The cycle without containment: Latin perfect stems

Donca Steriade

Abstract

The stems of all perfect forms of Latin are systematically similar to each other, and distinct from all other verbal forms. Despite their similarity, they have no affix in common: the perfect participle uses different markers from the non-participial perfect forms. I show that in the absence of a general perfect affix Latin marks the aspectual identity of all perfect forms through the global shape similarity between their stems. Stem similarity is enforced by asymmetric Base-Derivative correspondence constraints (Benua 1997), with one significant modification: correspondence between expressions is based on shared syntactic properties, without any condition of subconstituency between the Base and its Derivative. The fact that phonological similarity can be asymmetrically enforced in quasi-cyclic fashion between exponents that lack shared affixes is predicted by this change in the theory of cyclic inheritance (Chomsky, Halle and Lukoff 1956), and supports it against competing mechanisms.

February 27 2012

1. Introduction

In a typical inflectional system, a set of functional heads or syntactic feature values is associated with a set of exponents, or morphs. Inflected words are created by concatenating these morphs to roots. The result are inflectional paradigms in which, for some sets of forms, partial syntactic identity and phonological similarity go together. The Latin verbs in (1) illustrate this:

(1) Perfect aspect in Latin indicative forms

	Present	Past	Future
a. Perfect	*aud–ī–v–i–mus* 'we have heard'	*aud–ī–v–erā–mus* 'we had heard'	*aud–ī–v–er–i–mus* 'we will have heard'
b. Non-perfect	*aud–ī–mus* 'we are hearing'	*aud–ī–ēbā–mus* 'we used to hear'	*aud–ī–ē–mus* 'we will hear'

The forms in each row have identical aspect: [+perfect] for (1.a), [non-perfect] or no value, for (1.b). One aspect value comes with its own morph: *–v* for [+perfect], in verbs. As a result, the forms in (1.a) share a substring, the stem [*aud–ī–v*]. By default, the set in (1.b) also shares a stem, [*aud–ī*]. Patterns like (1) are the expected result when one syntactic property is expressed by a unified morph.

In other cases, syntactic features lack dedicated, unified exponents. In their absence, the forms that share these features may differ phonologically. Latin tense illustrates this second possibility. Each verb distinguishes past, future and present forms, in two aspects and two moods, but the full set of past tense forms has no common morph to stamp them all as [+past], and neither do the future and present sets. The data in (1) shows that past tense is diversely marked by *–ēbā* in the non-perfect indicative and by *–erā* in the perfect. Future markers vary with aspect, with *–ē* in the non-perfect and *–er* in the perfect; the present is not marked at all.

Current morphological theory can analyze both the case of one-to-one correspondence between a syntactic structure and a morph (e.g. verbal [perfect] ↔ *–v*), and the one-to-many case (e.g. [past] ↔ *–ē*/_ [perfect]; [past] ↔ *–erā* /_ elsewhere[1]). This study explores a third case, less well-understood but more revealing: a subset of forms share a syntactic feature, and this feature lacks a unified exponent, as the Latin past tense does, yet all forms bearing this feature in an

[1] This formalization is inspired by Distributed Morphology (Halle and Marantz 1993), but the statement made in the text holds more generally.

inflectional paradigm have stems that remain phonologically similar to each other. The similarity is systematic and goes beyond what the morphemic composition and the phonology would warrant. In this pattern, the similarity between stems functions as a substitute for a missing affix. In the preliminary examples in (2) below, the stem common to the perfect forms is in square brackets. The perfect stem [*mō(v)-*] is marked by three properties absent in non-perfect forms: it is monosyllabic, it has a long vowel, and it lacks the theme vowel (abbreviated TV).

2. A feature lacking an affixal exponent: Latin perfect aspect in verbal and participial forms.

	Verbal		Participial
Perfect	[*mōv*]–*i*–*mus* [Root$_{perf}$]-1st pl 'we have moved'	[*mōv*]–*is*–*se* [Root$_{perf}$]-Past-Infinitive 'to have moved'	[*mō*–*t*]–*us* [Root$_{perf}$-PerfPart]-NomSg 'which has been moved'
Non-perfect	[*mov*–*ē*]–*mus* [Root-TV]–1st pl 'we move'	[*mov*–*ē*]–*re* [Root–TV]–Infinitive 'to move'	[*mov*–*ē*]–*n(t)*–*s* [Root–TV]–Part-NomSg 'moving'

I will show that some of the properties marking the perfect stem are phonologically predictable in verbal forms. The participle adopts these properties even though the factors that motivate them in the verbal forms are absent from its stem. It is this transfer of predictable phonological properties that this study analyzes.

The mechanism that implements this transfer is related to cyclic inheritance (Chomsky, Halle, Lukoff 1956), but does not reduce to it. As in standard cyclic phenomena, we will observe an asymmetry between a *Base*, a form that in cyclic models is generated on an early pass through the grammar, and forms generated on later rounds, using information provided by the base. I call the latter *Derivatives*, extending this term to the inflectional domain. In cyclic accounts, the base, once generated, is stored in a derived lexicon (Halle 1975; Kiparsky 1982) and acts as a reference term in the computation of its derivatives. This two-step recursive arrangement insures that bases asymmetrically influence their derivatives: to resemble their bases, the derivatives become more marked phonologically, or less faithful to their underlying forms, or both; bases, on the other hand, are unaffected by the existence or shape of their derivatives. This is the base-priority effect, a well-documented aspect of the standard cyclic relation (Benua 1997, Kiparsky 2002). We will observe it in our Latin case as well.

A direct way to model base priority is to let derivatives inherit the phonological information contained in their bases. This effect is built into the grammar if we adopt the cyclic architecture proposed by Chomsky, Halle and Lukoff (1956). This architecture can be maintained in the OT context (Kenstowicz 1996, Kiparsky 2002): bases are subconstituents of their derivatives, and the phonology evaluates constituents, working from the innermost one outwards, forcing later evaluations to inherit the results of earlier ones.

The interest of our Latin case is that something like a Base-Derivative relation obtains between the participial and verbal perfect stems, and yet neither stem is contained in the other. This is seen in (2) and is confirmed by analysis below: the verbal stem [*mō–v*] is not contained in the participial stem [*mō–t*], nor the other way around. The systematic similarity between these stems can't be derived through normal cyclic inheritance.

Overall, the Latin paradigms we analyze will require the same modification of the cyclicity mechanism as the dependencies documented by Burzio (2005), Albright (2005), McCarthy (2005), Kenstowicz (2005), Steriade (1999a,b, 2008), Steriade and Yanovich (2011), Yanovich and Steriade (2010) and others, all of which involve phonological similarities between pairs of forms in which neither is contained, syntactically or morphologically, in the other. The needed modification consists, in a nutshell, in generating form-to-form similarity via Output-to-Output (O-O) correspondence constraints on pairs of expressions that share syntactic properties, but where neither need be a subconstituent of the other (Steriade 2008).

This contrasts with the leading O-O proposal, Benua's (1997), which maintains Chomsky, Halle and Lukoff's hypothesis that constituent structure and containment constrain the mechanism producing the similarity between bases and their derivatives. Benua limits the relations that model cyclicity to forms consisting of an affixed word [[W]-Aff] and its inner constituent [W][2]. The phenomena we analyze argue against this limitation: they suggest instead that the cyclic phenomena, originally thought to support the idea of containment-based inheritance in the word domain, are only special cases of a more general mechanism through which lexically related words influence each other's shape.

After a section of background on the morpho-phonology of Latin verbs, section 2 shows that the perfect participle and verbal forms are marked by disjoint sets of affixes. We have no reason to expect then that their stems will be more similar than those of other forms. Against this

[2] "I propose that the affix's subcategorization frame also specifies the OO-correspondence relation that links the affixed output in a paradigmatic identity relation. This provides a direct connection between morphological derivation and phonological identity relations, *preventing identity relations between randomly-selected words*. Because of their link with morphological subcategorization frames, *OO-correspondence relations compare a morphologically-derived word and its base, and not other kinds of word pairs*." (Benua 1997:30, italics mine, DS).

expectation, sections 3 and 4 show that all perfect stems, participial or verbal, are constrained to be similar. The similarity between perfect stems is asymmetrically enforced: properties phonologically justified in the verbal perfect are extended to the *t*-participle, where their original motivation is missing. The paper concludes with a summary of comparable phenomena elsewhere in Romance.

The generalizations proposed here come from searches in the Perseus Digital Library at http://www.perseus.tufts.edu/hopper/, augmented by the findings of standard reference works. They include a number of previously unreported patterns.

2. Background

2.1. Verbal stems in Latin

Latin verb forms fall into two aspectual classes, the *perfectum* 'completed' and the *infectum* 'not completed' (Brugmann 1895; Ernout and Thomas 1972; Hoffman and Szantyr 1971). In the *perfectum,* the morphology provides a further subdivision between, on the one hand, a verbal noun (the supine) plus two adjectival forms (the perfect and future participles) and, on the other hand, a large set of verbal forms comprising tensed verbs and the infinitive. The *infectum* stem is used in tensed verbs, infinitives and the present active participle. There is no form functioning as a present passive participle; or as a perfect active one (Brugmann 1895). Table (3) illustrates the morphological markers that distinguish the three stems. In each column, stems are listed in underlying, morphologically decomposed form; each is followed by a surface form. The term *echt-verbal* (EV) refers to the set containing tensed verb forms and the infinitive. The term *participial* includes in its reference the supine.

3. The three stems of Latin verbs (tensed forms are shown in the 1st plural indicative)

	root	*infectum*		*perfectum*			
				Echt-verbal (EV) forms		Participial	
a.	aud– 'love'	aud–ī–	audīmus	aud–ī–v–	audīvimus	aud–ī–t–	audītus
b.	hab– 'have'	hab–ē–	habēmus	hab–u–	habuimus	hab–it–	habitus
c.	caed– 'cut'	caed–	caedimus	ce–caed–	cecīdimus	caed–t–	caesus
d.	ag– 'drive'	ag–	agimus	ēg–	ēgimus	ag–t–	āctus
e.	dūc– 'lead'	dūc–	ducimus	duc–s–	duximus	duc–t–	ductus
f.	gnō–'know	gnō–sc–	gnōscimus	gnō–v–	gnōvimus	–gni–t–	gnitus

g.	vic– ‘win’	vinc–	vincimus	vīc–	vīcimus	vīc–t–	victus
h.	pet– ‘seek’	pet–	petimus	pet–ī–v–	petīvimus	pet–ī–t–	petītus

(3) illustrates the fact that the three verb stems are frequently distinct, because the affixes forming them are. *Infectum* forms are produced by suffixing a theme vowel (3.a-b), an *–esc, –isc* or *–sc* formative that is frequently stative or inchoative (3.f), an *–n* that appears as an infix when the phonotactics allow it (3.g), and, frequently, nothing (3.c-e, g-h). Echt-verbal perfect forms are marked by *–u/–v* (3.a-b, f,h), by *–s* (3.e), reduplication (3.c), vowel lengthening (3.d, g), or ablaut plus lengthening (3.d). The perfect participle stem is marked by *–t* and its variant *–it* (3.b), with apparent and real exceptions discussed below.

For this paper’s main argument, the central fact revealed by table (3) is that neither perfect stem is contained in the other: no participles like *[*dux–it*]*–us* exist, with the EV *dux–* stem inside the participial stem (cf. 3.e); no EV forms like *[*gnit-u*]*–imus* have participial stems like *gnit–* inside the EV stem (cf. 3.f). The morphology of Latin appears to generate each independently of the other. The main finding of fact reported here is that this is not so: the *t*-participle is built, in a sense to be made precise, on the EV perfect.

Table (3) also suggests that it is not possible to predict what stem-formation strategy will be used in the *infectum* or the EV *perfectum*, or to predict one stem from the other. This impression must also be corrected: a majority of EV perfect stems can be predicted from choices made in the *infectum*, along with other factors.

Latin verbs are divided into conjugation classes (Aronoff 1994, Halle and Embick 2005). Verb forms in the thematic conjugations, (3.a-b), contain a lexically selected theme vowel, *ī* or *ē,* or *ā*, placed before the first inflectional suffix: e.g. *aud–ī–s* ‘you hear’, *aud–ī–re* ‘to hear’, *aud–ī–v–isse* ‘to have heard’[3]. The athematic verbs, (3.c-h), attach inflectional suffixes to the root or separate them by a non-morphemic *i*. Most verbs fall into the *ā* (1st) and *ī* (4th) conjugations, but many common verbs belong to the remaining groups. The majority of verbs in the productive *ā* and *ī* conjugations keep their theme vowels in all three stems, (3.a). For all other verbs, no theme vowels need appear at all, or they appear in one stem, typically the *infectum*, (3.b); exceptions – e.g. theme vowels in the *perfectum* only – occur as well, (3.h). There are constraints on this distribution which bear on our argument, to be examined in section 4.

[3] Cf. Halle and Embick (2005) for proposals on the context where theme vowels are inserted.

2.2. The syntax of the Latin perfectum

Both the perfect participle and the EV perfect forms refer to completed events. But they are distinct in their argument structure, lexical category and other aspects of their syntax. This explains the fact that the distinction between the participial suffix *–(i)t* and the EV morphs was maintained throughout Latin and into Romance (with an exception class analyzed in section 5.1). The difference between exponents was generally maintained because it reflected syntactic differences between the two categories. In the present context, the key point is that the syntactic distinctness of the two *perfectum* categories explains why neither stem contains the other.

The perfect participles and the supines reflect a change in the verb's argument structure: they are derived intransitives, somewhat like passivized verbs, and unlike the EV perfects. Even the so-called active perfect participles like *pransus* 'having lunched' are intransitive: one can't say *pransus ovem* 'having lunched on mutton' with an Accusative marked direct object, even if the verb is transitive[4]. Perfect active participles express the theme argument of their verb by assigning Genitive case to it, e.g. *magnae habitus auctoritatis* 'possessed of great authority'[5]. In this they differ from EV perfects or the present participle, which assign Accusative. As for the supines, these are nominals with uses that are clearly passive (e.g. *herbas formidulosas dictu, non essu modo,* 'herbs terrible to talk about, not just eat'[6]) or, in the case of the *–um* supines, voice neutral or passive (e.g. *sperat se absolutum iri* 'hopes to be acquitted')[7]. The entire category of the supine is generally assumed to be voice-neutral (e.g. Letoublon 1983), unlike the active *infectum,* which requires overt passive affixes to convey a change from the active voice. There is a third form listed in grammars as using the participial *t*-stem: the future active participle, e.g. *factūrus* 'who will be making', cf. *factus* 'made'. This form is clearly transitive but it has no perfect aspectual value[8] and should thus be treated as a deverbal derivative that's syntactically independent of the perfect system, on a par with the large class of deverbal forms that appear to use the perfect participle's stem without being either perfective or participial. The formal identity between the perfect participle's stem and the latter class of forms, including the –

[4] E.g. *prandere luscinias* 'to lunch [on] nightingales', with Accusative after the infinitive, Horace, Satires, 2,3, 245.
[5] Caesar, *De Bello Gallico*, 7, 77.
[6] Plautus, *Pseudolus*, 3, 2.
[7] Cicero, *Pro Sulla*, 7
[8] E.g. *ante ludos votivos quos C.Pompaeus factūrus est* ('before the votive games that Cn. Pompaeus is going to be celebrating') in Cicero, *In Verrem* 1.1.31.

tūrus participle, is analyzed by Aronoff (1994) and Steriade (2011). This summarizes the voice differences between the perfect forms[9].

The aspectual difference between the participial and the EV perfect involves the permanence of the state achieved through the completed action: perfect participles tend to refer to long-term or permanent consequences. Thus the participle *habitus* used in the non-passive sense of 'having acquired' means 'having acquired for the longer term', hence 'weighty, corpulent.' Similarly *perītus* means 'skillful, expert' and not just 'having experienced something'. These seem individual–level properties. The sense of permanence is missing in the EV perfect and the present participle, which describe only the temporary involvement in an event.

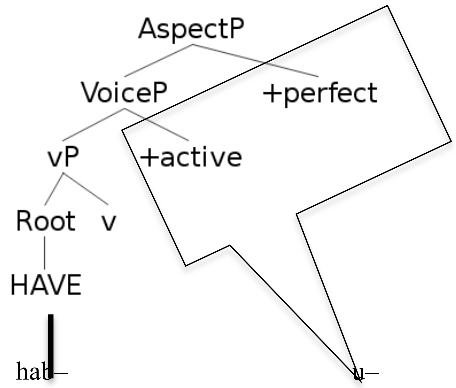
Finally, the perfect participle and supine are an adjective and a noun, respectively, and thus differ in lexical category as well from the EV perfect set.

It remains unclear which one of these three syntactic properties distinguishing the EV-perfect from the non-verbal forms is a consequence of the other, or if they're independent differences. For the analysis, I will refer arbitrarily to just one of them, the voice, or [±active] feature: I claim that the *–(i)t* suffix is simultaneously an exponent of the aspectual feature [Perfect] and of the voice feature [-active], meaning *intransitive*; and that the EV perfect affixes express both the [Perfect] feature shared with the participle and the non-shared [+active], where [+active] is defined as *potentially transitive*. The association between syntactic structure and exponents is illustrated below. The analysis remains the same if other unshared features between these forms are substituted for or added to [±active].

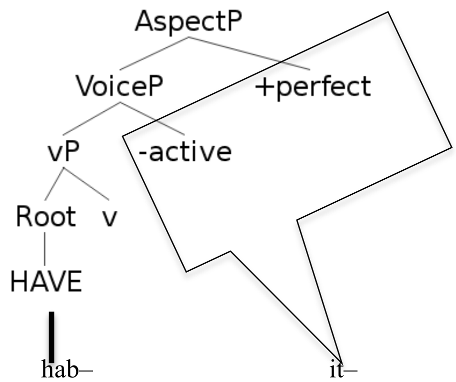
[9] All the remarks above hold of the perfect participles of non-deponents. In deponent verbs, both the present and the perfect participle can be transitive: on this, see Embick 2000. More generally, all periphrastic constructions can be transitive: e.g. *secutus sum eos* 'I have followed them'. I assume that transitivity in this case is a property introduced in, or licensed by, the auxiliary verb.

4. Relation between syntactic properties and exponents of the perfect

a. EV perfect stem: [hab–u–], as in *habuisse* 'to have had'



b.Participial perfect stem: [hab–it–], as in *habitus* 'having had', 'having acquired'



The phonological similarities between pairs of stems like [*hab–u*]–, [*hab–it*]– will be atttributed to correspondence triggered by the shared [+perfect] feature. The fact that these stems cannot become strictly identical will be traced to the fact that each affix also expresses one or more unshared syntactic features: merging the two stems would eliminate their exponents.

2.3.Phonologically conditioned alternations

Some of the differences between the three stems can be predicted by straightforward phonology. Latin obstruents assimilate in voicing (5.a-b). Devoicing of a stop may cause preceding vowels to lengthen, (5.b). Coronal stops trigger an unusual change when they precede an affixal obstruent, [s] or [t]: /d–t/, /t–t/ or /t–s/ turn into /ss/, (5.c-d, g). If the preceding nucleus is long, a geminate, including an expected [ss], simplifies to a singleton (5.e-f, h); this happens whether [ss] was derived through coronal merger (5.e-f) or via concatenation of underlying /s/'s, (5.h). The long vowel that conditions geminate reduction may be derived through devoicing (5.f). Geminates simplify after a consonant, (5.g). Intervocalic /s/ becomes [r], (5.h); geminate simplification follows this process, making it opaque (5.d-h). Clusters of sonorant-stop simplify before obstruents, optionally, and later obligatorily (5.i). Short /a/, /e/ reduce to /i/ in non-initial open syllables, to [e] in closed; non-initial diphthongs likewise reduce (cf. /ae/ -> [ī] in (3.c)).

These processes are all well-motivated but differ in regularity: voicing asimilation works across the board; [ss]-merger affects all, but only, stem-suffix combinations; the [s] rhotacism is fully general in suffixing contexts, but opacity and a restriction to derived environments prevent it from being surface true; finally, lengthening–via–devoicing and non-initial vowel reduction are just plain unpredictable in classical Latin, (5.d) vs. (5.f).

