

# Anatomy of an analogy

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One of the best-known examples of analogical change—perhaps **the best-known**—is the leveling of rhotacism, *s-r* alternations in Latin. Two major theories of this change can be discerned:

1. **Grammars abhor interparadigmatic stem allomorphy:** Mańczak (1957:396f.), Kenstowicz (1996), Campbell (2004:§4.5), Albright (2002: ch. 4), Albright (2005), etc.
2. **Phonological processes tend towards overapplication:** Kiparsky (1971, 1982), Roberts (2012), Bermúdez-Otero (2018), etc.

In this talk I will argue for a third theory of this analogy, namely that

1. **Neogrammarian sound change introduces exceptions,**
2. **exceptions cause loss of productivity, and**
3. **loss of productivity causes (covert) reanalysis.**

## Note on data

Word forms cited here are taken from the Bibliotheca Teubneriana Latina, an electronic corpus of all pre-modern Latin texts. The texts span from Plautus (3rd century BCE), the earliest well-preserved author, to Apuleius and Gellius (2nd century CE) at the end of the pagan era. Forms not found in this corpus, whether reconstructed or inferred from incompletely attested paradigms, are indicated with an asterisk (\*).

## Note on transcription

Transcriptions are given in the Latin alphabet except where greater phonetic detail is necessary. Note that *i* and *u* indicate both the high vowels [i, u] and glides [j, w], respectively, depending on position.<sup>1</sup> The characters *c* and *x* correspond to [k] and [ks], and the digraphs *ae* and *qu* represent [aj] and [kw]. Long monophthongs are indicated with macrons.<sup>2</sup>

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<sup>1</sup>There are at least some high vowel/glide alternations in Classical Latin, though it is not clear whether [j, w] are mere allophones of [i, u] or whether the Latin alphabet is deficient.

<sup>2</sup>These in turn are inferred using the testimony of classical grammarians, poetic meter, wordplay, non-standard orthographic conventions used in inscriptions, the adaptation of loanwords into Latin, the adaptation of Latin words

# 1 History

We begin with the indisputable historical facts.

- Intervocalic *s* merged with *r* in Old Latin.

(1)  $s > r / V \text{ — } V$

This change is “Neogrammarian” in the sense that it has very few exceptions (Labov 1981).

- The *terminus post quem*—the earliest possible date—for this change is sometime after
  - the Praeneste fibula (cf. NVMASIOI ‘for Numerius’), and
  - the Duenos inscription (cf. IOVESAT ‘he vows’).
- The *terminus ante quem*—the latest possible date—is the 4th c. BCE (Sommer 1902:§119). Cicero states (*Fam.* 9.21) that L. Papirius Crassus—dictator in 339 BCE and consul in 336 BCE—was the first of his clan to use the name Papirius rather than the ancestral Papisius.
- This change introduced substantial inflectional allomorphy across the lexicon, for instance in the masculine noun *honōs-honōris* ‘honor’.<sup>3</sup>

	sg.	pl.
nom.	<i>honōs</i>	<i>honōrēs</i>
gen.	<i>honōris</i>	<i>honōrum</i>
(2) dat.	<i>honōrī</i>	<i>honōribus</i>
acc.	<i>honōrem</i>	<i>honōrēs</i>
abl.	<i>honōre</i>	<i>honōribus</i>
voc.	<i>honōs</i>	<i>honōrēs</i>

- Not long after the actuation of (1), subsequent sound changes—particularly degemination of *ss* after diphthongs and long monophthongs—reintroduced intervocalic *s*.

(3)  $ss > s / \mu\mu \text{ — }$

- The *terminus ante quem* for (3) is the 1st c. BCE. The 1st c. CE grammarian Quintilian reports that autographs of Cicero (106–43 BCE)—which he apparently read—use *caussa* whereas texts transmitted to the modern era largely use *causa* ‘cause’ (Allen 1978:35).
- During the Classical period, many *s-r* alternations leveled in favor of an invariant *r*. Whereas Plautus uses *honōs-honōris*, Apuleius favors *honor-honōris*.

borrowed into other languages, and subsequent developments in Romance.

