identical in all features. The effect of unmitigated AGREE(F) domination would be a language with only single consonants or geminates but no complex clusters. The following tableau shows AGREE(F) dominating *GEMINATE to select the correct output.

(1) AGREE-F » *GEMINATE

/sub-port-o/[6]	AGREE-F	*GEMINATE
[subporto]	*!	
☞ [supporto]		*

AGREE-F in turn must be dominated by one or more other constraints, since obviously not all the consonant clusters in the data are geminate. Faithfulness constraints tend to protect root segments more than affix segments. “Root morphemes […] exhibit privileged behavior in the presence of phonological alternations, triggering or failing to undergo processes which affect affixes” (Beckman 1999: 191). The positional faithfulness constraint IDENT(F)-ROOT is violated any time an input element in the root is changed in any way. As with AGREE, IDENT is typically used to motivate assimilation with respect to a single feature, but here I add the (F) to include all features. This explains most cases of non-identical consonant clusters.

(2) IDENT(F)-ROOT » AGREE(F)

/sub-porto/	IDENT(F)-ROOT	AGREE(F)
[subporto]		**!
☞ [supporto]		*
[suppotto]	*!	

IDENT-F(root) is ranked higher than the general faithfulness constraint, IDENT-F, which is violated when an input element of any sort is changed with respect to any feature. The prefix consonant always assimilates to the root consonant, never the other way around.

(3) IDENT(F)-ROOT » IDENT(F)

/sub-porto/	IDENT(F)-ROOT	IDENT(F)
☞ [supporto]		*
[subborto]	*!	*

Combining the crucial rankings thus far, we get a summary tableau as follows:

(4)

/sub-porto/	IDENT(F)-ROOT	AGREE(F)	*GEMINATE	IDENT(F)
[subporto]		**!		
☞ [supporto]		*	*	*
[suppotto]	*!		**	*
[subborto]	*!	*	*	*

Finally, the following tableau shows the verb [suborno] ‘to furnish or supply’ in which the root begins with a vowel and no gemination occurs, demonstrating that this ranking of constraints can select the correct output for those cases too.

[6]The underlying forms involve more morpheme breaks. Here we are only concerned with processes surrounding the break between the prefix and the root, so to maximize simplicity I have only included the essential morpheme breaks.

(5) Vowel-initial root

/sub-orno/	IDENT-F(root)	AGREE(F)	*GEMINATE	IDENT(F)
☞ [suborno]		*		
[subborno]		*	*!	
[subonno]	*!			*

A residual issue in this initial explanation is that there are a couple of prefixes (*kirkum-*, *ante-*, *post-*) whose consonant clusters do not agree in all features. The ranking I proposed above would not be able to account for these, since AGREE dominates IDENT for non-root segments. For now, these will have to be left as lexical exceptions.

4. Further Complexity

The tableaux above explain the phenomenon of gemination in general. What remains to be explained is the selective behavior of the prefix consonants. Not all root-initial consonants induce gemination for a given prefix-final consonant, and the list of the gemination-inducing root consonants differs depending on the prefix consonant. This is a fairly difficult matter.

Table 5 below shows which root consonants induce gemination with each prefix consonant and which root consonants occur with the prefix consonant but do not induce gemination.

Table 5: Gemination Patterns

Prefix segment	Geminates before a root-initial __.	Does not geminate before root-initial __.
[d]	f, g, k, l, n, p, r, s, t	b, h, m, w
[b]	f, g, k, m, p	d, h, l, n, r, s, t, w
[n]	r, l	d, f, g, h, k, s, t, w
[r]	(none)	(all with which it occurs)

Capturing these patterns using OT principles requires significant additions to the tableaux, not all of which will be covered in this paper. I begin with the most restrictive pattern. There is a prefix [per-] (see Table 1) that never assimilates to the initial consonant of a verb root. This can be explained by the Syllable Contact Law, which apparently goes back to Murray & Venneman (1983). This principle states that when a coda consonant contacts an onset consonant in the next syllable, the coda consonant should be high in sonority but the onset should be low in sonority. Since [r] is already very high in sonority, it resists gemination. This principle could be made into a constraint and ranked above some of the others, but it would require some complicated wording to define the appropriate level of sonority so as not to exclude other prefix consonants that do geminate. Since this only affects the segment [r], I will skip tableaux and move on to the other consonants.