5. Illustrations of phonological processes

	Infectum	Echt-verbal (EV) *perfectum*	Perfect participle	Gloss
a.	scrib–i–mus	scrip–s–imus	scrip–t–us	'write'
b.	ag–i–mus	ēg–i–mus	ag–t–us [āctus]	'drive'
c.	pat–i–mur	-	pat–t–us [passus]	'suffer'
d.	cēd–i–mus	ced–s–i–mus [cessimus]	ced–t–us [cessus]	'step back'
e.	ūt–i–mur	-	ūt–t–us [ūsus]	'use'
f.	ed–i–mus	ēd–i–mus	ed–t–us [ēsus]	'eat'
g.	mord–ē–mus	mord–s–i–mus [morsimus]	mord–t–us [morsus]	'bite'
h.	haus-i-mus [haurimus]	haus–s–i–mus [hausimus]	haus–t–us [haustus]	'draw water'
i.	farc–i–mus	farc–s–i–mus [farsimus]	farc–t–us [far(c)tus]	'stuff, cram'

Further alternations affect other formatives. Vowels shorten before other vowels, e.g. *aud–i–ō* < /*aud–ī–ō/,* (cf. *aud–ī–mus*), with some paradigmatic exceptions; they also shorten before all non-strident final Cs, e.g. *aud–i–t* < /*aud–ī–t/* (cf. *aud–ī–s*), and certain clusters. Some *perfectum* suffixes alternate: the glide [w], written <v>, as in *aud–ī–v–imus* (3.a), is in complementary distribution with [u], as in *hab–u–i–mus* (3.b). Appendix 1 analyzes in greater detail the phonology of [u].

Verb roots undergo some changes whose mechanisms remain completely opaque in the classical language. We are interested in these insofar as they differentiate the three stems:

6. Vocalic alternations between verbal stems

a.	ell/_V ~ ul/_C	pell–i–mus	pe–pul–i–mus	pul–s–us	'push back'
b.	Cer ~ CrV:	spern–i–mus	sprē–v–i–mus	sprē–t–us	'separate'

Verbs whose *infectum* contains a geminate liquid have opaque *–s* perfect participles:

7. Geminate liquids vs. liquid-s sequences

a.	ll ~ ls	fall–i–mus	fe–fell–i–mus	fals–us	'trip up'
b.	rr ~ rs	verr–i–mus	verr–i–mus	vers–us	'sweep'

The [ls] sequence in (6.a, 7.a) came from [ld–t] by processes reviewed above because *fall–, pell–* came from *fald–, peld–*; however [ld] is not recoverable in the classical language. The source for [rs] in items like *versus* (7.b) is probably /rs-t/ (Kühner and Holzweissig 1966: 200): [rst] is unattested inside stems, but its underlying presence in *versus* is synchronically opaque.

The data in (6.a-7) is significant because it shows that some core verbs of the Latin lexicon had *s*–participles that could not be synchronically traced to the familiar *t*–suffix. This established *–s* as a further variant of the *–t/–it* participial suffix. One effect of the perfect uniformity conditions documented here will be to further expand this class of *s*–participles.

3. Exponents of the perfect

In the next sections I analyze the phonological structure of the participial and EV perfect stems, documenting systematic similarities between their surface forms. I show that these similarities have the directional character typical of a Base-Derivative relation. The prosodic structure of the EV perfect stem emerges as largely predictable; this predictable prosodic structure, though not its conditioning morphemes, is transmitted to the participial perfect stem.

The verbal system of classical Latin is in a transitional state, halfway between the inherited IE system, where what would later become the perfect participle was still an adjective independent of other verb forms (Brugmann 1895), and a much later Romance endpoint, when the perfect participle and the EV perfect had established a tight formal connection. I locate first the classical system in this longer-term development and then proceed to its analysis.

2.1. The historical sources of the Latin perfect

The historical source for the morphology of the EV perfect is a mix of old perfect and old aorist formatives, plus morphs from unidentified sources (Ernout 1953:187ff, Monteil 1970:302ff). These function in the classical language as equivalent markers of the perfect in EV forms.

The historical source for the perfect participle is an adjective marked by *–t,* originally suffixed directly to the root. Like other C–initial suffixes, this *–t* developed in Latin the option of being separated by a buffer /i/ from a stem final consonant, generating doublets like *al–i–t–us* and *al–t–us,* 'fed' (*al–e–re* 'feed'). Sound changes reviewed above generated two more variants: *–ss–*, after a short nucleus, as in *passus* (4.c), and *–s–* after a long one, as in *ūsus* (4.e).

Originally, the *t*–adjective was independent of the *perfectum*, indeed independent of the verb system (Brugmann 1895). The *t*–adjectives still function as denominal derivatives, as in *arbus–t–us* 'set with trees', from *arbos*, or *cultr–ā–t–us* 'knife-shaped', from *culter*. These and other comparable forms lack corresponding verbs whose perfect participles they could be. The original meaning of any *X–t*–adjective would have been the general one of 'possessing as an enduring property that of being associated with X' (Brugmann 1895:93).

In classical Latin, the *t*–adjectives built on verb roots are incorporated into the conjugation system. We diagnose this by the following properties: the *t*–adjectives can generate periphrastic perfect passives in active verbs (e.g. *aud–ī–t–a sum* 'I have been heard-FEM.SG'); they produce periphrastic active perfect forms, which can be transitive, in deponent verbs, (e.g. *sec–ū–t–a sum* 'I have followed-FEM.SG'); *t*-participles of deponent verbs assign accusative case to their objects, as other participles do, and unlike adjectives (e.g. *secū–t–ī mōrem* 'having followed-MASC.PL the custom-ACC'); they occur only in contexts where the eventuality associated with the verb is seen as completed, but the resulting property need not always be a permanent characteristic of the referent, (e.g. … *consul optumum factū rā–t–us noctem antecapere,* 'the consul, having judged-MASC.SG that the best is to get ahead of the night'[10]). In these respects, the *t*-participle has become by classical times the *perfectum* counterpart of the *infectum nt*-participle.

As seen earlier, the system of verbal exponence that Latin had inherited lacked a general *perfectum* morph because available exponents simultaneously expressed more than one syntactic feature. In fact, the participle and the supine shared *no exponent at all* with the EV perfect forms: neither their suffixes, nor their theme vowels, nor the root allomorphs they contained were guaranteed to be the same across the *perfectum*. Remnants of this state of affairs abound in the

[10] Sallust, *Catilinae Conjuratio* 55.

classical language. Over the cca 800 years of documented Latin history, the two *perfectum* stems began to resemble each other[11]. This convergence process progressed in Late Latin, and left traces throughout Romance (Laurent 1999). It is complete in Romanian, where, aside from one affix, all perfect stems, in every verb, are identical: this system is summarized in section 5. In Latin, the convergence is complete for just some dimensions of similarity. We turn to these.

3.2. Correspondences between tensed and participial perfect stems

Properties of the Latin EV perfect stem were generalized to the stem of the *t*-participle. Several such effects reinforced each other, suggesting an underlying global preference for identity between the two stems. (8) summarizes the similarities found in the classical system: the triplets that exemplify (8) consist of an EV perfect stem, followed by the *t*–participle stem, followed by the *infectum*. In each case, the first two stems are more similar than either is to the last.

8. Identity effects between echt-verbal and participial perfect stems
   a. Same syllable count:
      - both perfect stems are monosyllabic (*mōv–, mō–t–*; cf. disyllabic *mov–ē–*);
      - or both are disyllabic (*strep–u–, strep–it–*; cf. monosyllabic *strep–*[12])
   b. Same theme vowel:
      - both perfect stems have the same theme vowel (*pet–ī–v–, pet–ī–t–;* no TV in *pet–*);
      - or none (*hab–u–, hab–it–*; cf. theme vowel in *hab–ē–*).
   c. Same suffix:
      - the EV *–s* suffix begins to extend to the perfect participle (*man–s–, man–s–; man–ē–*).
      - the EV *–u* suffix also begins to be extended (*sol(v)–u–, sol–ū–t;* cf. *solv–*).

---

[11] There are only fragmentary acknowledgments of this development in the works I've consulted. The clearest is Ernout 1953:188, who states that there is "une union, secondaire sans doute, mais étroite, entre les deux formes, si bien que des influences analogiques se sont exercées de l'une à l'autre: *bien de parfait latins ne s'expliquent que par le participe to- et réciproquement*". Leumann1926:616ff alludes to the influence on *t*-participles by the EV perfect stems. Monteil (1970:350, 351) mentions isolated effects of the same type.

[12] The penultimate *–e* in present infinitives like *strep–e̱–re* is the pre-rhotic realization of the aspectually neutral buffer vowel /i/, found inter-consonantally in both *infectum* and *perfectum* forms (e.g. *strep–i–t, strep–i–mus* etc.) as well as in derivatives and compounds (cf. Godel 1961:74, who calls it a 'voyelle d'articulation'). It is regularly lowered before /r/. Its occurrence is phonotactically determined: it never occurs adjacent to a vowel. The comparison between the *–i* morpheme found in the *infectum* of verbs like *fac-i-ō* and this buffer /i/ is instructive: morphemic *–i* occurs in all *infectum* forms, including pre-vocalically (as in *fac–i̱–ō, fac–i̱–ēba–m*). By contrast, buffer /i/ occurs only when no vowel separates the root final consonant from the first inflectional or derivational suffix (e.g. *strep–i–mus*, but *strep–ō*, *strep–ēba–m*, While the phonotactically conditioned nature of the latter /i/ is clear, the conditions that dictate their insertion are yet to be determined: in verbal forms, /i/ is inserted between all C's, while in derivatives its appearance is variable.

d. Same root allomorph
   - root vowels tend to be identical (*pul–, pul–s–*; cf. *pell–*).
   - root consonants tend to be identical (*press–, press–*; cf. *prem–*).

The argument for directional stem-to-stem similarity is based on the syllable count identity (8.a). Other components of (8) contribute to the analysis by showing that a global condition underlies the partial similarities.

In the next section I show that the prosodic structure of the EV *perfectum* stem is largely predictable, because the choice between the syllabic suffix *–u* ([*hab–u*]*–ī*) and the non-syllabic ones (e.g. *–s* in [*scrip–s*]–ī) is predictable. Following this, section 3.5. shows that the syllable count predictably derived in the EV *perfectum* stem is replicated by other affixal means in the participial stem. Other similarities are documented in section 4.

3.3. Formation of the verbal (non-participial) perfect stem

Five stem formation strategies for the EV perfect were reviewed in (4). Table (9) provides information on the lexical frequency of these options: we will use this information to find default preferences among EV exponents. The *ā* and *ī* conjugations, with membership in the thousands, use only the *v*-suffix, the intervocalic variant of *–u*. Here I focus on the remaining group of over 320 verbs, which offer other options. Borrowing a term from Germanic philology, I refer to these as the strong verbs[13]:

9. Stem formation options for tensed perfects and their lexical frequencies (N =325)

infectum	perfect participle	EV *perfectum*	morpheme	frequency	gloss
hab-ē-mus	hab-i-tus	hab-u-i–mus	-u/v	42%	‘have’
scrib-i-mus	scrip-t-us	scrip-s-i–mus	-s	37%	‘write’
em-i-mus	emp-t-us <em-t-us	ēm-i–mus	V-length	9%	‘take’
mord-ē-mus	mors-us < mord-t-us	mo-mord–i–mus	reduplication	8%	‘bite’
pand-i-mus	pan-s-us< pand-t-us	pand-i–mus	no affix	5%	‘split’

[13] The strong verbs come from Kühner and Holzweissig’s (1966:834) list of verbs that depart from the regular *ā* and *ī* conjugation patterns, minus deponents or other defective verbs. Prefixed forms of the same verb were separately counted only when they diverged from their base in more than the prefix. For 40 verbs, different stems are found: distinct variants are counted as distinct verbs. The frequency hierarchy (9) remains the same under all assumptions.

The distribution of the more frequent EV affixes *–s* and *–u/v* is largely predictable. The 110 *s*-perfect forms in this corpus come from roots ending in consonants; in all cases, these consonants are original obstruents or nasals; in all but three (*haus–ī, perculs–ī* and *puls–ī*), the root-final obstruents or nasals that license *–s* are recoverable in the classical language from forms that are independent of the EV perfect. This restriction on the suffix *–s* has a well-defined function: by limiting *–s* to the post-obstruent context, Latin preempts the process that would turn inter-sonorant /s/ into [r][14]. To anticipate, the perfect suffix *–s* cannot occur in contexts that would encourage it to rhotacize: it must remain a strident[15].

The options in (9) can be reduced to four: suffixing *–u,* suffixing *–s*, reduplication, and a templatic option that consists of forming a bimoraic (CVCC or CV:C) stem. I refer to the latter as the μ-perfect. The μ-perfect groups together vowel-lengthening perfects (*ēm–ī,* cf. *em–ō*), the lengthening-*cum*-ablaut option (/a/ -> [e:]: *ēg–ī; ag–ō*), and a 'no-affix' option, largely limited to CVXC roots (e.g. *pand–ī*). The μ-perfect causes roots to become bi-moraic; the requirement is satisfied, in general, by lengthening a root vowel; lengthened vowels derived in this way may become [-low]; roots like *pand–* are bimoraic to begin with, so their μ-perfect stem undergoes no change[16]. Figure 1 presents the distribution of these four strategies for forming the EV perfect stem as a function of the manner of the last root segment.

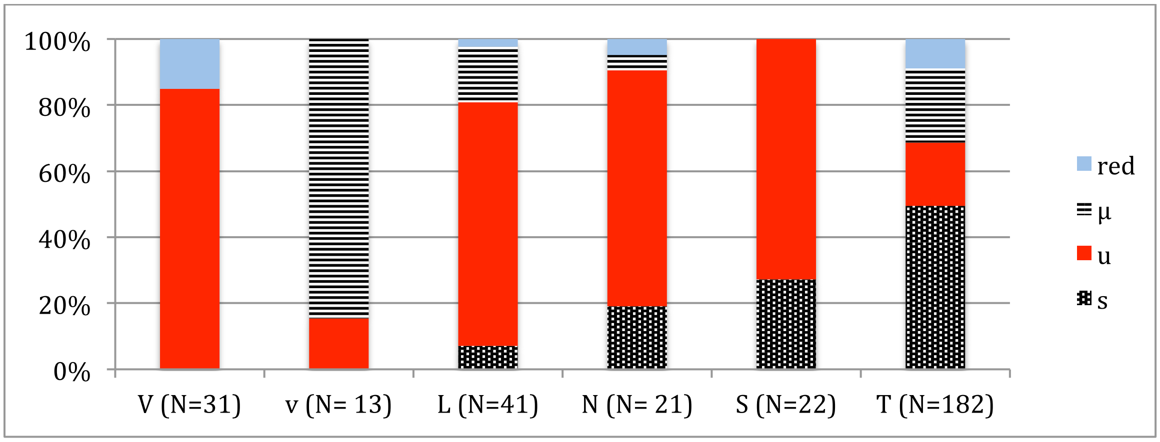
---

[14] There is ample evidence for /s/ -> [r] between oral sonorants, but in the context N_V, /s/ is perhaps not subject to rhotacism, judging from the few relevant forms, e.g. *anser* 'goose'. However, root-final /n/ is similar to potential contexts of rhotacism in partly avoiding the *–s* suffix. See Figure 1. In the following analyses I assume that all intersonorant /s/s are avoided, but nothing changes if this decision is modified.

[15] The generalization that perfect *–s* cannot be suffixed to sounds that would rhotacize it is perhaps what Leumann (1977:594) had in mind when stating that the suffix *–u/v* is used instead of *–s* after sonorants*,* "wo das *s*-Perfekt wohl aus lautlichen Schwierigkeiten vermieden wurde."

[16] Two bare root perfects, *bib–ī* and *scid–ī*, from *bib–ere* 'drink' and *scind–ere* 'split', keep their vowels short and thus cannot be analyzed under my proposal to collapse lengthening and bare root stems. All other 17 bare root perfects contain inherently heavy CVVC or CVCC roots.

Figure 1: distribution of tensed perfect types by manner of articulation of the last root segment [17]
T = stop; S = fricative, N = nasal; L= liquid; v = the glide [w]; V = vowel



The first notable aspect of this data is that the frequency of *–s* perfects rises with the decreasing sonority of the last root segment: *–s* is categorically impossible after vocoids, and essentially impossible after liquids. After stops, the only context where both *–s* and *–u/v* are phonotactically permitted, there are twice as many sigmatic than *–u/v* perfects. This suggests that the default exponent is *–s*, and that *–u/v* takes its place only when forced by phonotactics[18]. (10) is the analysis of this point. The preference for *–s* is represented by the exponence constraint USE S_{PERF}. I adopt a default ranking among all perfect formation strategies: USE S_{PERF} >> USE U_{PERF}>> USE μ_{PERF} >> USE RED_{PERF}. The top ranking, USE S_{PERF} >> USE U_{PERF}, corresponds to the hierarchy of lexical frequencies observed in phonotactically neutral contexts, after stops; the ranking USE U_{PERF}>> USE μ_{PERF} >> USE RED_{PERF} reflects overall differences in lexical frequencies.

The preference for *–s* over μ and RED emerges in the following observation: prefixed verbs sometimes abandon μ and reduplicated perfects in favor of *–s*, when the root ends in a stop: e.g. [*leg*]-*ere*, [*lēg*]*–ī* but *intel*-[*lex*]*–ī* (Monteil 1970:311). The opposite change never happens: *–s* stems are not replaced by μ or reduplicated forms.

10. Phonologically predictable choice between two tensed perfect suffixes: *–s* and *–u/v*

- USE X_{PERF}: any candidate stem of the non-partipial perfect contains the affix X
- *S/[SON]_V: [s] cannot occur between a sonorant and a vowel.

---

[17] Verbs whose *perfectum* forming strategies were difficult to categorize are excluded from this tabulation: e.g. in *serō, sēvī, satus,* I don't know what should count as the last root segment.

[18] The group of *s*-final roots is too small to confirm that they too share the preference for *–s*. Still, of the 6 roots ending in postvocalic /s/, 4 take *–s* (e.g. [*ges–s*]*–ī*). All 10 strong roots ending in *–Cs* or *–ss* select *–u*, e.g. [*pins–u*]*–ī* 'I crushed', probably because the geminate /s/ will not surface after a C: *[*pins–s*]*–ī* could only surface as zero-marked *[*pins*]*–ī.* The thematic variant *–ī–v* of *–u*, e.g. *capess–ī–v–ī* (*'I seized'* is another option after /ss/.

• ID STRID (PERF): surface instances of perfect *–s* are identical for [strident] to the input.

(i) Avoidance of inter-sonorant /s/: *ser–e–re, ser–u–ī* 'plait'

• root: *ser –*		*S/[SON]_V	ID STRID (PERF)	USE S_{PERF}	USE U_{PERF}
☞a.	[ser–u]–ī			*	
b.	[ser–s]–ī	*!			
c.	[ser–r]–ī		*!		
d.	[sēr]–ī			*	*!

(ii) Default preference for the suffix *–s*: *scrib–e–re, scrip–s–ī* 'write'

• root: *scrib–*		USE S_{PERF}	USE U_{PERF}
☞a.	[scrip–s]–ī		*
b.	[scrib–u]–ī	*!	
c.	[scrīb]–ī	*!	*

The occurrence of *–u/v* is also partly predictable. Figure (1) shows that it is by far the most frequent option, wherever *–s* is phonotactically blocked, but with an interesting exception: *–u/v* cannot be used after *–v*. Perfects like **mov–u(v)–ī* or **mov–ē–v–ī* (cf. *mov-ē-re* 'move'), or **solv–u(v)–ī* (cf. *solv–e-re* 'untie') are unattested. There are details to be settled here, covered in the Appendices, but the relevant point is that *–v–u* and *–v…v–* strong perfects are phonotactically prohibited. Since *–s* cannot be used after vocoids, the system defaults to the μ-perfect after *v–*. The analysis below uses *VU as a stand-in for both the ban **v…v* and on **vu* sequences.

11. Phonologically predictable choice between two tensed perfect formations: *–u/v* and μ

• root: *mov-*		*VU	USE $–S_{PERF}$	USE $–U_{PERF}$	USE $–\mu_{PERF}$
a.	mov-u-ī	*!	*		*
b.	mov-ī		*	*	*!
☞c.	mōv-ī		*	*	

I ommitted candidates that suffix *–s* to *mov–*, with or without rhotacism or further changes: their fate is sealed by the ranking S/[SON]_V: /s/, ID STRID (PERF) >> USE S_{PERF} seen earlier.

When voicing, place and root-final clusters are also factored in, more details in the selection of perfect morphemes can be predicted: most (23/26) verbs using reduplication target for copy a voiceless stop; half (15/29) of the minority of stop-final roots taking the *–u* suffix end in [k]; all roots ending in geminate *ss* or any s//C clusters avoid *–s*, most for *–u,* etc. We won't explore these points because our argument about cyclicity relies on just a subset of the restrictions noted.

A distinct predictive factor in the choice of tensed perfect strategies is a tendency to use the perfect *–u* in verbs whose *infectum* contains an extra syllable beyond the root, a theme vowel or a syllabic suffix: e.g. [*dom–ā*]*–re,* [*dom–u*]*–ī* 'to tame', *con*–[*tic–esc*]*–e–re, con*–[*tic–u*]*–ī* 'to grow silent'*,* [*hab–ē*]*–re,* [*hab–u*]*–ī*. I analyze this as a condition of rhythmic correspondence between the stem of the tensed *perfectum* and that of the *infectum*: a constraint MAX V (INFECTUM), requires that the tensed perfect stem have *no fewer vowels* than the *infectum* stem[19].