<sup>3</sup>As in traditional grammar, I cite nouns using their nominative singular (nom.sg.) and genitive singular (gen.sg.) forms, since this is almost always sufficient to reconstruct the full nominal paradigm.

- The short final-syllable vowel in leveled nom.sg. forms (5–6) reflects the following rule.<sup>4</sup>

(4) Pre-Liquid Shortening:

$$\mu \rightarrow \emptyset / \mu \text{ — } [+LIQUID] \Big]_{\text{PwD}}$$

Meiser (1998:§57.6) dates the introduction of this rule to 200 BCE.

- Doublets of some masculine and feminine nom.sg. nouns are attested (Quellet 1969):

(5) *arbōs/arbor* ‘tree’, *calōs/calor* ‘heat’, *clamōs/clamor* ‘shout’, *honōs/honor* ‘honor’, *lās/lar* ‘tutelary’, *odōs/odor* ‘smell’, *pauōs/pauor* ‘fear’

- Other nouns show an invariant *-or* < *\*-ōs*:

(6) *angor* ‘anguish’, *amor* ‘love’, *ardor* ‘heat’, *candor* ‘radiance’, *cruor* ‘blood’ (cf. Greek κρέας, Sanskrit *kravís*), *furor* ‘rage’, *horror* ‘dread’, *plangor* ‘lamentation’, *pudor* ‘shame’

- Finally, some nouns preserve the *s-r* alternation:

(7) *aes-aeris* ‘copper’, *colōs-colōris* ‘color’, *flōs-flōris* ‘flower’, *glīs-gliris* ‘dormouse’, *lepōs-lepōris* ‘grace’, *mōs-mōris* ‘habit’, *mūs-mūris* ‘mouse’, *ōs-ōris* ‘mouth’, *rōs-rōris* ‘dew’

- It has been claimed that monosyllables did not level (e.g., Kiparsky 1971, Albright 2005) but there are exceptions in both directions.
- The three stages of ‘honor’ are schematized below.

(8) *\*honōs-\*honōsis* > *honōs-honōris* > *honor-honōris*

## Questions

1. What triggers leveling?
2. Why does some *s-r* alternations level, and not others?
3. If grammars abhor interparadigmatic stem allomorphy, why is the length alternation in *honor-honōris* preferable to the consonantal alternation in *honōs-honōris*?
4. If phonological processes tend towards overapplication, why don’t instances of intervocalic *s* introduced by (3) participate in leveling?

<sup>4</sup>The minimal Latin word is a moraic trochee (Mester 1994) and subminimal words undergo lengthening in the nom.sg. (e.g., *sāl-salis* ‘salt’). Pre-Liquid Shortening do not produce subminimal words (e.g., *fūr-fūris* ‘thief’), but word-final degemination does (e.g., *far-farris* ‘spelt’, *mel-mellis* ‘honey’). A rule-ordering analysis suggest itself.

## 2 Exceptions to rhotacism

We now review a wide variety of exceptions to rhotacism in Classical Latin.

- Most modern analyses posit a synchronic rule of rhotacism (e.g., Albright 2002: ch. 4, Albright 2005, Foley 1965, Gruber 2006, Heslin 1987, Kenstowicz 1996, Watkins 1970). Assuming that *r* is predictably [+VOICE], this rule can be stated as follows.