In the prefixes *in-* and *kon-*, [n] geminates only before other sonorant consonants.[7] Here AGREE-F must be dominated by IDENT-F to eliminate gemination with non-sonorants. I invoke the specific agreement constraint AGREE(F)-SON ranked above IDENT-F. AGREE(F)-SON states that when a consonant cluster involves two sonorant consonants, they must be identical in all features. The two following tableaux show *kon-* before a sonorant in /kon-latro/ 'I bark at' and before an obstruent in /kon-sudo/ 'I sweat profusely'. The constraints as ranked here can select the correct output for both types of verb roots.

[7] [n] also exhibits place assimilation before other consonants. It is realized as [m] before [b] and [m] and as [ŋ] before [k] and [g]. However, this can be treated as a separate process and is not directly related to the gemination discussed here.

(6) AGREE(F)-SON » IDENT-F before a sonorant

/kon-latro/	IDENT-F(root)	AGREE(F)-SON	IDENT(F)	*GEMINATE	AGREE(F)
konlatro		*!			**
☞ kollatro			*	*	*
konnatro	*!		*	*	*
kollatto	*!		*	**	

(7) AGREE(F)-SON » IDENT-F before an obstruent

/kon-sudo/	IDENT-F(root)	AGREE-F(son)	IDENT-F	*GEMINATE	AGREE-F
☞ konsudo					*
kossudo			*!	*	
konnudo	*!			*	

In an extensive paper entitled “Sonorancy and Geminacy,” Shigeto Kawahara (1995:1) claims that “geminate sonorants are cross-linguistically marked, and furthermore, that the relative sonority of a geminate positively correlates with its markedness, i.e., the universal ranking *GEMGLIDE » *GEMLIQUID » *GEMNASAL holds”. The Latin data examined here supports this claim. If geminate sonorants are indeed more marked than other types of geminates, it makes perfect sense that [r] and [n] exhibit the most restricted gemination behavior. It also motivates the tendency for [r] to geminate even less than [n]. Kawahara proposes that this pattern is due to the perceptual difficulty of hearing contrastive length in sonorants. If it is more difficult to distinguish the segmental length of sonorants, then it is likely that languages will end up avoiding contrastively long sonorants. This tendency combined with the Syllable Contact Law discussed above can effectively explain why the Latin sonorants geminate less freely than other consonants.[8]

I move now to the consonants that geminate more freely. The formalism would get pretty complicated here, because several natural classes are involved. As Table 5 shows, [d] geminates with all other coronal consonants, as well as the obstruents [f], [g], and [k]. It does not geminate with voiced labials, but it does with the voiceless labials [f] and [p]. The segment [b] geminates with non-coronal obstruents, with the exception of a few verb roots that begin with [r]. Both [d] and [b] geminate with a nasal that corresponds to their place of articulation, but not with the non-corresponding nasal. Neither geminates with [h] or [w], but those are both [-consonantal] and can be considered exceptional.

To account for these patterns formally, we would need specific agreement constraints. Something like AGREE(cor) could specify that clustered consonants that share the same value of [coronal] must agree in all other features. This would capture the trend of [d] geminating with coronals but [b] avoiding it. The limited gemination of [n] would be exceptional, but some constraint related to Kawahara’s gemination hierarchy could be invoked to account for it. It would be downright difficult to explain why [d] geminates with the voiceless labials [f] and [p] and would require a very specific constraint to outrank AGREE(cor). Gemination with [g] and [k] would be difficult to motivate for both prefix consonants. A complete account of this phenomenon would need to set up elaborate tableaux to predict these patterns accurately, but my discussion will have to end here.

[8]Interestingly, the [m] in the prefix *kirkum-* never geminates, even with liquids, unlike the [n] at the end of the other prefixes discussed above. It also does not exhibit place assimilation like [n] does. It may be that Kawahara’s hierarchy can be further specified, so that gemination of labial nasals is even more marked than that of other nasals, Alternately, *kirkum-* may be a lexical exception.

5. Concluding comments

This paper has at the very least demonstrated that the deadness of Latin does not hinder OT from analyzing it. The approach of selecting certain violable constraints and ranking them in a particular order provides a fairly simple and elegant solution to the general process of gemination in Latin, just as it would for any living language. The complexity of the phenomenon I have examined, on the other hand, does cause some trouble. I have full confidence, however, that a more extensive investigation could account for it adequately and thus maintain and even further the honor and glory of Optimality Theory.

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