12. MAX V (INFECTUM) effects:

MAX V (INFECTUM): every V in the *infectum* stem has a correspondent in the EV perfect stem.

i. Disyllabic *infectum* selects disyllabic tensed perfect: [*hab–ē*]–re, [*hab–u*]*–ī* 'have'

• root: *hab–* • infectum: *hab–ē–*		MAX V (INFECTUM)	USE S_{PERF}	USE U_{PERF}	USE μ_{PERF}
☞a.	[hab–u]–ī		*		*
b.	[hāp–s]–ī	*!		*	*
c.	[hāb]–ī	*!	*	*	

ii. Default preference for the *–s*: *scrib–e–re, scrip–s–ī* 'write'

(iii)	• root: *scrib–*	MAX V (INFECTUM)	USE S_{PERF}	USE U_{PERF}	USE μ_{PERF}
☞a.	[scrip–s]–ī			*	*
b.	[scrib–u]–ī		*!		*
c.	[scrīb]–ī		*!	*	

The effect of matching syllable counts between the two stems was tested on the entire strong verbs corpus: indeed, a majority of 74% have the same number of syllables in the infectum and the EV perfect, either because both stems are athematic (as in [*scrib*]*–e–re,* [*scrip–s*]*–ī*) or because an extra affixal syllable in the *infectum* stem is matched by an extra syllable in

[19] Leumann (1977:594) states this as a generalization about stative verbs (*Zustandsverben*), many of which have roots extended by *– ē* in the infectum. This characterization is overly restrictive: it excludes many transitive verbs like *dom–ā–re, dom–u–ī* 'to tame' *noc–ē–re, noc–u–ī* 'to injure', *terr–ē–re, terr–u–ī* 'to frighten', *amic–ī–re, amic–u–ī* 'to throw around'. The right generalization is not about Aktionsart, but about numbers of syllables. By granting that the effect is one of prosodic uniformity, we can also connect this effect to the much more robust effect of rhythmic uniformity found internally to the perfect.

its *perfectum* counterpart (as in [*dom–ā*]*–re,* [*dom–u*]*–ī*). I tested also a narrower version of the effect, which corresponds more directly to the constraint MAX V (INFECTUM): I examined the 65 strong verbs whose root ends in an obstruent (and thus are free to employ any perfect stem formation strategy) and whose *infectum* stem contains a post-root syllable, i.e. verbs like [*hab–ē*]*–re*. The constraint MAX V (INFECTUM) predicts that all these verbs will use *–u* in the EV *perfectum* stem, to match the extra syllable of their *infectum* counterpart. This prediction is not borne out in its strong form, but a weaker one is: 52% (34) of the roots in this group use *–u/v*, as against the much lower rate of 20% in the overall group of *–u* perfects from obstruent final strong verb roots[20]. Thus in the phonotactically neutral context, after obstruents, *–u* is disfavored, but its frequency more than doubles in this same context whenever the *infectum* stem has an extra syllable. This suggests that MAX V (INFECTUM) plays a significant role, albeit not an exclusive one, in selecting the perfect EV stem.

Taken together, the phonotactically based blockage of *–s* and MAX V (INFECTUM) explain the use of *–u* in 82% of the 101 athematic *u*-perfects in our sample.

MAX V (INFECTUM) is outranked by phonotactics and IDSTRID(PERFECT): this explains the behavior of v-final roots, whose partial analysis in (11) can now be completed. Some aspects of this ranking – omitting constraints on vowel quality – are seen below.

13. *VU >> MAX V(INFECTUM)

• root: *mov-* • infectum: *mov–ē–*		*VU	*S/SON_V	IDSTRID (PERFECT)	MAX V (INFECTUM)	USE –U_{PERF}	USE –μ_{PERF}
a.	mov-u-ī	*!					*
b.	mo(u)–s-ī		*!		*	*	*
c.	mo(u)–r-ī			*!	*	*	*
☞d.	mōv-ī				*	*	

3.4. Lexical variation in the formation of the tensed perfect stem

Lexical preferences for some affixes clearly play a role in this system. They explain unpredictable deviations from the hierarchy of conditions established thus far. Four deviations require analysis. First, reduplicated perfects: their USE-RED_{PERF} constraint is ranked so low that no regular verb roots will default to this strategy, no matter what their phonotactic needs may be.

[20] In the larger class I counted 192 stop or *–s* final roots, excluding roots ending in *–sC* or *–Cs* or *–ss* sequences, which predictably take the *–u* suffix.

This is right in general: reduplication, unlike *–s, –u* or μ-affixation, is never a predictable option. But, unless more is said, ranking USE S$_{\text{PERF}}$ >> USE U$_{\text{PERF}}$>> USE μ$_{\text{PERF}}$ >> USE RED$_{\text{PERF}}$ blocks reduplication from ever being chosen: the μ exponent can always be used instead. We remedy this by letting lexically indexed versions of the constraint USE RED$_{\text{verb}}$ move up in the overall ranking. This is one method of incorporating clear archaisms into the synchronic analysis. Thus the ranking USE RED$_{\text{currō}}$ >> USE S$_{\text{PERF}}$ >> USE U$_{\text{PERF}}$>> … USE RED$_{\text{PERF}}$ allows *curr–e–re* 'to run' to form its EV *perfectum* as *cu–curr–ī,* as seen below in (14.i).

Comparable adjustments to the analysis are needed to allow μ-perfects from verbs not ending in *–v* and non–*u* perfects from verbs whose *infectum* contains a syllabic stem extension. Thus USE U$_{\text{cumbō}}$ >> USE S$_{\text{PERF}}$ >> USE U$_{\text{PERF}}$ provides an account, in (14.ii), of the 17 *u*-perfects like *–cub–u–ī* (*–cumb–e–re* 'recline'), whose EV-stem is otherwise expected to be **–cup–s–ī.* Lexical deviations from MAX V (INFECTUM) are analyzed in the same way: e.g. the verb *mord–ē–re* (+ 32 others) forms an unexpected sigmatic perfect *mors–ī.* This stem can be generated by promoting lexically indexed USE S$_{\text{PERF (mordeō)}}$ above MAX V (INFECTUM), (14.iii). Finally, the 7 sonorant-final roots that take *–s* without synchronically recoverable reason (e.g. *pul–s–ī; pell–ō*) can be analyzed by ranking, say, USE S$_{\text{PERF (pellō)}}$ above *S/[SON]_V (14.iv). This move must be supplemented by others, to maintain the distinction between the more likely contexts of rhotacism (e.g. post vocoid) vs. less the likely ones (post nasal, the contexts where we get more exceptions like *man–s–ī*), but this adjustment is not implemented here.

14. Exceptions as lexically indexed versions of USE X$_{\text{PERF}}$

i. Reduplicated perfects: *curr–e–re*, *cu–curr–ī* 'run'

• root: *curr–* • infectum: *curr–*		USE RED$_{\text{CURRŌ}}$	USE U$_{\text{PERF}}$	USE μ$_{\text{PERF}}$
☞a.	[cu–curr]–ī		*	*
b.	[curr–u]–ī	*!		*
c.	[curr]–ī	*!	*	

ii. Unexpected μ-perfects: *cumb–e–re, cub–u–ī* 'lean on'

• root: *cub–* • infectum: *cumb–*		USE U$_{\text{CUMBŌ}}$	USE S$_{\text{PERF}}$	USE U$_{\text{PERF}}$	USE μ$_{\text{PERF}}$
☞a.	[cub–u]–ī		*		*
b.	[cūp–s]–ī	*!		*	*
c.	[cūb]–ī	*!	*	*	

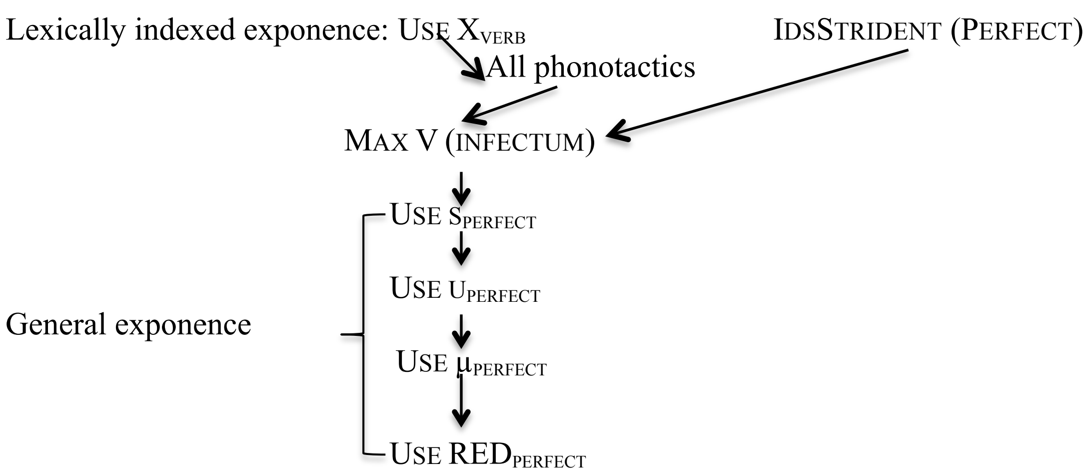
iii. Unexpectedly monosyllabic perfect stems: *mord–ē–re, mors–ī* < /mord–s–ī/ 'bite'

• root: *mord–* • infectum: *mord–ē*		USE S$_{\text{MORDEŌ}}$	MAX V (INFECTUM)	USE S$_{\text{PERF}}$	USE U$_{\text{PERF}}$
☞a.	[mor–s]–ī		*		*
b.	[mord–u]–ī	*!		*	

iv. Unexpected sigmatic perfect stems after sonorants: *pell–e–re, pul–s–ī* 'repell'

• root: *pell–* • infectum: *pell–*		USE S$_{\text{PELLO}}$	*S/[+SON]_V	USE S$_{\text{PERF}}$	USE U$_{\text{PERF}}$
☞a.	[pul–s]–ī		*		*
b.	[pull–u]–ī	*!		*	

15. Summary of the tensed perfect analysis



The essential finding of this section has been that we can predict the choice between the main contenders for the EV perfect formation: suffixing *–u* vs. *–s* vs. the μ-template. This determines the syllable count of the EV stem: it's monosyllabic for *–s* and μ perfects, bisyllabic for the *–u* perfects. Consequences of this choice for the perfect participle are examined next.

3.1. Perfect stems; rhythmic correspondences between them

The perfect stem is the constituent containing the root, a possible theme vowel, and a *perfectum* suffix: [*aud–ī–v*]*–ī* or [*aud–ī–t*]*–us*. I assume that reduplicating prefixes, like other prefixes, lie outside this stem: then *mo–*[*mord*]*–ī* has a monosyllabic stem. The buffer /i/ found in athematic forms – e.g. *dūc–i̱–mus*, *dux–i̱–mus* – with its pre-rhotic lowered variant [e], in *dūc–e̱–re*, is aspectually neutral and thus not a component of either stem (cf. footnote 12).

The syllable count of the perfect stems thus defined is almost always identical: disyllabic [*hab–u*] in [*hab–u*]*–ī* goes with a disyllabic stem [*hab–it*] in [*hab–it*]*–us*; monosyllabic [*scrip–s*] in [*scrip–s*]*–ī* with equally monosyllabic [*scrip–t*] in [*scrip–t*]*–us.* In strong verbs, this rhythmic identity is strictly enforced only between *perfectum* stems*:* the tendency to match stem length between the *infectum* and the EV perfect is observable, as seen earlier, but much weaker. The *infectum* stem is frequently longer than the *perfectum* and, in at least one class, regularly so: the disyllabic *infectum* stem of *v*-final verbs like [*mov–ē*]*–re* corresponds to a systematically monosyllabic *perfectum,* as in [*mōv*]*–ī,* [*mō–t*]*–us*[21]. Overall, 90% of the strong verbs have identical syllable counts between the perfect stems, suggesting that Latin controls the rhythmic profile of the *t*-participle's stem as a means to signal its aspectual identity with the EV perfect.

The argument for rhythmic identity in the *perfectum* is this. If any tensed perfect marker could freely cooccur in a verb's paradigm with either of the *–t* or *–it* variants of the participle, this would create rhythmic disparities: a disyllabic tensed stem could be paired with a monosyllabic participial stem, as in the real but rare paradigm of [*rap-u*]*-ī,* [*rap-t*]*-us*, from *rap-ere* 'snatch'. Or the other way around, as in the hypothetical pair [*rap-s*]*-ī,* [*rap-it*]*-us*. But pairs like [*rap-u*]*-ī,* [*rap-t*]*-us* are rare; and [*rap-s*]*-ī,* [*rap-it*]*-us* is just a non-existent pattern.

How is the syllable count identity achieved? The perfect stem is mono- or disyllabic as a function of markedness factors that apply only in the EV forms. The resulting profile is imposed on the perfect participle, via selection of its syllabic *–it* or non-syllabic *–t* suffixal variants.

*3. 2. Effect of *Cv on the syllable count of perfectum stems*

We consider the effect of each markedness factor in turn. When C-final roots add the EV suffix *–u/v*, as in [*hab–u*]*–ī*, the resulting perfect stem is disyllabic. Monosyllabic forms like *[*hab–v*]*–ī* are impossible, for reasons explored in Appendix 1. In, addition, syllabic *–u* is selected in many cases by MAX V (INFECTUM), to add a syllable to the stem, as in (12.i). To match disyllabic [*hab–u*]*–ī*, the participial stem selects the suffix variant *–it*, forming [*hab–it*]*–us*. The alternative *[*hāp-t*]*–us* can't be excluded on phonotactic grounds: *scriptus* < *scrib–t–us* is well formed. Further, the *–it* variant of the *t*–suffix is disfavored: 96% of the *–it* variants (55/57) appear in participles that are coupled with tensed perfect stems containing an extra syllable beyond the

[21] Rhythmic identity between perfect stems holds both of regular *ā* (1st), *ī* (4th) conjugations, and among strong verbs, but is an unambiguous mark of the *perfectum* only in the latter class. In regular verbs, the theme vowels *ā* and *ī* are always present, so stem length is identical across aspects: e.g. disyllabic [*aud–ī–v*]*–i–mus,* [*aud–ī–t*]*–us* in the perfect, and [*aud–ī*]*–re,* in the *infectum.*

root. Non-verbal *t*-adjectives (e.g. *hones–t–us*) never employ *–it*. So neither phonotactics nor any general preference for *–it* explain why the system chooses [*hab–it*]*–us*. The real reason is that the stem of *[*hāp-t*]-*us* doesn't rhythmically match that of [*hab-u*]-*ī*.

Conversely, if the tensed stem selects the suffix *s*, the stem remains monosyllabic, e.g. [*scrip-s*]-*ī,* and that dictates the choice of a bare C for the participle, hence [*scrip-t*]-*us*.

Rhythmic identity between perfect stems is achieved by MAX/DEP V (PERFECT):

16. a. MAX V (PERFECT):
For any verb, every nucleus (V) in the verb's EV perfect stem has a correspondent in its *t*-stem.

b. DEP V(PERFECT):
For any verb, every nucleus in the *t*-stem has a correspondent in the EV perfect stem.

In (17) we see how MAX V (PERFECT) forces the selection of a disyllabic EV stem to propagate to the *t*-participle. The tableau indicates in its upper left cell that one input in the computation of the participle is the EV perfect.

17. The effect of disyllabic tensed perfect [*hab–u*]*–ī* on participial [*hab–it*]*–us*

• EV perfect stem: [*hab–u*]– • perfect participle suffix: *t, it*		MAX V (PERFECT)	USE T_{PPL}
a.	[hāp-t]-us	*!	
☞b.	[hab-it]-us		*

The effect of USE T_{PPL} is to penalize the *it*-variant of the participial suffix, reflecting the fact that the distribution of *it* and *t* is asymmetric. Exceptional paradigms like *rapuī/raptus* are analyzed by promoting, on a lexically restricted basis, USE T_{PPL} above MAX V (PERFECT). The absence of verbs like **rapsī/rapitus* follows: the *–it* candidates are harmonically bounded by *–t* forms, which satisfy rhythmic uniformity and the preference for bare *t.*

18. Idiosyncratic paradigms (*rapuī/raptus*)

• EV perfect: [*rap–u–*]		USE$T_{PPL\ (rapiō)}$	MAX V PERFECT
☞a.	[rap–t]–us		*
b.	[rap–it]–us	*!	

The analysis models in the same way a minority of verbs where the EV perfect stem and its participle don't match (because a lexically indexed USE T_{PPL} outranks MAX/DEP V PERFECT) while the *infectum* and the tensed perfect do: e.g. [*sepel–ī*]–*re*, [*sepel–ī–v*]–*ī,* [*sepul–t*]–*us* 'bury'.

To return to the main point: the syllable count of EV stems like [*hab–u*]–, the result of phonotactic and correspondence factors spelled out above, is mirrored by the syllable count of corresponding participles like [*hab–it*]–. The EV stem is not contained in the participial stem, but does exercise an influence over its structure. A more complex version of this effect is seen next.

3.5. Participles of –v final verbs

The datum analyzed now is the loss of root-final –*v* in participles like [*mō–t*]–*us.* All 12 roots in *v* (*cav–ēre, fav–ēre, fov–ēre, iuv–āre, lav–āre, mov–ēre, niv–ere, pav–ēre, vov–ēre*, *solv–ere, volv–ere, ferv–ere*), with their prefixed variants, behave identically: they lose the –*v* in the *t*-participle, when it cannot be incorporated into a diphthong[22]. Missing –*v*'s in the *t*-participle generally accompany monosyllabic μ–stems in the EV-perfect: e.g. [*mōv*]–*ī,* [*mō–t*]–*us*. Such pairs are a consequence of rhythmic correspondence. Parallel to the –*v* roots are verbs ending in labiovelars (*liqu–ē–re, torqu–e–re, conqu–e–re, linqu–e–re and –stingu–e–re*)[23]. These too have monosyllabic EV stems (e.g. *līqu–ī, cox–ī*) and monosyllabic participial stems (*lict–us, coct–us).* Their behavior is predicted by the same constraints activated by the *v*-final roots.

19. Principal parts of strong *v*-final verbs

	Infectum (infin.)	EV-*perfectum* (1st sg)	Perfect participle	Gloss
a.	mov–ē–re	mōv–ī	mō–t–us	'move'
b.	cav–ē–re	cāv–ī	cau–t–us	'beware, avoid'
c.	solv–e–re	solv–ī, or solu–ī, or solū–ī	solū–t–us	'release'

20. Principal parts of strong labiovelar-final (non-deponent) verbs

	Infectum (infin.)	EV-*perfectum* (1st sg)	Perfect participle	Gloss
a.	liqu–ē–re	līqu–ī	lic–t–us	'be liquid'
b.	coqu–e–re	cox–ī	coc–t–us	'cook'

[22] Two other verbs, *vivere* 'live' and one variant of *–nivere* 'blink' end in underlying /g^w/, which lenites to [w] in V_V, but behaves as a stop in licensing a perfect *–s: vixī, nixī* (or *nipsī*).

[23] <qu> represents [k^w]; post-nasal, prevocalic <gu> is [g^w]. More on this topic in Devine and Stephens 1978.

(21) summarizes how the final labial element in the participles of these roots surfaces: the secondary labiality of *qu, gu* is completely lost; the segment *v* merges with a preceding rounded vowel and is otherwise preserved as a distinct segment.

21. How non-syllabic [round] surfaces before the *–t* of participles

Segment <v> = [w]			Secondary articulation [^{w}] in labiovelars
After round V	After a	After C	
merged with V mō–t–us	[u] cau–t–us	[u:] solū–t–us	Ø lic–t–us

(21) highlights a difference between the segment *v* and the secondary labiality of *qu*: in the same context, the latter is lost (*lictus*) while *v* is preserved (*solūtus, *soltus*). The analysis will attribute this to the ranking MAX SEGMENT >> DEP V ([PERFECT]) >> MAX [ROUND]: rhythmic correspondence is sacrificed to preserve a segment, but not a secondary articulation. A second difference in (21) is between *v*-preservation through coalescence vs. as a distinct segment: V-vocalization (in *cautus, solūtus*) is needed because non-prevocalic *v* is impossible; *ou–* coalescence (*mōtus*) is due to the Latin ban on *Vu* nuclei other than *au*, *[*mou–t*]–*us*.

We can address now the point of current interest, the rhythmic profile of the stem: the labial element in these roots could have been preserved in its original form, as a glide or as a secondary articulation, before the *–it* allomorph of the participle suffix. The forms should have been *[*mov–it*]–*us,* *[*cav–it*]–*us,* *[*liqu–it*]–*us.* Then why isn't *–it* used? Because it would violate DEP V (PERFECT) relative to an EV perfect stem ([*mōv*]–*ī*, [*cāv*]–*ī*, [*līqu*]–*ī*) which, for reasons explored above, must be monosyllabic. Thus the *ou* merger in *mōtus,* the *v->u* change in *cautus,* and the *q*-simplification in *lictus* are all caused by the rhythmic identity effect. The details follow.