(9) Rhotacism:

$$[+COR] \rightarrow \{-STRIDENT\} / [+VOCALIC] \text{ — } [+VOCALIC]$$

- This rule is clearly not surface-true, however. Saussure, who discusses rhotacism in his lectures on Latin phonology (Reichler-Béguelin 1980) seemingly believes the rule has been lost by the classical era:

Quand on dit : « s devient r en latin », on fait croire que la rotacisation est inhérente à la nature de la langue, et l'on reste embarrassé devant des exceptions telles que *causa*, *rīsus*, etc. (Saussure 1916:202)

- Generative phonology does not accord any special status to exceptionless generalizations:

Counterexamples to a grammatical rule are of interest only if they lead to the construction of a new grammar of even greater generality or if they show some underlying principle is fallacious or misformulated. (Chomsky and Halle 1968:ix)

Thus we must survey—in detail—the exceptions to (9) in Classical Latin.

- Knowledge of Greek was very common among literate Romans (Harris 1989), and Greek borrowings may show either Greek or Latin inflectional suffixes. But, even those Greek borrowings which follow native inflectional patterns preserve intervocalic *s*.<sup>5</sup>

(10) *ambrosia* ‘food of the gods’, *\*asōtus* ‘libertine’ (acc.sg. *asōtum*), *basis* ‘pedestal’, *basilica* ‘public hall’, *casia* ‘cinnamon’ (cf. *cassia*), *cerasus* ‘cherry’, *gausapa* ‘woolen cloth’, *lasanum* ‘cooking utensil’, *nausea* ‘nausea’, *pausa* ‘pause’, *philosophus* ‘philosopher’, *poēsis* ‘poetry’, *sarīsa* ‘lance’, *seselis* ‘seseli’

- One can also find intervocalic *s* in Germanic *glaesum* ‘amber’, *\*bisōn* ‘wild ox’ (nom.pl. *bisōntes*) and Celtic *\*gaesum* ‘javelin’ (gen.sg. *gaesī*), *omāsum* ‘tripe’.
- Historical grammars (e.g., Leumann 1977:§180, Sihler 1995:§173, Sommer 1902:§119) claim that tautosyllabic *\*r* blocks (1) in words such as *miser* ‘poor’. This blocking effect must have been sporadic given:

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<sup>5</sup>The one exception to this generalization, *tūs-tūris* ‘incense’, is discussed below.

- words like *aurōra* ‘dawn’ (< PIE *\*h<sub>2</sub>éwsōs*; cf. Sanskrit *uṣás*) and *soror* ‘sister’ (< PIE *\*swésōr*; cf. Sanskrit *svásr*),
- the infinitive suffix *-re* (< *\*-se*; cf. *esse* ‘to be’) in all *r*-final thematic verb stems (e.g., *currere* ‘to run’, *atterere* ‘to rub’), and
- both inherited intervocalic *s* segments in *ūrere* ‘to burn’ (< Proto-Italic *\*ouso-se*).

Some linguists (e.g., Cser 2010, Gruber 2006, Roberts 2012) have proposed a synchronic *\*rVr* constraint; if correct, it must rank below all faithfulness constraints given these exceptions.

- Others have proposed that (9) was restricted to derived environments:

Rhotacism, for example, changes /s/ to /r/ when, through morphological derivation, /s/ appears between two vowels. ...Rhotacism operates only on /VsV/ strings which are morphologically derived... (Heslin 1987:134)

Descriptively, intervocalic *s* becomes *r* when the VsV sequence is derived by suffixation. (McCarthy 2003:148)

Intervocalic *s* is in general retained and pronounced as a voiceless fricative...but in derived environments it changes to *r*. (Blumenfeld 2003:90)

...rhotacism becomes essentially a derived environment effect. (Roberts 2012:89)

Synchronically, rhotacism applies only in derived environments...Once its character as a derived-environment process is understood, it can be seen that rhotacism is virtually exceptionless. (Kiparsky n.d.)

However, there are many problems with such an account:

- Traditional grammar analyzes feminines like *casa* ‘house’, masculines like *fūsus* ‘spindle’, and neuters like *pisum* ‘pea’ as consisting of a *s*-final stem and a vowel-initial nom.sg. desinence: thus /kas-a/, /fūs-um/, /pis-um/. If this is correct, these would constitute exceptions to non-derived environment blocking.<sup>6</sup>
- Virtually all Latin nouns have a corresponding denominal adjective in *-ōs*- plus vowel-initial case/number suffixes. Rhotacism is also blocked in this context.