Consider first *lictus*: the simplification of *qu* to *c* is attributed to a constraint requiring rounding in a non-syllabic segment ([k^w] or [w]) to occur prevocalically, [w]$_{/_}$V.

22. a. *[w]$_{/_}$V: any [+round] non-syllabic is prevocalic.

b. Effect of zero-suffixed EV perfect stems on corresponding *t*-participles: [*lic–t*]*us*

• EV perfect stem: *līk^w*		[w]$_{/_}$V	DEP V (PERFECT)	MAX ROUND
a.	[lik^w –it]–us		*!	
b.	[lik^w–t]–us	*!		
☞c.	[lik–t]–us			*

Next consider [*solū–t*]–*us*. The corresponding EV stem has three variants: [*solū*]–*ī,* [*solu*]–*ī* and, the most frequent, [*solv*]–*ī*. (23) appeals to MAX SEG to explain why DEP V (PERFECT) is violated in [*solū–t*]–*us* relative to the EV stem in [*solv*]–*ī*.

23. Rhythmic mismatch due to phonotactics and MAX SEG

• EV perfect stem: *solv*		[w]$_{/}$_V	MAX SEG	DEP V (PERFECT)
a.	[solv–t]–us	*!		
b.	[sol–t]–us		*!	
☞c.	[solū–t]–us			*

Other disyllabic candidates, *solutus* and *solvitus,* are examined below. Now consider *cautus* and *mōtus*. The glide –*v* is not preserved as such in either of these, but both maintain, in immediate proximity to its original site, a rounded vocoid. In *mōtus* the underlying *v* is preserved in *ō,* satisfying MAX SEGMENT but violating UNIFORMITY. (Other implementations of the same idea are ommitted for simplicity.) The *ō* in *mōtus* could be due to length correspondence to the *ō* of *mōvī* or to compensatory lengthening, *ov* -> *ō*. As this point is unsettled, neither option is reflected below: the candidate *motus* is not considered. The length of *a* in *cautus* is indeterminate.

24. Effect of zero-suffixed EV perfect stems on corresponding *t*-participles: *mōtus* and *cautus*

• EV perfect stem: $m\bar{o}_i v_j$-		w]$_{/}$_V	DEP V (PERFECT)	UNIFORMITY	ID SYLLABIC
a.	[$mo_i v_j$–t]–us	*!			
b.	[$mo_i v_j$–it]–us		*!		
☞c.	[$m\bar{o}_{ij}$–t]–us			*	*

• EV perfect stem: *cāv*-		w]$_{/}$_V	MAX SEG	DEP V (PERFECT)	IDENT SYLLABIC
a.	[cav–t]–us	*!			
b.	[cā–t]–us		*!		
c.	[cāv–it]–us			*!	
☞d.	[cau–t]–us				*

With the main lines of the analysis in place, we return to the participles of the roots in –Cv.

25. Principal parts of C*v*-final strong verbs

a.	solv–e–re	solv–ī, or solu–ī, or solū–ī	solū–t–us	'untie'
b.	volv–e–re	volv–ī, or volu-ī	volū–t–us	'turn'

Consider first the most frequent of the EV perfect variants, the µ-perfect *solv–ī*.

26. Generating the EV-perfect stem in *solv–ī*

• infectum: *solv–*		*VU	USE –S_{PERF}	USE –U_{PERF}	USE –μ_{PERF}
a.	[solv–u]–ī	*!	*		*
☞b.	[solv]–ī		*	*	

The source of the alternative [*solū*]*–ī,* with its unexpected /ū/ is the merger of **vu* in the u–perfect *[*solv–u*]*–ī*[24]. Merger of /vu/ to [u:] in other *v*-final perfects would result in, say, /mov–u–ī/ → *[*mo–ū*]*–ī,* an impossible surface V-V:-V sequence. Thus *vu*–merger targets only CVCv–roots. The variant [*solŭ*]*–ī* arises from this [*solū*]*–ī* regularly from prevocalic shortening.

Since [*solv*]*–ī* is the most frequent variant of the EV-perfect, we ask why [*solū–t*]*–us* is the only form of its t-participle. W/_V (22.a) makes monosyllabic *[*solv–t*]*–us* impossible: but what excludes its minimal modification *[*solŭ–t*]*–us*? The answer is a robust regularity not yet recognized: stem final *u* is always long word medially. Lexical evidence supporting this is found in Appendix 3. Here we retain just its conclusion that stem final *ŭ* is prohibited. The constraint $*VC_0u–]_{stem}$ states this.

27. Generating the t-participle stem in *solū–tus*

• EV perfect: *solv–* • perfect participle suffix: *–t, –it*		W/_V	MAX SEG	$*VC_0u–]_{stem}$	DEP V (PERFECT)
a.	[solv–t]–us	*!			
b.	[sol–t]–us		*!		
c.	[solu-t]–us			*!	*
☞d.	[solū–t]–us				*

One failed candidate remains in play: *[*solv–it*]*–us*. It fares no worse than [*solū–t*]*–us* on DEP V (PERFECT) and it better satisfies IDLONG and IDSYLLABIC (PERFECTUM), relative to the µ-

[24] The fact that /vu/ becomes long [u:] under merger is consistent with findings about duration preservation in other instances of CV → V:, e.g. Topintzi (2006).

variant of the EV-perfect, *solv–ī*. Our analysis gives a synchronic reason to choose *solūtus* over **solvitus,* when the EV-perfect contains the disyllabic variants of the stem, [*solū*]–*ī*, or [*solŭ*]–*ī*, as seen below.

28. Generating the t-participle stem in *solū–tus* (continued)

• EV perfect: *solū–, solu-*		*VC_0u–]$_{stem}$	ID SYLLABIC (PERFECT)	ID SYLLABIC (IO)
a.	[solv–it]–us		*!	
b.	[solu–t]–us	*!		*
☞c.	[solū–t]–us			*

What remains unexplained is the failure of the monosyllabic variant, [*solv*]–*ī,* to license a second participle [*solv–it*]–*us.* This question affects very few roots and is left open[25].

This analysis extends to all strong verbs ending in *u/v*, e.g. *statu-ere* 'set up'. We predict for these verbs stem-final *ū*'s in the perfect, e.g. *statū-ī*, obtained through merger of stem-final *–u* and the regular perfect *–u*, or else a bare-stem *statu-ī*, generated by USEμ$_{PERFECT}$. Given either of these, the analysis predicts *ū* in the t-participle, e.g. *statū-tus,* as the effect of *VC_0u–]$_{stem}$. Critically, participles like *[*statu–it*]–*us* or *[*statū–it*]–*us* are ruled out by DEP V (PERFECT). Length matched pairs like *statū-ī*, *statū-tus* are what we find in older Latin (Leumann1977: §437,IC1). In the classical language, *ū* shortens prevocalically, so reported forms are *statu-ī*, *statū-tus.* Here the stable *ū* of *statū-tus* is due to *VC_0u–]$_{stem}$ >> ID LONG (PERFECT).

29. Generating the t-participle stem in *statū–tus*

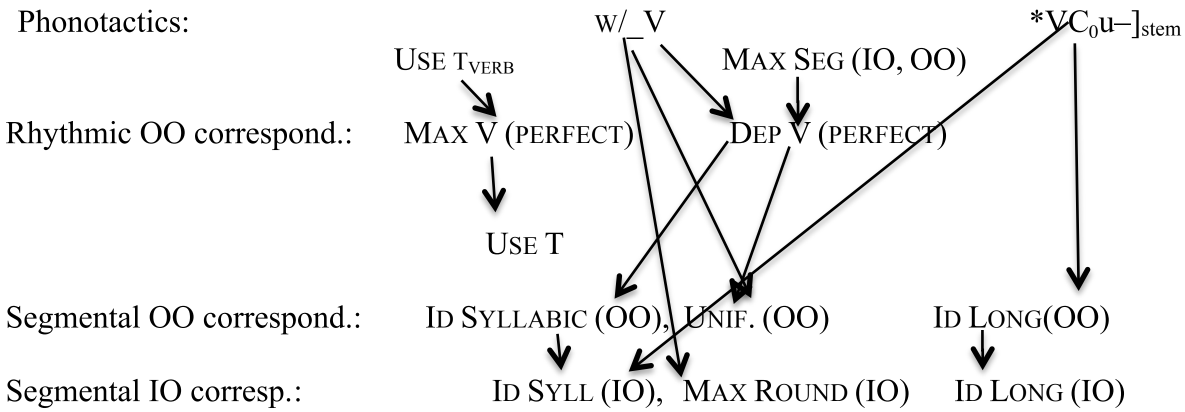
• EV perfect: *statū–*, *statu–*		*VC_0u–]$_{stem}$	DEP V (PERFECT)
a.	[statu-it]–us		*!
b.	[statu–t]–us	*!	
☞c.	[statū–t]–us		

Rankings established in this section are summarized below.

---

[25] A descriptive generalization that covers all *t*-participles of *v*– or *qu*– final verbs is that the sequence [wi] is banned directly before the participial suffix *–t*. This excludes **solvitus*, **loquitus,* etc. I have not pursued this in the text because the sequence [wi] is not avoided in any other context: witness forms like *ferv–idus* 'hot', *parv-itas* 'smallness', and many others, none of which become **ferūdus, *parūtas* etc. through syncope and vocalization. The main lines of the argument would not change had an indexed constraint against *wi-t* been used. A historical scenario that explains the absence of *solv–it–us* is provided by Niedermann 1953:34.

30. Rankings between phonotactics, exponence and correspondence generating t-participles



3.6. Confirming evidence: deponents

In the model proposed here, the prosodic structure of the EV-perfect stem controls that of the participial *t*-stem. A disyllabic EV-stem favors a disyllabic *t*-stem, and this preference is satisfied by choosing *–it* over *–t* as in [*hab–it*]*–us*, [*hab–u*]*– ī*; or *–t* over *–it*, as in [*statū–t*]*–us*, [*statu*]*–ī*. Monosyllabic EV-stems prefer monosyllabic participial stems, and this generates otherwise perplexing pairs like [*mōv*]*–ī*, [*mō–t*]*–us*.

This analysis predicts that default preferences for the expression of *t*-participles, normally overridden by correspondence to the EV–perfect, can be satisfied when rhythmic correspondence becomes moot, in verbs that lack the EV stem. This prediction is now tested against the class of deponent verbs. The deponents, like all passives, express the EV-perfect analytically, by combining *t*-participles with the auxiliary 'be'[26]. Their essential property in the present context is that they lack any synthetic EV-perfect stem: they don't use –s, μ or RED.

31. *Infectum* and *perfectum* forms from passives and deponents:

		Infectum: 1st sg ind. pres.	Perfect participle	EV-perfect 1strd sg indic.	Root
non-deponent	active	vert-ō 'I turn'	--	**synthetic**: vert–ī 'I have turned'	vert–
	passive	vert-o-r 'I am turned'	versus < vert–t–us 'turned'	**analytic**: versus sum 'I have been turned'	

[26] The defining characteristic of deponents is that their *infectum* and EV-perfect are formally identical to those of passive forms, but lack the passive sense. An analysis of the syntax-exponence interactions in Latin deponent verbs is offerred by Embick 2000.

deponent	active	ūt-it-ur 'uses'	ūsus < ūt–t-us 'having used'	**analytic**: ūsus sum ' I have used'	ūt–
	passive	--	ūsus 'used'	--	

Like other Latin verbs, some deponents have *infectum* stems that are extended by a syllable-sized morph like *–isc*, e.g. [*pac–isc*]*–or,* [*pac–t*]*–us* 'I agree'. In any non-deponent, the presence of a syllabic stem-extension in the *infectum* would require an extended EV-perfect stem, through the effect of MAX V (INFECTUM); in turn, the longer EV-perfect stem requires an extended participial stem, through MAX V (PERFECTUM). It is this chain reaction that helped explain in earlier sections triplets like [*hab–ē*]*–re*, [*hab–u*]*–ī*, [*hab–it*]*–us.* Had [*pac–isc*]*–or* been allowed to possess a synthetic perfect, this form would have had a disyllabic stem such as [*pac–u*]*–ī:* we can infer this from the 135 *non*-deponents whose infectum contains the similar *–esc* extension. These have u-perfects at a rate of 91%, as predicted by MAX V (INFECTUM)[27]: e.g. *coalescō, coaluī* 'to grow together', *derigescō, deriguī* 'to grow rigid', *contabescō, contabuī* 'to waste away', etc. Earlier discussion has also established that a disyllabic EV–perfect stem in *–u* would dictate, lexical exceptions aside, disyllabicity in its participial stem, e.g. *co*[*alu*]*ī*, *co*[*alit*]*us*. Thus the expected *t*-participle in a non-deponent *paciscō* would be *[*pac–it*]*–us*, if EV [*pac–u*]*–ī* existed. But a deponent is by definition unable to generate an EV form: in its absence, nothing stands in the way of satisfying USE –T. This is why [*pac–t*]*–us* exists.

32. Role of the analytical EV-perfect in the formation of *t*–participles

(i) *t*-participles of deponents with extended infectum stem: [*pac–t*]*–us*

• infectum: [*pac–isc*]– • EV perfect stem: impossible		MAX/DEP V (PERFECT)	USE T_{PPL}
☞a.	[pac-t]-us	moot	
b.	[pac-it]-us		*!

(ii) *t*-participles of non-deponents with extended infectum stem: [*coal–it*]*–us*

• infectum: [*coal–esc*]– • EV perfect stem: [*coal–u*]–		MAX/DEP V (PERFECT)	USE T_{PPL}
a.	[coal-t]-us	*!	
☞b.	[coal-it]-us		*

[27] The generalization 'if *–esc i*n the *infectum* then then *–u* in the EV-perfect' admits of 12 (9%) exceptions, such as *lucescō, luxī* 'to begin to shine'. These forms are in fact regular too: they're analyzed in section 5.2.

I support this argument by comparing the strong deponents (i.e. deponents from the 2nd and 3rd conjugations) with syllabic stem extensions in the *infectum* to the group of strong non-deponents whose infectum contains the same extensions.

There are 24 deponents like *paciscor*, that possess both *infectum* stem extensions and attested *t*-participles[28]. Of these, 4 have non-deponent counterparts with attested EV perfect forms: these can be ignored, since their *t*-participles are identical to those of the non-deponents, and have identical stems to the EV perfects. Of the remaining 20 deponents, 19 (95%) have bare *–t* participles whose stems mismatch the size of the *infectum* stem, exactly as predicted by the analysis in (32.i).

Compare now the group of 113 strong *non*-deponent verbs like *coalescō*, whose infectum stem contains the same stem extensions. Among these, 50% follow the pattern of *coalescō:* rhythmic identity between *infectum*, EV-perfect and t-stems, obtained by using the *–it* participial variant. We see below that the rate of *–it* use is in fact much higher, 91%, among the productively derived verbs of this class. This is strong support for the analysis in (32).

An equally instructive difference arises among roots that end in the labiovelar *qu*. The *–ūtus* participles are attested for deponent verbs (*secūtus, locūtus*) and for the non-deponent verbs where *v* is a distinct segment rather than labialization on a stop (*solūtus*). But they are not found for non-deponent verbs with monosyllabic EV-perfects like *liqueō, līquī,* whose t-participles, e.g. *lictus*, were derived above. The difference between *lictus* and *locūtus* is predicted by the overall analysis. The deponents must form their EV-perfect analytically, with an auxiliary and a *t*-participle and lack synthetic EV-perfects like **loxī*. The *t*-participle is now free to choose a form where the labial element of the input is preserved, satisfying MAX ROUND IO: this leads to *locūtus*. While our analysis does not explain what favors synchronically *locūtus* over *loquitus*, it does explain what favors either over **loctus,* and why *lictus* works differently.

3.7. Productivity

A word now about exceptionality and productivity in the trends described in this section: the perfect satisfaction of rhythmic correspondence, seen in [*coal–esc*]*ō,* [*coal–u*]*ī,* [*coal–it*]*us,* has

---

[28] This figure does not include prefixed verbs from the same root; the numbers rise to 55 verbs if the prefixed variants are separately counted. The 25 verbs are: *aboriscor*, *apiscor*, *paciscor, -fetiscor, –miniscor, expergiscor, nanciscor, obliviscor, ulciscor, proficiscor; liceor, tueor, experior, orior, metior, –sentior, gradior, fateor, ordior, patior, vereor, morior*; and the semi-deponents *audeō* and *soleō.* The semi-deponent *gaudeō* was not included in the count: it has an old EV sigmatic perfect, *gāvīsī* < *gāvid-s-ī*, which explains the t-participle *gāvīsus.*

exceptions in the inherited stock of old verbs, like [*mord–e*]*–ō, mo*[*mord*]*–ī,* [*mors*]*–us.* These exceptions are the reason why only 50% of the verbs in the class of strong non-deponents with extended *infectum* stems satisfy completely the rhythmic matching requirements between stems. The productive pattern, however, is one of perfect rhythmic identity.

To show this, I use two islands of productivity in the set of strong verbs: the *–esc* and the *–u* verbs. Of 135 *–esc* verbs, 91% have attested *–u* perfects; of the 11 *–esc* verbs that have all their principle parts attested – the *t*-participle being rare among inchoatives – all but one (91%) follow the pattern of complete rhythmic correspondence seen in *coalescō*. The one exception, *in[haer–esc*]*–ō, in*[*haes*]*–ī, in*[*haes*]*–um,* is itself regular, as seen below in 5.2. Of the 90 *–u* verbs like *statu–ō* that have all principle parts attested, all 90 show perfect matching among their stems.

It is these perfect patterns of rhythmic correspondence in non-deponents that should be compared to the equally productive pattern of non-correspondence between the *infectum* and the *t*-participle discovered in the deponents. Our analysis predicts both.

The evidence of this section has confirmed the proposed scenario for deriving Latin verbs: *t*-participles build stems that match the nuclear count of the EV-perfects; they default to other preferences only when the EV-perfect is missing. In turn, the EV-perfect stem is built to maximize satisfaction of the phonotactics activated by the exponents of its category, and by correspondence to the *infectum*.

The deponents confirm that there is no across-the–board correspondence between *all* members of the verbal paradigm, as the theories of Optimal Paradigms (McCarthy 2005) and Uniform Exponence (Kenstowicz 1998) would predict. Instead, correspondence is established between pairs of stems standing in a pairwise Base-Derivative relation: the *perfectum* pair, on the one hand, and the non-participial pair (*infectum* and EV-perfect), on the other. Apparent across-the-board identity, as in [*coalesc*]*ō,* [*coalu*]*ī,* [*coalit*]*us*, is a cumulative effect: the EV stem inherits the rhythmic structure of the *infectum*, and then passes it on to the *t*-participle.

3.7. Conclusions on rhythmic correspondence; transition to segmental correspondence

The rhythmic uniformity analysis derives the full spectrum of perfect forms from strong roots, using independently understood phonotactics and affixal preferences. Similar effects of rhythmic uniformity are found outside of Latin, in the Malayalam causatives (Michaels 2009), in the Pima reduplicated plurals (Riggle 2006); in blends across languages (Bat-El 2006), in the French slang derivatives (Plénat and Roché 2001), among others. The Latin pattern is similar to these, but applies to a non-standard Base-Derivative pair: the two verbal stems agree in aspectual values, but not in their other syntactic properties, and thus neither contains the other.

It would be odd if the two perfect stems sought to match each other rhythmically but in no other respect. The remainder of our investigation of Latin shows that they are converging segmentally as well, but that progress is slower on other similarity dimensions. We seek to explain this. The probable generalization is that the rate at which the merger of the two stems progressed was faster when it involved adjusting affixal material – e.g. choosing between *–t* and *–it* – than when changes in the root allomorphs were needed. The next section documents adjustments in the theme vowels. These are affixal items: we observe that the process of adjusting them to insure identity between perfect stems is nearly complete in classical Latin.

4. Identity of theme vowels

The defining property of the regular *ā* (1st) and *ī* (4th) conjugations is that their stems contain the same theme vowel in all verb forms: the same *ā* appears in *am-ā-re*, *am-ā-v-isse* and *am-ā-t-us.* In the class of strong verbs, this across-the-board identity of theme vowels is restricted: the *infectum* class is uniform, in that all *infectum* forms contain the same theme vowel, or none; the *perfectum* is uniform in the same sense. But there is no general uniformity of theme vowel choice between these categories. Of interest to this study is the *perfectum*-internal uniformity.

4.1. Identity of theme vowels in the perfectum

To detect it, we focus on verbs whose *infectum* and *perfectum* diverge. For instance, most *ē*-verbs lose the theme *ē* in the perfect: compare *infectum hab-ē-re* to the perfect forms *hab-u-isse,* not **hab-ē-v-isse, hab-i-tus,* not **hab-ē-tus.* Here I provide counts on a group of 119 strong verbs from Kühner-Holzweissig's (1966:834ff) list, selected because they display a long vowel in the position where a theme vowel is expected, directly before the first inflectional suffix, but only in some of the three categories of interest: *infectum*, EV-perfect or *t*-participle. (This long vowel is mostly a theme; in a few cases its status is debatable.) The key finding is that the same long vowel occurs presuffixally in all perfect forms, echt-verbal and participial, but not the *infectum*; or, if it's there in the *infectum,* it's absent from all perfect forms. Four verbs, 3% of the total, deviate from this pattern. They deviate in a predictable direction, by always preferring *t*-suffixes that are directly affixed to the root, without a theme vowel (e.g. *sepelī-v-ī, sepul-t-us*). Overall, our 119 verbs, selected because they could in principle display some independence in theme vowel selection between *t*-participles and EV-perfects, show instead almost complete, constant agreement between all perfect forms and divergence relative to the *infectum*.

The patterns found are summarized below. Each row provides diagnostic forms for a verb whose *infectum* and *perfectum* differ in their theme vowels. The rightmost row indicates how frequent the type of *infectum-perfectum* divergence illustrated by the verb in that row is. Frequencies listed are for unprefixed verbs: prefixed verbs generally follow the inflectional pattern of the base, so full lexical frequency figures are higher than indicated.

33. Differences between the theme vowel of *infectum* and *perfectum*

i. verb types whose *perfectum* forms contain the same theme vowel, or none (N=115)

	infectum	*perfectum*		gloss	pattern	lex.
	infinitive	EV: infinitive	*t*-partic.			frequency
a.	cub-ā-re	cub-u-isse	cub-i-tus	'recline'	*ā* absent in *perfectum*	14
b.	haur-ī-re	haus-isse	haus-tus	'open'	*ī* absent in *perfectum*	13
c.	hab-ē-re	hab-u-isse	hab-i-tus	'have'	*ē* absent in *perfectum*	68
d.	pet-e-re	pet-ī-v-isse	pet-ī-tus	'aim for	*ā,ī,ē* absent in *infectum*	20

ii. verbs whose *t*-participle and tensed perfect have different theme vowels (N=5)

infectum	*perfectum*		gloss	pattern	lexical
infinitive	infinitive	*t*-partic.			frequency
ser-e-re	s-ē-v-isse	sa-tus	'sow'	*ē* absent in *t*-participle	2
ī-re	ī-v-isse	i-tus	'go'	*ī* absent in *t*-participle	2

The handful of archaisms in (33.ii) don't implicate theme vowels. We thus find complete uniformity of theme vowel choice in the entire *perfectum*.

The synchronic considerations that require theme vowels to be present in the *infectum* but not the *perfectum* of the verbs in (33.a-c) are unknown; neither do we know what reverses this preference in (33.d). However we do know that the constraint MAX V (PERFECTUM), motivated earlier by evidence independent of the theme vowels, will insure that once a theme vowel is required, for whatever reason, in one *perfectum* stem, a corresponding vowel will have to appear in the other. Similarly, if a theme vowel is prohibited in one *perfectum* stem, DEP V (PERFECTUM) will extend that prohibition to the other *perfectum* stem. To fully account for the generalizations in (33.i) we need, beyond the existing MAX/DEP, conditions on featural identity between theme vowels: the vowels must be identical in length, backness and height. The mention of theme vowels is needed, because other pairs of correspondent vowels are not subject to equally stringent matching conditions: e.g. the pair /i/-/u/ in the pair [*hab–u*]–*ī*, [*hab–it*]–*us*[29].

34. IDENT THEME V (PERFECT): For any pair of verbal forms V_1, V_2
if (a) V_1, V_2 are headed by the same lexeme,
and (b) V_1, V_2 are *perfectum* forms,
then any theme vowel in V_1 has *a featurally identical* correspondent in V_2 .

The constraint in (34) appears to be undominated in this data. Taken together, MAX/DEP V (PERFECT) and IDENT THEME V (PERFECT) license attested combination types, like *cubuī/cubitus* (no theme vowel in either) or *petīvī/petītus* (same theme vowel in both) and blocks conceivable other combinations, e.g.**petāvī/petītus* (different theme vowels), **petīvī /petitus* (a theme vowel in just one perfect stem).

4.2. Affixal identity between the perfectum stems

Most Latin verbs have distinct exponents for the participial EV perfect. This section analyzes the verbs that use *–s* as a general perfect marker.

35. Sigmatic perfect stems extended from tensed perfects to *t*-participles

infectum	Tensed *perfectum*	Expected participle	Attested participle	
farc–i–mus	[far(c)–s]–i–mus	far(c)–t–us	[far(c)–s]–us	'stuff'
fīg–i–mus	[fīc–s]–i–mus	fīc–t–us*	[fic–s]–us <fixus>	'fasten'
man–ē–mus	[man–s]–i–mus	man–t–us*	[man–s]–us	'stay over'
/haus–ī–mus/ [haurīmus]	/[haus–s]–i–mus/ [hausimus]	haus–t–us	/[haus–s]–us/ [hausus]	'draw water'

The *s*-suffix in participles like *farsus* is a generalization of the EV perfect *s*: it can't come from a regular *tt→ss→s* development, because the root *farc–*, along with the others in (35), doesn't end in [t] or [d]. Verbs like (35), with an etymologically unexpected *–s* in the participle, represent a fifth (22/104) of the verbs whose EV perfect is *s*-marked. An additional 21 fall in the category of *caesī, caesus* (*caed–ere* 'cut') where surface [s] in the participle could be an underlying *–t* or a

[29] The constraint in (34) recognizes theme vowels as distinct entities, following Embick and Halle (2005). Their analysis of the theme difference between *infectum* and *perfectum*, i.e. their rule (21), differs in detail from ours, but it shares a recognition of a basic fact: all *perfectum* forms are treated as a unified class by the relevant rules.

generalized *–s*. Overall then, close to half of the sigmatic EV perfects are accompanied by participles whose affix is also, on the surface, *–s*. In all these verbs, no other property – the root vocalism or consonantism, or the theme vowel – distinguish the EV stem from the participial stem: the two perfect *s*-stems are always fully identical. The verb *tund–ere* 'strike' makes this point concrete. It has three EV perfect variants (*tutudī, tunsī, tūsī*) and two participles (*tūsus, tunsus*): significantly, the sigmatic stems of this verb fall into identical pairs *tunsī, tunsus* and *tūsī, tūsus*. No verb possesses just non-identical s-pairs like *tunsī, tūsus* or *tūsī, tunsus*[30].

In some forms, the end result of identical EV and participial perfect stems in *–s* is obtained by extending to the tensed perfect an original participial –Cs sequence. Older and newer forms illustrating this shift are shown below:

36. Geminate liquid roots shifting to uniformly sigmatic perfect stems

infectum	Old EV *perfectum*	New EV *perfectum*	Perfect participle	
pell–i–mus	pe–pul–i–mus	pul–s–i–mus	pul–s–us < pl̩d-tos	'repell'
–cell–i–mus	–cul–i–mus	–cul–s–i–mus	–cul–s–us < cl̩d-tos	'beat down'
verr–i–mus	verr–i–mus	ver–s–i–mus	vers–us < vr̩s-tos	'sweep'

Taken together, this data shows that the surface *–s* in perfect stems generalizes in both directions, from the EV stems to participles, (35), and vice versa, (36). The extension produces in each case completely identical stems. There are several points here that require analysis.

First, there is an asymmetry between affixes: only *–s* generalizes to all perfect stems in Latin. No classical participles contain the EV marker *–u*: no item like [*coal–it*]*–us* is replaced by anything like *[*coal–ū–t*]*–us* or *[*coal–u–(t)*]*–us* under the influence of EV [*coal–u*]*–ī*. Similarly, lengthening, ablaut and reduplication remain exclusive marks of the EV perfect stem[31]. Neither does participial *–t* get extended to the EV forms: a *t*-participle like [*vic–t*]*–us* does not inspire new EV forms like *[*vic–t*]*–ī,* even though an EV form like [*mul–s*]*–ī* does give rise to [*mul–s*]*–us*. Appeals to analogy (e.g. Ernout 1953:226, Kühner-Holzweissig 1966:200) don't say why analogical extension targets *–s* alone. What explains this?

---

[30] By contrast, verbs with only one sigmatic perfect stem, or with none, can display such root-allomorph differences: e.g. *strinx–ī, strict–us,* from *string-ere* 'tighten'.

[31] A lone exception: the late reduplicated participle *fefellitus* (from *fallere* 'deceive', based on the EV *fefellī*). Participles like *[*coal–ūt*]*–us* accompanied by *–u* EV perfects became common later in Romance: cf. section 6. In classical forms like *secūtus, volūtus,* [ū] originates in a root segment, [k^w] or [w]: such *ūtus*-participles did not analogically extend, in the classical language, to roots lacking a final [w].

The starting point in this development are the sound changes (*ts, tt → ss → s/V:_*) that caused the perfect stems of inherited paradigms like [*caes*]–*ī,* [*caes*]–*us* to be identical and marked by surface –*s*[32]. These paradigms gave rise to a reanalysis in the *perfectum* exponence system that made (35-36) possible: the –*s* of [*caes*]–*ī,* [*caes*]–*us* was reinterpreted as a general perfect suffix and this allowed its extension to [*fars*]–*ī,* [*fars*]–*us* and similar forms. All other perfect affixes remained exponents of the perfect participle or of the EV perfect (–*u*, RED, μ).

What is relevant in the present context is that the generalized –*s* was used only to promote stem identity between the EV stem and the participial one. This is suggested by two gaps. The first has been mentioned before and involves unattested pairs like *tunsī, tūsus* where both perfect stems are sigmatic but their root allomorphs differ. The second is the following: there are roots whose perfect is uniformly *s*-marked (*caesī, caesus*; *farsī, farsus*); roots whose EV perfect is sigmatic but whose participle isn't (*scripsī, scriptus*); and *t/d*-final roots whose EV form is non-sigmatic, while the participle contains a phonotactically mandated –*s* (*vīdī/vīsus*). What we do not find are innovative perfect paradigms like **ēgī, axus, *pupugī, puxus, *cēpī, capsus, *māni, mansus,* where a secondarily sigmatic participle is paired with a non-sigmatic EV stem.

We explain this gap as follows: the general perfect –*s* is a dispreferred variant of the perfect participial –*t*, licensed only if it generates full identical perfect stems. It is dispreferred because, in competitions between more and less specific exponents, the latter lose, *ceteris paribus:* they express fewer of the morphosyntactic features of the input (cf. Halle 1997:427's *Subset Principle*[33]). The general perfect –*s* has exactly this disadvantage relative to –*t*: it produces stems whose participial nature – or [-active] value, as in (4) – goes unmarked. Its saving grace is its ability to satisfy the preferred identity between perfect stems: and so this is the only circumstance that allows its use. The schematic tableaux below illustrate this idea by contrasting attested innovative paradigms like *farsī, farsus* with impossible innovations, e.g. **ēgī, axus*. The consideration that handicaps the generalized perfect –*s* is temporarily referred to as USE –T (PERFPART). The right constraint is introduced in the following section. The constraint CORR (PERFECT) checks the identity of EV and participial perfect stems: it too is revised below.

[32] Monteil (1970:351).

[33] "The phonological exponent of a Vocabulary item is inserted into a morpheme in the terminal string if the item matches all or a subset of the grammatical features specified in the terminal morpheme. […] *Where several Vocabulary items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen*." (Italics mine). See also Wolf's 2008 OT reinterpretation of this.

37. The use of the generalized perfect –*s* affix in two paradigms

(a) Selecting *farsus* in *farsī/farsus*

• EV perfect: *far–s–* • perfect participle suffix: *–t,–it,* • perfect suffix*: –s*		CORR (PERFECT)	USE –T (PERFPART)
a.	[far–t]–us	*! (s-t)	
☞b.	[far–s]–us		*

(b) Rejecting **axus* in **ēgī/axus*

• Root *ag–*, EV perfect: *ēg–* • perfect participle suffix: *–t,–it* • perfect suffix*: –s*		CORR (PERFECT)	USE –T (PERFPART)
a.	[ac–s]–us	*	*!
☞b.	[ac–t]–us	*	

The difference between (37.a) and (37.b) stems from the prior evaluation of EV forms: one verb chose an –*s* EV perfect stem ([*far–s*]–) while the other chose an old µ-perfect ([*ēg*]–). The prior choice of –*s* for the EV stem opens up in (37.a) the possibility of using the general perfect suffix –*s* in the participle, to satisfy CORR(PERFECT). For *ēgī* this option is not open because its EV form is not sigmatic. This analysis is pursued in more precise terms in the next section.

5 Correspondence between morpho-syntactically distinct units

This analysis of the Latin perfect began by noting that the stems of the perfect participle and of the EV perfect are morphologically distinct. This is why the systematic similarities linking them are unexpected and worthy of study. This section examines how correspondence is established between such pairs of stems.

The similarities uncovered here can be analyzed in two ways. One is to assume that the perfect stems must resemble each other in specific respects, without any requirement of global correspondence between them. Then there is no expectation of total identity. The other option is that the stems correspond: they are placed in correspondence by their aspectual identity. Because they correspond, they are expected to be phonologically identical: deviations from full identity must then be traced to credible conflicting conditions. If both these options are viable, learners could waver between them, just as the analyst does[34]. But as the sum of unrelated similarities

[34] It's possible that any systematic partial similarity between constituents is a reflex of global correspondence. Then the first analysis would simply be a non-starter.

between stems increases, the second analysis is increasingly favored: it alone predicts the drift towards complete merger.

It is the global correspondence analysis that fits the observations made here. The key argument is the emergence of *–s* as an undifferentiated perfect suffix, which must be analyzed by invoking a preference for complete identity between the two stems. The task of this section is then to spell out how the idea of global correspondence between perfect stems is consistent with their prevalent surface distinctness.

To recapitulate, the perfect stems are identical only in paradigms like [*caes*]–*ī*, [*caes*]–*us* and distinct in all other paradigm types. The sources of difference between them are: (a) distinct affixes (e.g. [*scrip–s*]–*ī*, [*scrip–t*]–*us*); (b) the related fact that distinct affixes trigger distinct phonological processes (e.g. [*fend*]–*ī*, [*fen–s*]–*us* <[*fend–t*]–*us*); and, finally, (c) the occasional unpredictable distinctness of the root allomorphs (e.g. [*tul*]–*ī*, [*lā–t*]–*us* 'carry').

5.1. Perfect stems are distinct when they contain distinct affixes

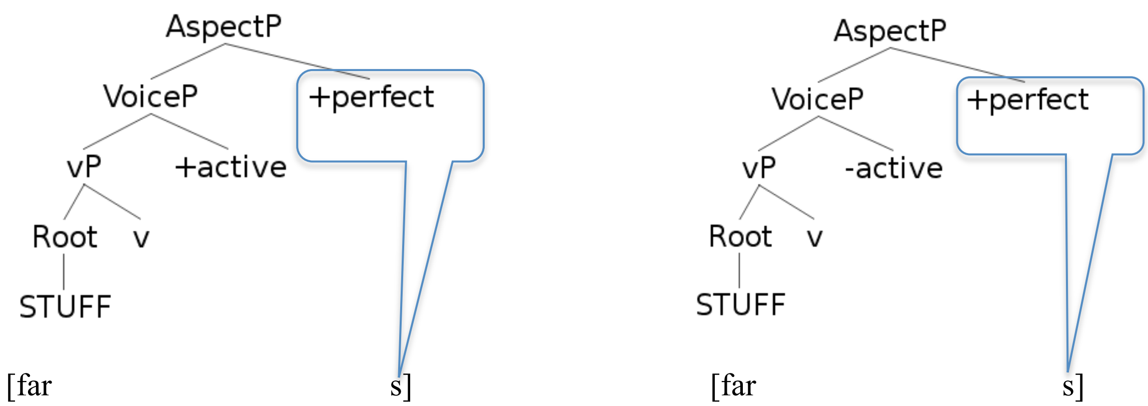
Under the analysis we explore, the shared [+perfect] aspect activates a constraint, CORR (PERFECT), that places the [+perfect] stems of any one root in correspondence:

38. CORR (PERFECT): If two syntactic structures are lexically related and contain [+perfect], their word-sized exponents stand in correspondence.

Lexically related forms are those belonging to the same lexeme (Aronoff 1994). We simplify matters here by assuming that lexical relatedness reduces to sharing a root. CORR (PERFECT) is a member of a broader class I will refer to as CORR (*S*), where *S* is the shared syntactic property. Other instances of CORR (*S*) are documented, under different names, in Steriade 1999, 2007.

Candidates satisfying CORR (*S*) activate detail correspondence constraints whose satisfaction should lead to full identity between exponents. In Latin, the factors preventing this are: the preference for expressing the distinction between participial and EV perfect structures through the use of distinct exponents; the phonotactics; and, in a minority of cases, the preservation of old, listed participial forms like [*lā–t*]–*us*. The first and most potent of these factors was noted earlier in (4): if the stems of [*hab–u*]–*ī* and [*hab–it*]–*us* become identical, then syntactic features like [±active], which differentiate the two categories, will go unexpressed. What we have learned since (4) is that, for a small but growing class of Latin verbs, strict identity between correspondent perfect stems trumps the full expression of syntactic features. We observe the inverse relation between stem identity and exhaustive exponence below:

39. Perfect Stems of [*far–s*]– *ī*, [*far–s*]– *us*



When the generalized perfect *–s* affix is used, as in (39), the [±active] differences between participles and EV perfects go unexpressed.

We use the structures and exponents of (4) and (39) to make precise the analysis of perfect correspondence sketched earlier. The new ingredient are constraints on exponence which favor the structures in (4) over (39). Their format is adopted with simplifications and some change of terminology from Wolf (2008), who proposes that the relation between morphosyntactic structures and exponents is governed by violable correspondence constraints. To implement this idea, Wolf assumes that affixes contain syntactic structures that can be matched against those present in the syntactic contexts in which they are inserted. If a syntactic structure contains a property 𝓢, but the affixal array chosen to express it has no morph that includes a counterpart of 𝓢, the relevant candidate violates a MAX 𝓢 constraint. If the affix chosen contains a structure 𝓢 that's absent from the syntactic representation, a DEP 𝓢 constraint is violated. In this conception then, affixes have both a phonological and a syntactic representation and MAX/DEP 𝓢 constraints encourage the selection of affixes whose syntactic structure matches exactly the syntactic context. In (40), the relevant instance of 𝓢 is the feature value [±active], the voice property that distinguishes participles from EV perfect forms.

40. DEP 𝓢 ([+active]): For every instance of [+active] at the exponent level, assign a violation-mark if there is not an identical instance of [+active] at the syntactic level.

The effect of DEP ***S*** ([+active]) will be to prevent the perfect participle from adopting wholesale the stem of a non-sigmatic EV perfect. MAX ***S*** is relevant too: it spells out why the general *–s* suffix is generally dispreferred: it fails to express the [-active] feature specific to the participle:

41. MAX ***S*** ([-active]): For every instance of [-active] at the morpheme level, assign a violation-mark if there is not an identical instance of [-active] at the morph level.

MAX ***S*** ([-active]) and DEP ***S*** ([+active]) are seen in action in (42). Correspondence between stems is indicated by co-subscripting. Candidate (b) has a perfect record of satisfaction for CORRPERF and related MAX/DEP/IDENT [PERF] constraints, but it places the affix μ, which is specified as [+active, +perfect], in the stem of the participle, which is a [-active] structure: this violates MAX ***S*** ([-active]) and DEP ***S*** ([+active]). The second violation is fatal. Candidate (c) uses the general perfect suffix *–s*, which carries no [±active] value and thus avoids violating DEP ***S*** ([+active]); (c) ties with (a) on constraints that evaluate similarity with the EV perfect stem (represented here only by DEP C [PERF]) but loses to (a) on MAX ***S*** ([-active]).

42. Correspondence without total identity between perfect stems: [*vīc*]*–ī*, [*vīc–t*]*–us*

	EV perfect: [vīc]$_i$– Affixes: μ: [+active, +perfect] –(i)t: [-active, +perfect] –s: [+perfect]	CORRPERF	DEP ***S*** ([+active])	DEP C [PERF]	MAX ***S*** ([-active])
a.	☞ [vīc–t]$_i$– us			* (t)	
b.	[vīc]$_i$– us		*!		*
c.	[vīc–s]$_i$– us			* (s)	*!

All candidates in (42) satisfy CORRPERF. The consequences of violating it are seen next. In (43), candidates that satisfy CORRPERF activate the rhythmic correspondence constraints MAX/DEP V (PERFECT) and are thus encouraged, correctly, to match the syllable count of the EV perfect stem; in (44), a revision of the earlier (37.a), satisfaction of CORRPERF results in full identity between perfect stems, in just those cases where the EV perfect stem is sigmatic. The full ranking asserted earlier in (42) is verified there.