(11)	a.	<i>coma</i>	‘hair’	<i>comōsus</i>	‘hairy’
		<i>fābula</i>	‘story’	<i>fābulōsus</i>	‘storied’
	b.	<i>ventus</i>	‘wind’	<i>ventōsus</i>	‘windy’
		<i>nimbus</i>	‘cloud’	<i>nimbōsus</i>	‘stormy’
	c.	<i>sebum</i>	‘tallow’	<i>sebōsus</i>	‘oily’
		<i>callum</i>	‘hard skin’	<i>callōsus</i>	‘callous’

<sup>6</sup>However, there are few affirmative arguments for the traditional segmentations. Emonds (2014) independently argues—compellingly in my opinion—for an alternative analysis in which these environments are non-derived.

- Under similar traditional analyses, verbs like *\*crisāre* ‘to writhe amorously’ (2sg. present indicative *crisās*), *quaesere* ‘to beg’, and *uisēre* ‘to view’ also permit intervocalic *s* at stem-suffix boundaries.
- Intervocalic *s* derived from prefixation or compounding does not undergo rhotacism.<sup>7</sup>

- (12)
- |    |                     |             |                                                        |
|----|---------------------|-------------|--------------------------------------------------------|
| a. | <i>antesignānus</i> | ‘commander’ | (cf. <i>ante</i> ‘in front’, <i>signāns</i> ‘marking’) |
|    | <i>dēsecāre</i>     | ‘cut off’   | (cf. <i>dē</i> ‘from’, <i>secāre</i> ‘to cut’)         |
|    | <i>cisalpīna</i>    | ‘cisalpine’ | (cf. <i>cis</i> ‘this side’, <i>alpīna</i> ‘alpine’)   |
|    | <i>disicere</i>     | ‘scatter’   | (cf. <i>dis-</i> ‘apart’, <i>iacere</i> ‘to throw’)    |
| b. | <i>olusātrum</i>    | ‘parsnip’   | (cf. <i>olus</i> ‘vegetable’, <i>ātrum</i> ‘black’)    |
|    | <i>pedisequus</i>   | ‘footman’   | (cf. <i>pedī</i> ‘on foot’, <i>sequor</i> ‘to follow’) |

This data leads Roberts (2012) to claim rhotacism is a “stem level” process.

- There are many other nouns and adjectives with intervocalic *s* in a non-derived environment. Some further examples are given below.<sup>8</sup>

(13) *agāsō* ‘lackey’, *asinus* ‘wild ass’ (cf. *asellus* ‘donkey colt’), *asīlus* ‘horsefly’, *bāsium* ‘kiss’, *cāseus* ‘cheese’, *disertus* ‘eloquent’, *lāser* ‘juice of the laserpitium’, *pausea* ‘(a type of) olive’, *\*pesesta* ‘plague’ (acc.pl. *pesestas*), *quasillum* ‘wool basket’, *rēsīna* ‘resin’, *susurrus* ‘whisper’ (onomat.?), *vēsīca* ‘bladder’

- Verb stems in *-t*, *-d* largely select *s*-initial allomorphs of the perfect passive participle and agent nominal suffixes.<sup>9</sup> These trigger assibilation and devoicing of /t, d/ after short monophthongs and deletion after diphthongs and long monophthongs.