43. Correspondence without total identity between perfect stems: [*hab–u*]–*ī*, [*hab–it*]–*us*

	EV perfect: [hab–u]$_i$– Affixes: u: [+active, +perfect] –(i)t: [-active, +perfect] –s: [+perfect]	CORRPERF	DEP *S* ([+active])	MAX V [PERF]	MAX *S* ([-active])
a.	[hab–t]$_{j–}$ us	*!			
b.	[hab–t]$_{i–}$ us			*!	
c.	☞ [hab–it]$_{i–}$ us				
d.	[hab–u]$_{i–}$ us		*!		*

44. Correspondence with total identity between perfect stems: [*far-s*]–*us*

	EV perfect: [far-s]$_i$– Affixes: –s: [+perfect] –(i)t: [-active, +perfect]	CORRPERF	DEP *S* ([+active])	DEP C [PERF]	MAX *S* ([-active])
a.	[far–t]$_j$ –us	*!			
b.	[far–t]$_i$ –us			* (s-t)	
c.	☞ [far–s]$_i$ –us				*

The critical constraint here, IDENT C [PERF], evaluates featural identity between the consonants of correspondent perfect stems: candidate (b) fares worse than (c) on this score and loses, because its only advantage is on the lower ranked MAX *S* ([-active]).

To distinguish *farsī, farsus* from paradigms like *scripsī, scriptus* – still well attested in the classical language – we have two options, both involving lexical indexation. The first appeals to lexically indexed USE T$_{verb}$, a constraint type we used above to encode the preservation of older variants of the perfect participle. An analysis of *scriptus* that relies on USE T$_{scribo}$ is seen below:

45.

	EV perfect: [scrib-s]$_i$– Affixes: –s: [+perfect] –(i)t: [-active, +perfect]	USE T$_{scribo}$	DEP C [PERF]	MAX *S* ([-active])
a.	☞ [scrib–t]$_i$ –us		* (s-t)	
b.	[scrib–s]$_i$ –us	*!		*

The other option uses lexically indexed MAX *S* ([-active]) ranked above DEP C [PERF] or, equivalently, IDENT C [PERF]. The analysis in (45) limits the use of lexical indexation to already necessary cases, so the first option is preferred.

This exhausts the affixal differences between EV and participial perfects. The essential points here were (a) that perfect stems correspond even when their affixes differ and (b) that the general correspondence condition CORRPERF serves both as the unified trigger of the partial similarity effects studied earlier, and as the explanation for the innovative sigmatic paradigms, whose perfect stems are not just similar, but strictly identical.

5.2. Other sources of distinctness between the perfect stems

When their suffixes differ, the two perfect stems activate different phonotactic constraints, amplifying their surface distinctness. The clearest cases involve μ-perfects like *līqu-ī* [li:k^{w}i:] 'I relinquished'. Their corresponding participles must contain an overt suffix. The only affixal options are then *–it, –t, –s*; the rhythmic identity condition MAX V (PERFECT) excludes the first. The remaining two will force [k^w] to lose its labial component. The result is *līct–us,* whose stem is now doubly mismatched relative to the EV perfect: there is a suffix *–t* only in the former, and the corresponding dorsal stops differ in labiality.

On our analysis, the stems [*līqu*]– and [*lic-t*]– correspond. They must be differentiated by the suffix *–t* for reasons examined above. The further difference, [k^w] vs. [k], follows from w/_V, and from the fact that the EV perfect is evaluated at an early stage, where correspondence to the participle's stem is not a consideration. Without this second assumption – if, for instance, the participial and EV perfect stems were evaluated simultaneously, Optimal-Paradigms style – delabialization would overapply and generate the more similar pair, *[*līc*]–, [*lic-t*]–, rather than the attested [*līqu*]–, [*lic-t*]–. Thus all available evidence points to a two-step evaluation of perfect stems: EV first, participle second.

The current analysis makes a further prediction: in productively formed perfect participles, phonotactics permitting, the root allomorph will adjust to match segmentally the root allomorph contained in the EV-stem. One aspect of this prediction involves adjustments that aim to achieve identical length for corresponding vowels. Comparable vowel length adjustments are predicted for participles of *all* strong verbs. The verbs that bear on this prediction are those in which one or both *perfectum* stems contain a root vowel that differs in length from that of the *infectum*. If we exclude roots where a length difference in the *perfectum* is phonotactically necessary (e.g. [*cāv*]–

ī vs. [*cau–t*]*–us*, cf. (21)); and roots in which the length of a *perfectum* vowel cannot be determined (e.g. [*nūb*]*–ī*, [*nup–t*]*–us*)[35] we are left with 29 items. Of these, about two thirds bear out our prediction. Both categories are seen below: the row labeled 'Match' contains pairs of perfect stems with identical vowel length, as predicted.

46. Root vowel length matches and mismatches in the perfect stems of strong verbs

Match:19	cēdō, cĕssī, cĕssus	suădeō, suāsī, suāsus	ūrō, ŭssī, ŭssus	vincō, vīcī, vīctus
Mismatch:10	mĭttō, mīsī, mĭssus	cădō, cecĭdī, cāsus	cĭeō, cīvī, cĭtus	queō, quīvī, quĭtus

These results are not straightforward to interpret. Length matches like *suāsī, suāsus* are not clearly attributable to perfect correspondence: the EV perfect and the participle could have separately undergone the lengthening that occasionally accompanies stop devoicing. Length matches of the type *ūrere, ŭssī, ŭssus,* with unpredictable shortening of the root vowel would be relevant if we knew what drives the shortening in the first place: it's certainly intriguing, and consistent with the present analysis, that both perfect stems underwent shortening, but the source of the process is unknown. The length match in *vincō, vīcī, vīctus* is the most persuasive, because the source of the length in EV *vīc–ī* is understood: it's the μ-perfect that causes it and it's perfect correspondence that extends it to the participle.

Consider now the mismatches. There are 10 roots with length-mismatched perfects: e.g. *cĭeō, cīvī, cĭtus*. All 10 paradigms look like plausible archaisms: the EV perfect shows older perfect exponents (reduplication and the μ-affix), while the participle, unaffected by perfect correspondence, has the historically expected structure (bare root in zero grade + *–to*). The present analysis claims that these participles are inherited in their old form, and frequent enough to resist restructuring. The mismatched perfect *quīvī, quĭtus* falls into this same class, but here we find fresh evidence supporting the idea of perfect correspondence: side-by-side with older *quĭtus,* there is the secondarily lengthened *quītus* (Leumann 1977:522).

Overall then, the restructured participles support the predicted length match among perfect stems, but the number of old participles, uncoupled from the EV form, is still considerable[36]. Finally, we never find adjustments in the *height* of the participial vowel: the perfect paradigm of

[35] Vowels are known to be long when they occur in open syllables; they are clearly short when they fail to induce degemination of following geminates; in closed syllables, the length of high vowels can be determined from the quality of their Western Romance descendants; but in all other cases, length is hard or impossible to determine.

[36] This holds also for paradigms like *ferō, (te)tulī, (t)lātus* or *stringō, strinxī, strīctus* or *colō, coluī, cultus* where the mismatch is not in length but in other properties.

ag–ere 'drive' is *ēgī, āctus* not **ēgī, ēctus*; similarly for *cēpī, captus*, *fēcī, factus* etc. I lack an explanation for this fact, beyond the conjecture that the *ē*-ablaut was driven by an affixal feature like [+active] whose morphosyntactic content restricted it to the EV context.

The mixed picture presented here is not unexpected: the merger between perfect stems happened over a period of centuries. The classical language held longer on to old forms, perhaps because its literary tradition made it conservative. By contrast, the Eastern variety of Latin discussed below, deprived of contact with the literary standard, achieved identity between the perfect stems before the first documents.

The Latin convergence of perfect stems appears to have proceeded faster via adjustment in non-root formatives (theme vowels and *–t/–it* variants) than through changes in root allomorphs. A faithfulness asymmetry between roots and non-root morphemes (Casali 1996, Beckman 1998) is the probable cause of this effect, but its analysis is not undertaken here.

5.4. Correspondence between infectum and EV perfect stems

The focus of this study is the stem correspondence in the perfect macro-paradigm, traced to the partial identity between the syntactic structures expressed by perfect stems. A weaker matching effect between stems of the *infectum* and the EV perfect was also detected: this second factor helped explain the correlation between syllabic stem extensions in the *infectum* and the overuse of the syllabic *–u* suffix in the EV perfect (cf. (12) and section 3.6).

It is not immediately clear what motivates this second correspondence effect. One possibility is that the feature [±active] differentiates not only the EV perfect from the perfect participle but also the latter from the *infectum*. If the [+active] value is shared by all EV forms across the *perfectum/infectum* divide, the EV *perfectum*-to-*infectum* correspondence could thus be due to the shared [+active] value. The hypothesis that the *infectum* set is [+active] by default must be made compatible with passive *infectum* forms like [*hab–ē*]*–t–ur* 'is being had' ([*have*–TV]–3RD SG.–PASSIVE). It is possible that the outer passive affix *–ur* overrides the default [+active] value of the stem it attaches to, but the specifics of the analysis remain to be spelled out.

A datum analyzed earlier excludes a second option: that the EV *perfectum*-to-*infectum* correspondence is a default relation holding between all members of a verbal paradigm. What rules out this idea is the fact that strong deponents, and generally all paradigms lacking an EV perfect, show no rhythmic match between the *infectum* and the perfect participle. In the absence of a mediating EV perfect form, the perfect participle and the *infectum* bear no relation. The most promising conjecture then is that there is a strictly pairwise, syntactically motivated relation between each of the pairs of stems discussed here, the echt verbal pair EV-*perfectum* and EV-*infectum* on the one hand, and the perfect pair on the other.

5.5. Choosing the base

Both of these paradigmatic identities display asymmetries typical of Base-Derivative relations. To summarize the evidence: the *infectum* chooses its stem – a monosyllabic root or a root plus a syllabic extension – without regard to the consequences of this choice for the shape of the EV-perfect: the latter has to match the syllable count of the *infectum* by opting sometimes for dispreferred suffixes. Similarly, the *perfectum* chooses its stem based on phonotactics and correspondence to *infectum*, and oblivious to the effects of this choice on the participial *t*-stem: the burden of satisfying perfect correspondence constraints rests entirely on the participle.

What predicts the choice of base? Why is the derivational sequence *infectum* → EV perfect → *t*-participle? In cyclic inside-out derivations, inner forms are bases for outer ones. But Latin bases are not contained in their derivatives. The inside-out account of base priority is inapplicable here. We now look for factors that predict the choice of base in the Latin verbal system, and also have the potential to predict bases in standard cyclic derivations.

We begin with the specifics of the Latin case. The intuition of the Latinist is that the priority chain *infectum* → EV perfect → perfect participle is tied to the greater richness of forms using each base stem relative to the set of forms using the derivative stem: in any verb, there are more *infectum* forms than EV perfect forms, and more of the latter than the verbal forms using the participle's stem. What is the relevant sense of *more forms*?

Preliminary counts suggest that the relevant measure is not token frequency. In support of this, Figure 2 presents ratios of EV perfects to perfect participial and supine forms in 20 verbs. The figure after each verb's stems reports the total number of perfect forms from that verb, found in the Perseus database of Latin texts. The verbs were chosen on the following grounds: they are reasonably frequent overall, to minimize zero attestation of forms; they have phonologically distinct stems in all three categories, *infectum* included, to ward off ambiguities in classification; roots with multiple perfect variants were avoided, to speed up the search; and about half the verbs were intransitives, because their participial stems have more limited uses. It was anticipated, incorrectly as it turns out, that token frequency ratios will fluctuate as a function of the existence of passive participles. Beyond these criteria, the verbs were randomly chosen.

Figure 2: EV and participial perfect forms as % of all attested perfect forms in 20 Latin verbs
Based on counts in http://www.perseus.tufts.edu/hopper/

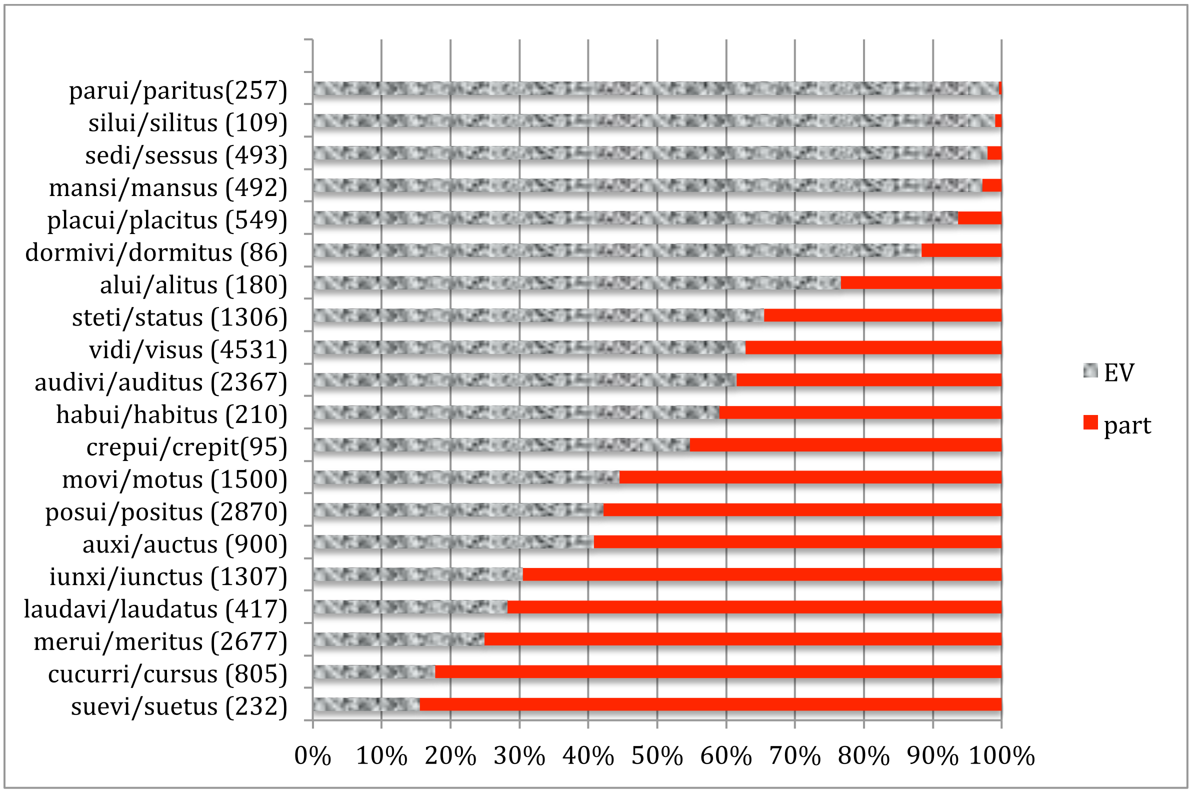


Figure 2 shows that, for these 20 verbs, there is no overall advantage for either stem in the token frequency ratio: forms built on the perfect participle stem range from less than 1% of the attested perfect tokens of that verb to more than 80%. On the other hand there is, in these 20 verbs, a massive overall token frequency disparity favoring the participle stem: forms using it represent 94% of all the perfect tokens in this sample. This is the opposite of what one expects if the base category is identified as the one that holds a cumulative token frequency advantage.

The searches revealed a point not reflected in this chart: the root-to-root frequency variation is driven by fluctuations in the status of individual participles and supines. These range from hapaxes (e.g. *silitus* 'having grown silent') to lexicalized forms that are massively more frequent than any other perfect form (e.g. supine *cursus* 'a run', or the participle-become-adjective *suētus* 'accustomed'). The frequency of EV perfect forms, on the other hand, is tied to that of the *infectum* and plausibly reflects the overall frequency of the verb alone.

It is still possible that token frequency was a factor in identifying the base, at an early stage: the first signs of a paradigmatic influence exercised by the EV perfect on the perfect participle predate the first documents. They may reflect a prehistoric token frequency superiority of the EV forms no longer reflected in the classical Latin texts: the likely cause for a change in this measure is the lexicalization of many *t*-participles and supines, which boosted their frequency.

However, there is a sense in which the EV system possesses more of something than the perfect participial system, even in the classical language. This asymmetry emerges when we focus on the range of morphological distinctions expressed using each stem. The *infectum* is by far the richest in morphosyntactic distinctions: it distinguishes 6 moods (participle, gerund, imperative, indicative, subjunctive, and infinitive); 2 of these contrast 2 tenses (future and present in the imperative; present and imperfect in the subjunctive), while the indicative contrasts all 3; voice contrasts are expressed in 3 moods (infinitive, indicative, subjunctive). If we count all combinations of tense, mood and voice values in the infectum, leaving aside person/number or case/number combinations, there are 16 distinct categories in the infectum. The EV-perfect stem, by contrast, is used the expression of only 6 categories: 3 moods (indicative, subjunctive and infinitive), with a 3-way tense contrast in the indicative and a binary tense contrast in the subjunctive. The EV-perfect expresses no voice contrast at all: its passive is formed analytically. Finally, the perfect *t*-stem contrasts just 2 moods: participle and supine.

These observations reveal that the EV perfect stem is superior in type frequency to the *t*-stem; and that the *infectum* is superior in type frequency to both. By extension, they suggest that in any pair linked by phonological correspondence, the base can be identified as the one used in a larger set of distinct morphological types, compared to its derivatives.

This idea carries over to standard cyclic relations, where bases are contained in their derivatives. In a familiar BD set like that of *origin* and *original,* the base occurs twice: by itself and inside its derivative. The derivative occurs once. Further, in the typical case, each base has multiple derivatives, thus multiplying its type frequency advantage: e.g. *origin* produces *original* but also *originate*. The conjecture then, not further explored here, is that the results obtained by stipulating that the base is the inner form can be derived instead from frequency asymmetries: the base generates more types than its derivative. This asymmetry certainly holds for standard cyclic relations. The Latin results show that it extends to base-derivative sets where neither contains the other. The inside-out idea contributes nothing to the analysis of this second class.

This is significant for the hypothesis that the non-standard Base-Derivative relation found here is fundamentally identical to its better-studied standard cyclic counterpart (cf. Steriade 2008).

5.6. Multiple bases

Two hypotheses developed above combine to predict a new pattern. If two lexically related exponents enter in correspondence on the basis of shared syntactic properties, without one having to be the other's immediate subconstituent, and if the base, in each such relation, is the form benefitting from higher type frequency, then one exponent may have two or more bases. Schematically, this possibility arises if exponents E_1 and E_2 share one property $\mathcal{S}$, if E_1 and some E_3 share a distinct syntactic property $\mathcal{S}'$, and if the type frequencies of each of E_2 and E_3 are higher than that of E_1. In that case, both E_2 and E_3 are, potentially, the bases of E_1.

The consequences of this will be manifest if BD correspondence is active in the system. One possibility is that each of E_2 and E_3 will exercise some influence on the shape of E_1. This is attested in varieties of French adjectival liaison (Steriade 1999) and, more robustly, in the formation of Romanian agent nouns (Steriade 2001). In such 'split-base' effects, it may be necessary to spell out which base controls which property of the derivative: for instance, in the stem of Romanian deverbal agent nouns, the root allomorph is that of the gerund, while the theme vowel is contributed by the infinitive. If such facts don't follow from higher principles, then competing correspondence constraints must be explicitly ranked.

A different possibility is that one base has priority in the spellout of all aspects of the derivative's stem; but another base is activated if the first is missing or unsuited for some forms. The Latin data bear out this prediction. A few inchoative *sc*–verbs were reported in section 3.6 to violate MAX V [INFECTUM]. We observe now that all these forms are in fact rule-governed: they adopt the EV-perfect of corresponding non-*inchoative* statives. Relevant forms are seen below:

47. Unexpected EV-perfects among *esc*-, *isc*-verbs and their corresponding simple verbs.

	The *esc*– or *isc*–verb		Corresponding simplex verb		
	Infectum	EV-perfect	Infectum	EV-perfect	
a.	haer–esc–ō	hae–s–ī	haer–e–ō	haes–ī	'begin to stick to/stick to'
b.	lūc–esc–ō	lux–ī	lūc–e–ō	lux–ī	'begin to shine/shine'
c.	vīv–esc–ō	vix–ī	vīv–ō	vix–ī	'come back to life/live'
d.	–cup–isc–ō	–cup–ī–v– ī	cup–i–ō	cup–ī–v– ī	'covet/desire'

For the EV-perfects of the *sc*–verbs above we expect **haer–u–ī, *luc–u–ī* (matching the syllable count of the inchoative's *infectum*, cf. (12.i)), **vīv–ī* (as in (13)) and **–cup–u–ī* (matching the lack of a theme vowel in the *infectum*). These expectations are upheld by all other inchoatives: all 27 *sc*-verbs that lack a simplex counterpart, e.g. *obmutescō*, *obmutuī* 'become mute', all 41 *sc*-verbs like *contabescō, contabuī* 'waste away' whose simplex verb lacks an EV-perfect, and all 51 *sc*-verbs whose simplex counterpart has an EV perfect in *u*–, e.g. *splendescō, splenduī* 'begin to shine', like *splendeō, splenduī* 'shine'.

They are contradicted by (47). That data stands for two subregularities. First, when the EV-perfect of the simplex stative verb is irregular, as in (47.a-c), its irregularities are passed on to the perfect of the corresponding inchoative[37]. Second, when the simplex verb belongs to the regular 4^{th} (*ī*) conjugation, as in (47.d), the corresponding *sc*-verb loses its *ī* and switches to the 3^{rd} conjugation (e.g. *cupiscō, cupiscere*), but its EV-perfect continues to have the *–ī–v*]– stem appropriate for *ī*–verbs. Generalizing: whenever the EV-perfect stem of the simplex stative is not a *u*-form, this non-*u* stem is also found in the perfect of the corresponding inchoative verb.

An account of this pattern is that the default base of the EV perfect for all inchoative verbs is the EV-perfect of the simplex non-inchoative; the *infectum* of the inchoative is a secondary base, which influences the outcome when the default base is absent. The competition is seen below:

48.

EV-perfect of simplex verb — *Infectum* of inchoative

[*haes*]–ī — [*haer–esc*]–ō

[*haes*]–ī ([*haer–u*]–ī)

EV-perfect of inchoative

The priority of one potential base over another is a ranking of CORR *S* constraints. In the present case, a first approximation analysis is that when pairs of lexically related forms, a stative and an inchoative, share [+perfect], they are placed in correspondence by CORR [PERFECT]. Pairs of forms that are lexically related and both inchoative are placed in correspondence by CORR [INCHOATIVE]. The ranking needed is CORR [PERFECT] >> CORR [INCHOATIVE]. The tableau in

---

37 [*hae–s*]–*ī* irregular because the infectum stem [*haer–ē*]- has a syllabic stem extension that's unmatched in the perfect; [*lux*]–*ī* is irregular in the same sense. Finally, [*vix*]–*ī* preserves in the EV perfect the remnants of a labiovelar that's not otherwise recoverable.

(50) demonstrates that lower ranked CORR [INCHOATIVE] is active; (49) illustrates the ranking. Both bases and all candidate derivatives are annotated with their syntactic feature composition.

49. Competition between two bases in the formation of perfect inchoative [*haes*]$_i$– ī

B1: [*hae–s*]$_i$– [+perfect] B2: [*haer–esc*]$_j$– [+inchoative, -perfect]	CORR [PERFECT]	CORR [INCHOATIVE]
☞ [*hae–s*]$_i$ [+perfect, +inchoative]		*
[*haer–u*]$_j$ [+perfect, +inchoative]	*!	

50. One base is missing: the formation of perfect inchoative *con*[*tab–u*]– ī

B1: (missing) [+perfect] B2: [*tab–esc*]$_j$– [+inchoative, -perfect]	CORR [PERFECT]	CORR [INCHOATIVE]	MAX V [INFECTUM]
[*tap–s*]$_i$ – [+perfect, +inchoative]		*!	
[*tap–s*]$_j$ – [+perfect, +inchoative]			*!
☞ [*tab–u*]$_j$ – [+perfect, +inchoative]			

An alternative analysis will rely instead on Burzio's (2005) idea that more similar forms are more likely to become strictly identical: all perfect forms of the basic stative and and all corresponding perfect forms of the derived inchoative are guaranteed to contain identical, perfect-specific endings for mood, tense and person-number. This guaranteed point of formal similarity is what triggers the merger of the stems. The choice between these options is left open.

The pattern analyzed in this section is straightforward: a perfect stem is either identical to a related perfect stem or, when the latter is missing, it is similar to a related imperfective stem. This simple pattern cannot be analyzed in Benua's BD theory, because that theory is committed to the idea that any Derivative contains its unique Base as its immediate constituent. The difficulty posed by the perfect inchoatives for this idea is that their syntactic structure is either [[Root-Inchoative]-…Perfect] or [[Root…Perfect]-Inchoative]. In Benua's theory whichever one of these structures is correct determines which form is the base of *all* perfect inchoatives. But neither of these structures does justice to the observation that the perfect inchoative *has a choice of bases*: when the preferred one is accidentally missing, a secondary base steps in to replace it.

Competitions among bases similar to the one studied here are documented in Aguero-Bautista's (1998) study of Dominican Spanish diminutives, where feminine diminutives choose between being similar to the masculine diminutive or to the feminine non-diminutive[38]; in Kager's (2001) analysis of the perfect prefixed verbs in Dutch, whose bases are the perfect of corresponding non-prefixed verbs and the non-perfect of prefixed verbs; and in Bat-El's (2002) analysis of Hebrew truncated imperatives, whose bases are the future *and* the past stem.

This concludes the presentation of the theory proposed in this study and of its predictions for the Latin aspectual morphology.

6. Post-script: perfect correspondence in later Romance

The EV perfects and the perfect participles continued to exert a mutual formal attraction in later forms of Latin. Relevant Romance facts are assembled by Laurent (1999). No synchronic analysis of any Romance perfect system known to me spells out this relation. This section partly remedies this gap: I outline the perfect correspondence system of Romanian, summarizing the analysis in Steriade (2012). This summary highlights points that support the ideas of the Latin analysis: a form of asymmetric correspondence holds between the stems of the Romanian EV and participial perfect; as in Latin, these are morphologically distinct stems; the perfect correspondence system has become virtually exceptionless in Romanian, illustrating what happens when the archaisms, still abundant in Latin, are lost. Some formal details differ between Latin and Romanian, suggesting that the inherited verb system was reorganized in Easter Romance. It preserves the broad principles underlying the parent system, but few actual forms.

The correspondence between Romanian perfect participles and tensed perfect forms is illustrated in abbreviated form in (45). Only the 3rd persons of simple perfects are listed here.

51. Perfect forms of three Romanian verbs, and corresponding infinitives

infinitive	*ved–eá* 'to see'		*árd–e* 'to burn'		*fiérb–e* 'to boil'	
perf. part.	[*vʌz–ú–t*] 'seen'		[*ár–s*] 'burnt'		[*fiér–t*] 'boiled'	
perfect	[*vʌz–ú*] 'saw-3sg'	[*vʌz–ú*]–*rʌ* 'saw-3pl.'	[*ár–s*]–*e* 'burnt-3sg'	[*ár–s*]–*e–rʌ* 'burnt-3pl'	[*fiér–s*]–*e* 'boiled-3sg'	[*fiér–s*]–*e–rʌ* 'boiled-3pl'

The stem allomorph used in tensed perfect forms is identical to the one found in the participle, with a difference: the perfect participle suffix *–t* is systematically suppressed in tensed verbs. This is seen in verbal forms like [*vʌz–ú*]–*rʌ* (not *[*vʌz–ú–t*]–*rʌ*) or [*fiér–s*]–*e* (not *[*fiér–t*]–*e*):

[38] Cf. Kenstowicz 2005 for additional analysis of the Dominican data.

post-vocalic *–t* in the participle is eliminated completely, while post-consonantal *–t* is replaced by *–s*. In all other respects the EV and participial stems are segmentally identical: the identities in (45) are representative not of a majority but of the totality of Romanian verbs

When the participle is sigmatic, as in *ár–s* 'burnt', it is used unchanged as the stem of the EV perfect. This suggests that *–s* continues to be a general exponent of perfect aspect, and is thus free to appear in both participles and in tensed forms; *–t* is, as in Latin, the carrier of morphosyntactic features specific to the participle. For this reason, it is blocked by DEP *S* ([+ACTIVE]) from the stem of verbal forms. Thus the segmental identity and distinctness between the stems of the participle and of the EV perfect follow largely from the interaction between exponence conditions and perfect correspondence.

The relation between Romanian perfect stems is asymmetrical, as in Latin, but the base is here the participle. A simple argument establishing this involves the computation of stress. The stress pattern of participles is predictable according to general principles that hold for all morphologically simple forms, in all lexical categories (Steriade 1985, Chitoran 2002): stress falls on final heavy (VC(C)) rimes, otherwise on the penult, with rare antepenult deviations. The markedness constraints characterizing the general stress pattern (avoidance of final stress on light syllables and right-lapse avoidance) are violated in certain suffixed forms (Franzén and Horne 1997) in ways that suggest a cyclic derivation. Among these forms is the tensed perfect: forms like *vʌz–ú* have stress on a light final; forms like *fiér–se–rʌ* – tensed perfects using the stem of rhizotonic participles – have antepenult stress. These markedness violations follow from an analysis in which stress is computed in the participle and transmitted, via BD correspondence, to the perfect verbal forms. In this system, where the participle stem is the base and the EV perfect its derivative, the BD asymmetry appears again to be predictable from frequency factors: the EV perfect is much impoverished relative to its Latin ancestor, and now lacks all mood contrasts. By contrast, locutions that employ the participle's stem replace most uses of the simple EV perfect.

A key point emerges from this summary. The predictable stress of the Romanian perfect participle determines the stress of the corresponding tensed perfect via the ranking BD IDENT STRESS >> MARKEDNESS. This looks like cyclic stress assignment, but it is not normal cyclicity: the perfect participle is not always contained in the tensed perfect stem. Its suffix *–t* cannot appear inside a verbal form. Yet the same suffix *–t* that's prohibited from the verbal stem is the consonant which determines that stem's stress: final stress in participial *vʌz–ú–t* is due to the final consonant; this consonant disappears from the verb, e.g. in *vʌz–ú,* but the stress remains. As in Latin, the similarity between base and derivative results from a cyclic derivation in which the base is blocked from appearing inside the derivative.

6. Summary and conclusion

This paper has documented asymmetrical dependencies between the three stems of Latin verbs. The model we used to analyze them can be summed up as follows:

- Lexically related word- or stem-sized exponents are placed in correspondence by CORR ($\mathcal{S}$) constraints when their associated morphosyntactic structures share a syntactic feature $\mathcal{S}$.
- The correspondence triggered by shared $\mathcal{S}$ activates conditions (MAX SEGMENT($\mathcal{S}$), DEP SEGMENT ($\mathcal{S}$), IDENTFEATURE($\mathcal{S}$)) whose full satisfaction would result in identity between the correspondent exponents.
- Total identity between them conflicts with the formal expression of their syntactic distinctness. The latter is analyzed, after Wolf (2008), by using MAX $\mathcal{S}$, DEP $\mathcal{S}$ constraints which require that the syntactic structures inherent in affixes match the syntactic structures of the expressions into which affixes are inserted.
- In the Latin cases, conflicts between the syntax-morphology MAX/DEP $\mathcal{S}$ constraints and the phonological correspondence MAX/DEP SEGMENT($\mathcal{S}$) set is resolved in two ways: when all syntax-morphology correspondence constraints outrank the phonological correspondence constraints, the resulting stem pairs become partly similar, but their affixes remain distinct; in a minority of cases, the stems become strictly identical by violating a MAX/DEP $\mathcal{S}$.
- Derivatives can have multiple bases, with the choice between them determined by the ranking of CORR $\mathcal{S}$ constraints or alternative similarity factors.
- Standard BD correspondence, e.g. that between *oríginal* and *orìginálity*, represents a simple subtype of the non-containment correspondence studied here: correspondent expressions, e.g. the free-standing word and its counterpart in the stem of *original–ity*, are syntactically identical. For this reason, no MAX/DEP $\mathcal{S}$ constraint conflicts with these exponents achieving full phonological identity: only conflicting phonotactics or IO correspondence can stand in the way.
- The correspondence patterns we have analyzed display the characteristic asymmetries of BD correspondence. We can (though in fact we need not) model these using stepwise

derivations reminiscent of Lexical Phonology and Stratal OT: base forms are generated first, stored in a derived lexicon and thus made immune to any further changes; their derivatives are generated on later evaluations, in which the base forms serve as inputs, along with possibly other forms. But because the bases studied here are not subconstituents of their derivatives, they need to be identified by new principles (cf. Albright 2002 for a review of the options). In the Latin case, the factor that predicts the BD asymmetry may be the greater type frequency of the base category; we had to leave open, however, the possibility that an initial token frequency asymmetry was at the root of the original perfect correspondence system.

The evidence supporting this analysis bears on the theory of phonological cyclicity. Mainly, it strengthens the case for correspondence conditioned only on lexical relatedness and partial syntactic identity. Earlier work has made related points. Albright (2002, 2005, 2010) analyzes inflectional paradigms one of whose members acts as a phonological base for the others, even when its syntactic properties block it from being contained in its derivatives. The mechanisms Albright proposes are distinct from the ones motivated for Latin and these differences are yet to be bridged by a unified theory. But the basic point of a BD-style dependency established in the absence of containment emerges from that work as well. An analysis of French liaison and English derivational morphology (Steriade 1999) motivates constraints similar to CORR *S*. That proposal finds further support in an analysis of the similarity between the stems of Romanian agent nouns and present participles (Steriade 2001): here too, neither of the correspondents contains the other. The phenomenon of inflection-dependence (Steriade 2007, Steriade and Yanovich 2011) is similar in its implications: stems predictably generated in an inflectional paradigm function as derived inputs in the phonological computation of derivatives of the same root, even when the inflected forms are not contained in the derivative. Further afield, Crosswhite (1999), Kenstowicz (2005), Törkenczy and Rébrus (2005), Ito and Mester (2004) and others show that requirements of distinctness or anti-homophony obtain between pairs of lexically related forms. Here the familiar BD asymmetry reemerges in new territory: we can identify a derivative as the form that violates markedness, IO faithfulness or exponence to avoid being identical to the base, while the latter is computed as if the derivative doesn't exist. In pairs linked by antihomophony neither form *could be* contained in the other: so these patterns too require evaluations in which a reference term is not contained in the item being evaluated.

This evidence changes our view of the mechanisms that generate cyclic identity effects. The original view of the cycle – the view that informed the work of Chomsky and Halle (1968), and later, more explicitly, that of Kiparsky (1982), Pesetsky (1979) and others – was that it is the direct phonological reflex of the inside-out workings of word formation. To maintain this view, the BD asymmetries documented here would have to be analyzed as unrelated to standard cyclic cases: we have seen, however, that a unification is possible in a theory where subconstituency between bases and derivatives is not a precondition for correspondence.

The first proposals on BD correspondence, e.g. Benua's (1997), mistakenly attempted to taylor the OT analysis of cyclic effects too narrowly to the inside-out hypothesis: in an attempt to be explicit and restrictive, Benua stated that correspondence holds only between word pairs where one is an immediate constituent of the other. That statement was justly tagged as a stipulation by Kiparsky 2000 and Bermúdez-Otero 2010, in the course of building arguments for Stratal OT, a theory that relies strictly on input-output faithfulness and rejects correspondence between independent surface forms. In fact, Benua's theory had most of the right ingredients to analyze all types of BD correspondence, *oríginal-orìginálity* pairs, as well as Latin-style *mōvī-mōtus* pairs: the stipulation identified by Stratal OT proponents is wrong not only because it is a stipulation but because it prevents an essentially successful theory from deploying its full potential. The fuller evidence examined here suggests that the idea of OO correspondence is surprisingly close to being right: only its initial implementation was hampered by incomplete empirical support.

References

Aguero-Bautista, Calixto (1998) 'Cyclic and identity effects in Spanish diminutives and augmentatives', Generals paper, MIT.

Albright, Adam. 2005. The morphological basis of paradigm leveling, in Laura Downing, Tracy Alan Hall, Renate Raffelsiefen, eds., *Paradigms in Phonological Theory* . Oxford U Press

Albright, Adam. 2010. Base-driven leveling in Yiddish verb paradigms, *Natural* Language & Linguistic Theory. Dordrecht: Aug 2010. Vol. 28, Iss. 3; p. 475

Aronoff, Mark. 1994. *Morphology by Itself*. Cambridge: MIT Press.

Bat-El, Outi. 2006. Blends. *Encyclopedia of Language and Linguistics* (2nd edition). Oxford: Elsevier

Beckman, Jill 1998 *Positional Faithfulness*, University of Massachusetts, Amherst PhD Thesis

Benua, Laura. 1997. *Transderivational identity: Phonological relations between words*. Ph.D. Dissertation. Amherst, MA:U. Mass.

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

Burzio, Luigi 1998 Multiple Correspondence, *Lingua* 103, 79-109.

Burzio, Luigi 2005 "Sources of Paradigm Uniformity", in Laura J. Downing, T. A. Hall, Renate Raffelsiefen, eds. *Paradigms in Phonological Theory*. Oxford: Oxford University Press: 65-106.

Casali, Roderick 1998 *Resolving Hiatus*, Routledge.

Chitoran, Ioana. 2002. *The Phonology of Romanian: A Constraint-Based Approach*. Berlin: Mouton de Gruyter.

Crosswhite, Katherine 1999 Intra-Paradigmatic Homophony Avoidance in two Dialects of Slavic, in Matthew Gordon (ed.) *UCLA Working Papers in Linguistics*—vol. 1, UCLA.

Csér, András 2010 "The Latin -alis/aris allomorphy revisited". In Franz Rainer, Wolfgang U. Dressler, Dieter Kastovsky, Hans Christian Luschützky (eds.) *Variation and Change in Morphology. Selected papers from the 13th International Morphology Meeting*, Vienna, 2008. Amsterdam: John Benjamins. 33–52.

Davis, Stuart 1998 "Syllable Contact in OT", *Journal of Korean Linguistics* Volume: 23, Issue: 2, Pages: 181-211

Devine, Andrew M. and Laurence D. Stephens. 1977. *Two studies in Latin phonology*. Saratoga, CA: Anma Libri.

Egbert, James. 1895. *Study of Latin Inscriptions*, American Book Company, New York.

Embick, David 2000 Features, syntax and categories in the Latin perfect, *Linguistic Inquiry*, Volume 31, Number 2, Spring 2000 185–230

Embick, David and Morris Halle 2005 On the Status of Stems in Morphological Theory in T. Geerts and H. Jacobs eds. *Proceedings of Going Romance 2003*, John Benjamins.

Ernout, Alfred 1953 *Morphologie historique du latin*, Klincksieck, Paris.

Ernout, Alfred and Antoine Meillet 1959 *Dictionnaire étymologique de la langue latine: histoire des mots*. Klincksieck, Paris

Ernout, Alfred and François Thomas 1972 *Syntaxe latine*, Klincksieck, Paris

Godel, Robert 1961 "Sur l'évolution des voyelles brèves latines en syllabe intérieure," in Klaus Strunk (ed.) 1973 *Probleme der Lateinischen Grammatik*, Darmstadt.

Halle, Morris 1973, Prolegomena to a Theory of Word Formation, *Linguistic Inquiry*, Vol. 4, No. 1, pp. 3-16

Halle, Morris. 1997. 'Distributed morphology: Impoverishment and fission.' In *MITWPL 30: Papers at the Interface*, ed. Benjamin Bruening, Yoonjung Kang and Martha McGinnis. MITWPL, Cambridge, 425-449.

Halle, Morris and Alec Marantz 1993 Some key features of Distributed Morphology, MIT Working Papers in Linguistics 21, 275-288

Hoffmann, J.B and A. Szantyr 1971 *Lateinische Grammatik*. Zweiter Band: *Syntax und Stilistik*. (Handbuch der Altertumswissenschaft, ii. 2. 2.). Munich: Beck, 1971

Ito, J and Mester, A. 2004 "Morphological contrast and merger: ranuki in Japanese", *Journal of Japanese Linguistics* 20. 1-18

Kager, René 2001, *Base Dependence and Prefix Fusion in Dutch*, talk presented at the Conference on Paradigm Uniformity, ZAS Berlin.

Kenstowicz, Michael. 1998. "Base identity and uniform exponence." In J. Durand & B. Laks, eds., *Current Trends in Phonology: Models and Methods*. Salford: University of Salford, 363-394

Kenstowicz, Michael. 2005. Paradigmatic Uniformity and Contrast, in L.Downing, T.A.Hall and R.Raffelsiefen (eds.) *Paradigms in Phonological Theory*, OUP.

Kiparsky 1982 Lexical Phonology and Morphology. In In-Seok Yang (ed.), *Linguistics in the Morning*, Seoul, 1982.

Kiparsky, Paul. 2000. "Opacity and Cyclicity" *The Linguistic Review* 17:351-367, 2000.

Kühner, Raphaël and F von. Holzweissig 1966 *Ausführliche Grammatik der lateinischen Sprache*. Second edition. Revised by F. von Holzweissig. Hannover: Hahnsche Buchhandlung

Laurent, Richard 1999 *Past Participles from Latin to Romance*, University of California Publications in Linguistics vol. 33, UC Press

Letoublon, Françoise 1983 "Les verbes de mouvement et l'auxiliarité en latin," *Glotta* 61, 218-228.

Leumann, Manu *Lateinische Laut- und Formenlehre*, 1977. (Handbuch der Altertums-wissenschaft, ii. 2. 2.). Munich: Beck.

McCarthy, John and Alan Prince. 1995. Faithfulness and reduplicative identity. In Beckman, Dickey and Urbanczyk (eds.) *Papers in Optimality Theory*. University of Massachusetts Occasional Papers, 18, p. 249-384. GLSA, UMass Amherst.