- (14)
- |    |                 |              |                |             |                |           |
|----|-----------------|--------------|----------------|-------------|----------------|-----------|
| a. | <i>metere</i>   | ‘to reap’    | <i>messus</i>  | ‘reaped’    | <i>messor</i>  | ‘reaper’  |
|    | <i>fodere</i>   | ‘to dig’     | <i>fossus</i>  | ‘dug’       | <i>fossor</i>  | ‘digger’  |
| b. | <i>plaudere</i> | ‘to applaud’ | <i>plausus</i> | ‘applauded’ | <i>plausor</i> | ‘cheerer’ |
|    | <i>lūdere</i>   | ‘to play’    | <i>lūsus</i>   | ‘played’    | <i>lūsor</i>   | ‘player’  |

Heslin (1987) argues underapplication of rhotacism in (14b) is the result of opacity.

(15) Voice Assimilation:

[+VOICE] → {−VOICE} / — [−VOICE]

<sup>7</sup>However, there is historical residue of prefix-stem rhotacism: e.g., *dirimere* ‘to separate’ < *\*dis-emere*.

<sup>8</sup>Many of these words are likely borrowings, but lack the well-established etymologies needed to avoid circularity.

<sup>9</sup>In the terminology of Aronoff (1994), these are “third stem” derivatives.

(16) Assibilation:

$$\left[ \begin{array}{c} +\text{CORONAL} \\ -\text{SONORANT} \end{array} \right] \rightarrow \{+\text{STRIDENT}\} / \text{---} [+ \text{STRIDENT}]$$

(17) Sample derivations:

/fod-s-us/	/lu:d-s-us/	UR
fotsus	lu:tsus	Voice Assimilation (15)
fossus	lu:ssus	Assibilation (16)
	lu:sus	Rhotacism (9)
		Degemination
<i>fossus</i>	<i>lūsus</i>	SR

## Local conclusions

- There is a large, diverse body of exceptions to rhotacism in Classical Latin.
- Attempts to reformulate the grammar to minimize exceptions—with the possible exception of Heslin’s opacity-based analysis of 3rd-stem derivatives—fail.
- Under any reasonable formulation of productivity—the “tolerance principle” (Yang 2005, 2016) or weaker notions like the “plurality principle” (Bloomfield 1933:213) or “statistical predominance” (Nida 1949:14)—rhotacism is unproductive.

## 3 Analysis and analogy

How then should *s-r* alternations of the *honōs-honōris* type be analyzed?

- Several hundred masculine and feminine nouns in the third declension form a nom.sg. in -s.<sup>10</sup> This suffix devoices final obstruents (15) and deletes stem-final /t, d/.

<sup>10</sup>Emonds (2014) argues that this nom.sg. suffix is shared with 2nd, 4th, and 5th declension non-neuters; e.g., *filiu-s* ‘son’, *manu-s* ‘hand’, *fidē-s* ‘faith’.

(18)	a.	<i>ops</i>	<i>opis</i>	‘resources’
		<i>plēps</i>	<i>plēbis</i>	‘plebeian’
	b.	<i>cōs<sup>a</sup></i>	<i>cotis</i>	‘whetstone’
		<i>laus</i>	<i>laudis</i>	‘praise’
	c.	<i>fax</i>	<i>facis</i>	‘torch’
		<i>rēx</i>	<i>rēgis</i>	‘king’
	d.	<i>turris</i>	<i>turris</i>	‘tower’

<sup>a</sup>This form is another example of subminimal lengthening.

- Stem-final *n* also deletes before *-s*: e.g., *pollis-pollinis* ‘seed’, *sanguis-sanguinis* ‘blood’. The other nasal phoneme /m/ is unaffected: e.g., *hiems-hiemis* ‘winter’.
- One can also derive *s-r* alternations from deletion of stem-final *r* by a following *-s*.
- Whereas word-final *ts*, *ds* are completely unattested (Devine and Stephens 1977:129), word-final *ls*, *ns*, and *rs* do occur. However, such examples all derive from coronal deletion.

(19)	a.	/pult-/	<i>puls</i>	<i>pultis</i>	‘porridge’
		/mont-/	<i>mons</i>	<i>montis</i>	‘mountain’
		/frond-/	<i>frons</i>	<i>frondis</i>	‘leaf’
		/konkord-/	<i>concors</i>	<i>concordis</i>	‘united’
	b.	/capi-ent-/	<i>capiens</i>	<i>capiensis</i>	‘capturing’
		/audi-ent-/	<i>audiens</i>	<i>audientis</i>	‘hearing’

- To capture this pattern, it is essential that the rule in question delete only one coronal consonant. Stampe (1973:ix), for example, derives this fact by splitting deletion into two processes, with deletion of /n/ preceding deletion of /t, d/.
- In SPE, Chomsky and Halle assume that all rules apply simultaneously (op. cit., 343f.). However, Johnson (1972: ch. 5) adduces a number of phonological examples where directional application—either left-to-right or right-to-left, depending—is required.<sup>11</sup> Here, left-to-right application can be used to derive the fact that the deletion does not iterate.

(20) Pre-*s* Deletion:

$$[+CORONAL] \rightarrow \emptyset / \_ [ +STRIDENT ] \Big]_{\text{PwD}} \quad (\text{Condition: left-to-right application})$$

- There are only two exceptions to this generalization:

<sup>11</sup>For the history—and finite-state implementation—of directional rule application, see Gorman and Sproat in press.



- *trāns* ‘across’: this may simply be a lexical exception, but intriguingly, no Romance cognate preserves the *n* (e.g., Spanish *tras*-; Meyer-Lübke 1935:736f.).
- *fers* ‘you bear’ (2sg. pres. act. indic.): this form of a highly-suppletive verb is itself irregular: one would expect *\*feris* (cf. *ferimur*, etc.).
- Hale et al. (1997) argues leveling of the *s-r* alternation reflects a lexical restructuring in which an *r* allophone of /s/ is projected into underlying representation. However, (20) allows for the possibility that restructuring occurred **covertly**, before leveling.
- Let us suppose that the evaluation metric disprefers lexical exceptionality diacritics. Then, a child acquiring Latin should analyze *honōs* as /hono:r-s/ once (9) becomes unproductive.
- Further changes are needed to trigger the overt leveling. In the third declension, -s competes with a null nom.sg. suffix (e.g., *decor-decōris* ‘charm’). By the Classical period the null suffix was the most frequent for *r*-final roots. Thus a child acquiring Latin who has heard an oblique form of *honōs*, but who has failed to hear—or to understand— *honōs* itself would likely posit /hono:r-∅/ (Kiparsky 1982:230) rather than /hono:r-s/.
- Such a process is naturally comparable to overregularization errors known from studies of
  - children’s speech errors (e.g., Marcus et al. 1992), and
  - morphological generation errors made by neural networks (e.g., Corkery et al. 2019, Gorman et al. 2019).
- Variable deletion of word-final *s* (Wallace 1982, 1983, 1984), a feature of the Latin since at least Plautus, may have hastened this final change.
- It is worthwhile to compare the above proposal with Saussure’s:

Now given a form with intervocalic [r]...one could not determine directly from it whether the [r] in question was one that alternated with [s] or not. Saussure suggests that it is precisely this indeterminacy...which provides the motivation for the analogical formation. (Anderson 1985:54)

- Lahiri and Drescher (1983) make a similar claim regarding the Romance reflexes of the 3rd declension. They argue that the spread of the Proto-Romance nom.sg. -*is* eliminated the phonological context for a Proto-Romance analogue of (20), which lead to a similar restructuring (e.g., *mons-montis* > Old French *montis*).
- While their analysis only discusses *t*-final stems it also may have applied to rhotacizing stems. The *Appendix Probi*, a 4th c. CE palimpsest, prescribes *glīs-gliris* ‘dormouse’ rather than nom.sg. *gliris*, apparently a common solecism at the time.