Michaels, Jennifer. 2009 To Alternate or Not to Alternate: What is the Boundary? To appear in *NELS 40 Proceedings*

Monteil, Pierre 1970 *Éléments de phonétique et de morphologie du latin*, Nathan, Paris

Murray, Robert, and Vennemann, Theo. 1983. 'Sound change and syllable structure in Germanic phonology.' *Language* 59: 514 -528.

Niedermann, Max 1953 *Phonologie historique du latin*, Klincksieck, Paris

Padgett, Jaye 2002 *Russian voicing assimilation, final devoicing, and the problem of [v].*

Roché, Michel and Marc Plénat (2003) . "Prosodic constraints on suffixation in French". *In* G. Booij, J. DeCesaris, A. Ralli & S. Scalise (eds), *Topics in Morphology. Selected Papers from the Third Mediterranean Morphology Meeting (Barcelona, September 20-22, 2001)*, I.U.L.A., Universitat Pompeu Fabra, Barcelona, pp. 285-299.

Riggle, Jason 2006 Infixing reduplication in Pima and its theoretical Consequences, *Natural Language and Linguistic Theory,* vol. 24, n°3, pp. 857-891

Roché, Michel and Marc Plénat (2003) . "Prosodic constraints on suffixation in French". *In* G. Booij, J. DeCesaris, A. Ralli & S. Scalise (eds), *Topics in Morphology. Selected Papers from the Third Mediterranean Morphology Meeting (Barcelona, September 20-22, 2001)*, I.U.L.A., Universitat Pompeu Fabra, Barcelona, pp. 285-299.

Steriade, Donca 1982 *Greek Prosodies and the Nature of Syllabification*, MIT PhD thesis.

Steriade, Donca. 1984. "Glides and vowels in Romanian". *Berkeley Linguistic Society* 10, 47-64.

Steriade, Donca. 1999. Lexical conservatism in French adjectival liaison, in B. Bullock, M. Authier, and L. Reed (eds.), *Procedings of LSRL 25*. Benjamins, pp. 243–71.

Steriade, Donca 2001 "Paradigm structure in Romanian agentives", talk presented at the Conference on Paradigm Uniformity, ZAS Berlin.

Steriade, Donca 2008 "A pseudo-cyclic effect in the Romanian declension", A.Bachrach and A.Nevins (eds.) Inflectional Identity, Oxford University Press, pp. 313-361

Steriade 2011 "Constraint interaction derives morphomic identity," to appear in Ana Luís and Ricardo Bermúdez-Otero (eds.) *The Morphome Debate: Diagnosing and Analysing Morphomic Patterns*, Oxford University Press

Steriade, Donca and Igor Yanovich 2011 "Inflection dependence in the nominal accentuation of East Slavic: evidence from Ukrainian and Russian", talk presented at the 20th meeting of *Formal Approaches to Slavic Linguistics*.

Topintzi, Nina. 2006."A (not so) paradoxical instance of compensatory lengthening: Samothraki Greek and theoretical implications." *Journal of Greek Linguistics* 7: 71-119

Wolf, Matthew. 2008. *Optimal Interleaving: Serial Phonology-Morphology Interaction in a Constraint-Based Model.* Ph.D. dissertation, University of Massachusetts Amherst.

Appendix 1: *The phonology and spelling of Latin u/v*

The *–u/v* perfect suffix poses a phonotactic problem that was deferred until now. Root-internally, *u* and *v* are in complementary distribution: *v* (= [w]) occurs only prevocalically, unless the preceding segment is a non-liquid consonant; in all other contexts, only *u* can surface. A constraint prohibits Cv, if C is a non-liquid: but it seems to operate differently across the boundary between the perfect stem and the personal endings from all other contexts. Here I analyze the relevant data and its implications for the representation of the perfect suffix.

In the V–Liquid_V context, /v/ is allowed, but not /u/ (Devine and Stephens 1977): e.g. *cerv–ī* 'deer-PL', *alv–ī* 'belly-PL'. After all other consonants, in word-internal contexts, only [u] occurs: *ingenu–ī* 'native-PL'; *mutu–ī* 'reciprocal- PL'; *pecu–āri–us* 'belonging to cattle'. The difference between liquids and non-liquids can be explained by recognizing in **Cv* a prohibition against rising sonority C-Glide sequences. I will refer to this constraint as *RISING CG[39]. This can distinguish permitted sequences of falling sonority (liquid-v) from disallowed sonority rises (other C-v). *RISING CG >> *HIATUS >> IDENT [±SYLLABIC] IO explains the contrast of *cerv–ī* vs. *mutu–ī,* whether /v/ or /u/ is the underlying segment. Below we start from /u/.

2. Distribution of [u] and [w] after liquids and non-liquids.

(i) ceru-ī		*RISING CG	*HIATUS
☞a.	cerv-ī		
b.	ceru-ī		*!

(ii) mutu-ī		*RISING CG	*HIATUS
a.	mutv-ī	*!	
☞b.	mutu-ī		*

[39] This is related to the Syllable Contact Law (Murray and Vennemann 1983, Davis 1998). Space does not allow a discussion of the issues raised by this condition. For the facts analyzed here, the reader can substitute SYLLABLE CONTACT for the *RISING CG constraint in the text. On the intermediate sonority of the glide /w/ in the older IE languages – lower than liquids but higher than nasals – see Steriade 1982; on the comparably low sonority stattus of [w] in some of the modern IE languages see Padgett 2002 and references there.

But perfect *–u* differs: after liquids it remains syllabic. It is trisyllabic in *car–u–ī* 'I have been deprived of', not **carvī;* and in *al–u–ī* 'I have nourished', not **alvī.* Without modifying the rest of the analysis, we can assume that perfect *–u* deviates from all other *u*'s because it is underlying /–uv/. Further evidence for this representation emerges below. Using /–uv/, *car–u–ī* becomes *car–uv–ī*, with the expected disyllabic stem and no hiatus.

Two further issues arise now. First, we must derive *aud–ī–v–ī* and *laud–ā–v–ī* from what has become under the new analysis underlying *aud–ī–uv–ī, laud–ā–uv–ī*. What must be explained is the disappearance of /u/ in this context, compared to the preservation of both vowels in hiatus in forms like *pecu–āri–us, ingenu–ī* etc. The correct ranking will protect root vowels (MAX V_{root} >> *HIATUS), long vowels (MAX V: >> *HIATUS), and possibly short vowels in specific other contexts, but not short vowels before homorganic glides, so not the /u/ of /uv/: the ranking must be *HIATUS >> MAX $V_i/\_G_i$. The fact that MAX $V_i/\_G_i$ is lower ranked than other instances of MAX V fits the similarly low ranked status of DEP $V_i/\_G_i$ relative to other instances of DEP V, a ranking needed to explain the preference for epenthetic vowels that match the quality of adjacent glides. Both rankings are predicted under the P-Map hypothesis, from the similarity between a homorganic vocoid sequence like [uw] and either of its isolated components, [u] or [w].

Second, the *uv*-hypothesis must be consistent with Latin spelling. The Latin alphabet had one letter for both /v/ and /u/ (Egbert 1895:25), so the expected spelling of *habuī*, which under our hypothesis is *habuvī*, should contain a doubled instance of this grapheme, <HABVVI>. The attested spelling is however always <HABVI>. Why is the second <V> missing?

I propose that double <VV> is always reduced to <V>, not only in the case of immediate interest to us but in every instance where the resulting graphemic string has an unambiguous interpretation. This proposal resolves old questions about phoneme-grapheme correspondences in Latin and is in line with the general Latin dispreference for double letters: geminate spellings for long consonants were a recent (1st cent. AD) addition and long vowels were rarely distinguished from short ones by doubling (Leumann 1977:12ff).

In prevocalic position, there was no surface contrast between /u/ and /uv/ (Niedermann 1953:104, Godel 1961). In this position, both /uv/ originating from a vocoid sequence and the /uv/ originating from the intervocalic lenition of /ug^w/ were generally spelled by a single <V>. The data in (3) illustrates the spelling of /uv/ from /ug^w/: underlying /ug^w/ is spelled as <VC> before consonants; where /g^w/ lenites to /v/, between vowels, the expected /uv/ us spelled as

<VV> before /iV/ sequences, and, significantly, as <V> in all other prevocalic contexts:

3. Expected [uw] from /ug^{w}/ spelled <V> or <VV>

	No lenition	Lenition		gloss
	_ C: <VC>	_iV: <VV>	elsewhere _V: <V>	
flug^{w}–	fluc–t–us <FRVCTVS> fluc–s–ī <FLVXI>	fluv–ius <FLVVIVS>	fluv–it (3rd sg. pres) <FLVIT> fluv–er–is (2nd sg.fut.) <FLVERIS>	'flow'
frug^{w}–	fruc–t–us <FRVCTVS>		fruv–it–ur (3rd sg. pres) <FRVITVR> fruv–o–r (1st sg. pres.) <FRVOR>	'derive enjoyment'

The important datum here is in the 'elsewhere _V' column, which contains evidence for expected /uvi/, /uve/, /uvo/ strings being spelled as <VI>, <VE>, <VO>. This is the same reduction of <VV> to <V> we postulate in order to make the perfect /uv/ of /hab–uv–ī/ consistent with the attested <HABVI> spelling. The same change is attested in alternations like *novō* <NOVO>'new-ABL' and *de–nuō* <DENVO>'once again' from *de-novō*: short /o/ reduces regularly to /u/ in the non-initial syllable; the /uv/ sequence thus derived is spelled with a single <V>, <DENVO>.

Consider now *fluvius* <FLUVVIVS>: why is the sequence /uviu/ spelled in full as <VVIV> instead of as <VIV>? The answer is that a reduced spelling <VIV> would be ambiguous: it could stand for /uviu/ or for /uju/, as in /cujus/, /hujus/ (genitive singular forms of demonstrative pronouns). In the latter case, the /j/ was itself long – /cuj:us/– but the doubled spelling <CUIIUS>, although possible, was not widespread (Egbert 1895:26).

A search for <uv> digraphs in Perseus returns about 120 forms that confirm a basic point: /uv/ is spelled <VV> only under three conditions, all of which involve potential ambiguity:

4. Where /uv/ is spelled <VV>

a. before /iV/, <VVIV>:

Lanuvium, Iguvium, Pacuvius, *simpuvium* 'sacrificial bowl'

b. after initial /j/, <IVVE>, <IVVO>:

iuvenis [juvenis] 'young', *iuvō* [juvo:]'help', and their derivatives

c. after initial /u/, <VVA>, <VVE>:

ūva 'grape'; *ūveō* 'I am humid', and their derivatives

The cases in (4.a) are identical to that of *fluvius*: here simplified <VIV> is avoided because it would be locally ambiguous between /uviu/ and /uju/. In (4.b), the spelling adopted for /juvV/, e.g. <IVVENIS>, avoids ambiguity with /ivV/: simplified <IVENIS> would be open to that second interpretation[40]. Finally, the reduced spelling <VA>, instead of attested <VVA> for a string like /ūva/ will be ambiguous with /va/, as in /vacō/ 'I am void', missing entirely the initial vowel.[41] For the same reason, initial /vu/, as in /vultus/ 'look' is spelled <VV>: the simplified spelling <VLTVS> will be ambiguous with the onsetlesss /ultus/ 'avenged'; while final /uu/, as in /mutuus/, with hiatus, is likewise spelled with doubled <VV> to avoid ambiguity with well-formed, potential /mutus/.

This excursus into the spelling conventions of Latin yields the result anticipated. Latin avoids all doubled letters, including <VV>, but this preference is tempered, in the case of consonants, by avoidance of local homography, the ambiguity in the mapping between graphemes and a phonetic string. Potential homography explains every case where <VV> is written. The perfect *–uv* morpheme is spelled with a single <V> because it occurs only prevocalically, a context where no contrast between /uv/ and /u/ is possible.

The presence of the perfect suffix *–uv* in surface representations, e.g. in what we now reconstruct as *car–uv–ī* 'I lacked', eliminates two otherwise inexplicable hiatuses implied by the standard transcriptions: the form *car–u–ī* we started with, which has now become *car–uv–ī*, and the 1st plural perfect forms like *hab–u–i̲–mus,* which is similarly replaced now by *hab–uv–i–mus.* The problem posed by the second form is that it appears to contain Godel's 'voyelle d'articulation' *i* next to a vowel, a context where this *i* normally never occurs in.

Under this revision of our analysis, the constraint *RISINGCG, replacing *CV, is not the one that blocks monosyllabic stems in perfect stems like *[*hab–v*]*–ī.* Rather, perfects like *[*hab–v*]*–ī,* like *[*car–v*]*–ī,* is ruled out because an underlying vowel, the /u/ of /–uv/, was unjustifiably lost. The rest of the analysis remains the same.

[40] The graphemic string <IVVE> cannot be interpreted as [ivue] because [vu] is itself impossible in general, with only predictable deviations which don't apply here. Native initial /ivV/ is phonotactically restricted – its expected realization is /juV/, with hiatus – but it surfaces in loans, e.g. /iverna/, a version of /Hibernia/.

[41] Niedermann 1953:104-105 also suggests that the failure to write <VV> for the expected /uv/ in forms like *fluit*, is strictly orthographic. In support of this, he cites occasionally simplified spellings like <IVENTA> for /juventa/ (cf. 4.b) and <PLUIA> for /pluvia/ (cf. (4.a)). He does not explain why <VV> is systematically reduced in some contexts (e.g. *fluit, habui*) but not in all (*fluvius* etc).

Appendix 2: *Vu and related

Latin avoids similar or identical segments at close range, inside morphemes and across them (Csér 2010). The fact that *v*-roots cannot use the *–uv* perfect suffix is an instance of this broader OCP effect[42]. There are three such cases of blockage to consider:

5. Phonotactics explain why *–v/u* perfects are blocked on *–v/u* final roots

	Root	Expected *–v/u* tensed perfect	Sequence avoided	Attested tensed perfect
a.	mov–	*mov–ē–v–ī	*vVv	mōv–ī
b.		*mov–uv–ī	*vu	
c.	tribu–	*tribu–uv–ī	*uu	tribu–ī

We verify that the starred sequences in (5) are indeed disfavored. Case (a), **vVv* falls into the larger class of C_iVC_i sequences whose avoidance is documented by Csér 2010. (On attested */v–ā–v/* in thematic perfects see below.) I assume, based on Csér's evidence, a prohibition on identical consonants, $*C_i…C_i$, leaving unsolved all questions about the distance between the target consonants and about the extension of this constraint to homorganic consonants.

Case (b), the string **vu*, is attested in Latin (492 instances in Perseus) but arises only under the compulsion of two phonotactics: when original /o/ is preceded by /v/ and followed by velarized, pre-consonantal /l/, as in *vu[ɫ]tus, vu[ɫ]gus*; and from final *oC,* as in *avus* 'grandfather'. In neither of these contexts does Latin permit a contrast between /o/ and /u/. There are no other /vu/ sequences in Latin. The attested classes of *vu* are generated by constraints against the final short *oC, eC* (abbreviated *MID-C#) and against *voɫ* (here *VOɫ), both of which dominate the ban on sequences of high labial vocoids (abbreviated *VU). Although low-ranked, the latter is active: it dominates the constraints on the selection of perfect exponents. A simplified analysis of these non-contrastive *vu* sequences is given below[43]:

---

[42] Why */uv/* sequences are tolerated under specific circumstances on the surface (cf. (4)) in a system that otherwise bans repeated *u/v* sequences across morpheme boundaries is not immediately clear. One is tempted to invoke the classical autosegmental distinction between multiply linked autosegments (here, the labial vocoid shared in /uv/) vs. sequences of distinct, identical ones (the prohibited /vVv/ sequence in the hypothetical perfect *mov-ē–v–ī*; or the prohibited /vu/ of hypothetical **mov–u–ī*). This account is incomplete: it is missing an analysis of the data in (4).

[43] In a complete analysis, the phonotactics interacting here – *VU, *MID-C#, *VOɫ– are MINDIST constraints on the minimal distance between contrasting sequences (Flemming 2002), and not prohibitions on individual sequences. Thus the right interpretation of *MID-C# is that it bans the contrast between short final *o-u* in closed syllables, not just final *oC*. A full analysis that reflects this point introduces further complexities not strictly relevant here.

6. Systematic exceptions to OCPv$_U$

(i) volgo-s		*VOɫ	*l/_C	*VU
a.	volgus		*!	
b.	voLgus	*!		
☞c.	vuLgus			*

(ii) avo-s		*MID-C#	*VU
a.	avos	*!	
☞b.	avus		*

Case (c) of (5) was discussed in Appendix 1: /v/ surfaces between *u_ī, u_e* but is not written. Case (d) is related to (b): /uu/ sequences are impossible in Latin, except when the second /u/ is generated by *MID-C#, as in *mut–u–us* 'mutual'. Their analysis is identical to (6.ii).

The sequence *vVv* is found in a few *ā*-verbs: e.g. *prīvāv-ī* 'I robbed'. This can be explained. In regular *ā*-verbs, the theme vowel is present in the *infectum* and the *perfectum*. This is the effect of a uniformity condition akin to the MAX THEME V (38), but unrestricted to aspectual class. I propose that this theme-vowel uniformity condition outranks in regular verbs the ban on *vVv*: *prīvāv-ī* violates the OCP but keeps its theme vowel; the alternative **prīv-ī* critically violates the generalized MAX THEME V condition. Under this analysis, the OCP effect is masked everywhere except in strong verbs like *moveō*, i.e. in verbs that are independently known to violate the generalized uniformity condition on theme vowels.

Appendix 3: stem-final lengthening of *u*

This appendix presents the evidence for the constraint *VC_0u–]$_{stem}$ introduced in section 3.5. The table below provides a sample of the alternations between long and short *u*, with the former occurring in stem-final, word-medial position and the latter in word final position, where the quantity distinction is preserved.

7. Long –ū from short –u stems in VC_0_CV contexts: nominal bases

Base in short u–		Derivative in –ū–C…	
tribu-s	'tribe'	tribū–lis	'of the same tribe'
		tribū–nus	'head of a tribe'
		tribū–tim	'tribe by tribe'
cornu,	'horn'	cornū–tus	'horned'
or cornū		cornū-cōpia(e)	'the horn of abundance'

pecu	‘cattle’	pecū–nia pecū–lium	property property in cattle
testu	‘earthen pot’	testū-dō	‘tortoise’
veru	‘a spit, broach’	verū-culum verū-tus	‘small javelin’ ‘armed with a javelin’
curru-s	‘chariot’	currū-lis	‘belonging to a chariot’
manu-s	‘hand’	manū-mittō	‘release from one’s power’
usu-s	‘use’	usū-fructus	‘use without ownership’

This pattern is also regular in *–u* verbs: before all derivational suffixes, we find only long /ū/.

8. Long –ū from short –u stems in VC_0_CV contexts: verbal bases

dē–minu–ō (minus ‘less’)	‘I diminish’	dē–minū–tīvus	‘diminutive’
argu–ō	‘I argue’	argū–mentum	‘argument’
ed–ō	‘I eat’	edū-lis	‘edible’

This *u*-lengthening process admits of three deviations. First, there are no long *–ū*’s before vowels (e.g. *dē–minŭ–ō*) but this is the effect of a further, broader condition: Latin vowels shorten before other vowels. Second, in derivatives of older, unproductive types, some presuffixal /ū/s occur in free variation with short /ĭ/ – e.g. *manū–brium* ~ *manĭ–brium* ‘handle’ – as do some short /ŭ/’s – e.g. *manŭ–cium* ~ *manĭ–cium* ‘glove, muff’, *manŭ-festus* ~ *manĭ–festus* ‘palpable’. Free variation of /ŭ ~ ĭ/ with zero is also attested – cf. *pocŭlum* ~ *poclum* ‘drinking vessel’ – but inside morphemes. All these variants tell us what happens in the absence of the presuffixal lengthening in (24-25): medial short [u] in open syllables varies with /i/ or disappears. Then lengthening is a means to preserve intact the *quality* of a short [u], in the VC_0_CV context, where its contrast with /i/ tended to be neutralized (Godel 1961), and its *existence* was threatened by syncope.

So the fuller scenario is this: in earlier Latin, short vowels in open non-initial syllables – that is, in the VC_0_CV context – reduced to a schwa-like [ɨ] whose contextually variable quality was recorded as <u> or <i>, and which was prone to syncope. This much is well-known; the <u>~<i> and <u>~Ø variants are lexical relics of this older stage. The new proposal is this: in later Latin, vowel reduction no longer operates across the board, but the reduction-triggering phonotactic continues to be active. I refer to this constraint as $*VC_0uC{-}V$. To satisfy $*VC_0uCV$, and to maintain /u/'s presence and quality, stem final /u/ is lengthened. The stem-final /u/s are singled out for lengthening because they occur intact in other contexts than VC_0_CV, where reduction and syncope don't happen: lengthening is then a means of stabilizing the more noticeable alternations. This is where the penultimate *ū* of *statūtus, solūtus* etc. comes from.