## Explanantia

- What triggers leveling?
  - Neogrammarian sound change—e.g., (3)—and borrowing, followed by
  - loss of productivity, followed by
  - covert reanalysis (e.g., /hono:s/ > /hono:r-s/), followed by
  - loss of -s (e.g., /hono:r-s/ > /hono:r/).
- Why does some *s-r* alternations level, and not others?
  - The only nouns which can be reanalyzed with covert /r-s/ are masculine and feminine 3rd declension nouns.
  - While they look superficially similar, the majority of neuters have adjacent vocalic changes suggesting suppletion of a categorial suffix.
  - Any differences between poly- and monosyllables are coincidental.
- If grammars abhor interparadigmatic stem allomorphy, why is the length alternation in *honor-honōris* preferable to the consonantal alternation in *honōs-honōris*?
  - Paradigm uniformity plays no role in these changes.
- If phonological processes tend towards overapplication, why don't instances of intervocalic *s* introduced by (3) participate in leveling?
  - Rhotacism does not overapply; rather, it is projected into underlying form.

## 4 The residue

A few other categories show alternations introduced by rhotacism in Classical Latin. As will be seen, however, nearly all examples pose other challenges for synchronic analysis.

### 4.1 Rhotacism in 3rd declension neuters

- Neuter nouns of the third declension also participate in stem-final rhotacism alternations.
  1. One neuter noun fails to undergo rhotacism at any point: *uās-uāsis* 'vase'.
  2. Four nouns—all monosyllables in *-ūs*—undergo no further stem changes except rhotacism:<sup>12</sup>

(21) *crūs-crūris* 'leg', *iūs-iūris* 'law; gravy', *pūs-pūris* 'pus', *tūs-tūris* 'incense'

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<sup>12</sup>Thiselton-Dyer (1911) argues that presence of rhotacism in *tūs* (< Greek θύος) dates the introduction of incense to the Latin-speaking world sometime before the 4th c. BCE.

3. A larger group of polysyllables show alternations between nom.sg. *-is* or *-us* and oblique *-er-* or *-or-*, respectively:

(22) *cinis-cineris* ‘ash’, *corpus-corporis* ‘body’, *cucumis-cucumeris* ‘cucumber’, *decus-decoris* ‘glory’, *facinus-facinatoris* ‘deed’, *femur-femoris* ‘thigh’, *fēnus-fēnoris* ‘(financial) interest’, *frīgus-frigoris* ‘the cold’, *lepus-leporis* ‘hare’, *lītus-lītoris* ‘shore’, *nemus-nemoris* ‘grove’, *pectus-pectoris* ‘breast’, *pecus-pecoris* ‘cattle’, *pignus-pignoris* ‘pledge’, *pulvis-pulveris* ‘dust’, *stercus-stercoris* ‘feces’, *tempus-temporis* ‘time; temple (of the head)’, *tergus-tergoris* ‘hide’

- Cser (2020) tentatively proposes the following synchronic rule:

(23) Post-*r* Lowering:

$i \rightarrow e / \_\_ r$

This is an improvement over earlier—and somewhat fantastical—proposals that this lowering is triggered only by those *r* < \*s. However, this rule

- (a) does not apply to *vir* ‘man’, *viridis* ‘green’ or their derivatives, or
- (b) to initial syllables in general.

As Cser notes, such a rule would incur many more exceptions and/or conditions if applied to the larger class of neuters with obliques in *-or-*.

- One possibility is to analyze *-us/-or-* as allomorphs of a categorial head (e.g., “little *n*”). For instance, one might identify an “acategorial” root /dek-/ with derivatives such as the neuter noun *decus-decoris* ‘glory’, masculine noun *decor-decōris* ‘elegance’, and impersonal verb *decet* ‘it is fitting’.
- Some earlier work (Hale et al. 1997) incorrectly identifies *decor* as a leveled form of *decus*. However these forms differ in sense, gender, and vowel length (inferred from oblique forms).

(24) Neuter/masculine doublets (after Kieckers 1930:§II.36):

<i>decus</i>	<i>decoris</i>	‘glory’	<i>decor</i>	<i>decōris</i>	‘elegance’
* <i>fulgus</i> <sup>a</sup>	<i>fulgoris</i>	‘flash’	<i>fulgor</i>	<i>fulgōris</i>	‘lightning’
<i>tenus</i>	<i>tenoris</i>	‘snare’	<i>tenor</i>	<i>tenōris</i>	‘one who holds (s.t.)’

<sup>a</sup>This occurs in the fragments of the 2nd c. CE grammarian Festus.

4. And a large group of polysyllables alternates between *-us* and *-er-*:

(25) *foedus-foederis* ‘treaty’, *fūnus-fūneris* ‘funeral’, *genus-generis* ‘race’, *glomus-glomeris* ‘ball’, *holus-holeris* ‘vegetable’, *latus-lateris* ‘flank’, *mūnus-mūneris* ‘service’, *onus-oneris* ‘load’, *opus-operis* ‘work’, *pondus-ponderis* ‘weight’, *rūdus-rūderis* ‘lump’, *scelus-scleris* ‘wicked deed’, *sīdus-sīderis* ‘constellation’, *vulnus-vulneris* ‘wound’, *ulcus-ulceris* ‘sore’, *vellus-velleris* ‘pelt’, *venus-veneris* ‘attractiveness’

- This is a direct reflex of qualitative ablaut (Meiser 1998:§98.1). The “acategorical” analysis may also be appropriate here; e.g., /skel-/ for neuter noun *scelus-scleris* ‘wicked deed’, masculine noun *scelestus* ‘wicked person’, and verb *scelerō-sclerāre-sclerāvī-sclerātus* ‘defile’.

- Only (21) provides unambiguous evidence for the productivity of rhotacism; the alternating preceding vowel in (22–25), are not yet understood synchronically and may suggest alternative interpretations of their *s/r* alternations.
- Neuter nouns do not level.

## 4.2 Rhotacism in the 5th declension

- Halle and Vaux (1998) claim that rhotacism is responsible for *-rum* genitive plurals (gen.pl.) in the 5th declension, a small group of mostly-feminine nouns. The paradigm for *fidēs* ‘faith’ is shown below.

	sg.	pl.
nom.	<i>fidēs</i>	<i>fidēs</i>
gen.	<i>fideī</i>	<i>fidērum</i>
(26) dat.	<i>fideī</i>	<i>fidēbus</i>
acc.	<i>fidem</i>	<i>fidēs</i>
abl.	<i>fidē</i>	<i>fidēbus</i>
voc.	<i>fidēs</i>	<i>fidēs</i>

- However, this account obscures a more robust generalization: *-rum* of a short stem is the gen.pl. allomorph for all noun stems ending in a non-high vowel:

(27) Genitive Plural Allomorphy (after Emonds 2014):

$$\begin{bmatrix} +\text{GEN} \\ +\text{PL} \end{bmatrix} \iff \begin{array}{l} -\text{rum} \text{ / } [-\text{HIGH}] \text{ —} \\ -\text{um} \text{ / } \text{elsewhere} \end{array}$$

- Some partial paradigms are shown below.<sup>13</sup>

<sup>13</sup>There are several other alternations hypothesized but not yet discussed: *e*-epenthesis in *pater*, *o*-raising in *bel-lum*—possibly related to (22)—and lengthening in *aquārum* and *fidērum*. I assume all of these have a trivial analysis.

	stem	nom.sg.	gen.pl.	
(28)	a.	/akwa-/	<i>aqua</i>	<i>aquārum</i> ‘water’
		/fide:-/	<i>fidēs</i>	<i>fidērum</i> ‘faith’
		/bello-/	<i>bellum</i>	<i>bellōrum</i> ‘war’
	b.	/turri-/	<i>turris</i>	<i>turrium</i> ‘tower’
		/portu-/	<i>portus</i>	<i>portuum</i> ‘port’
	c.	/patr-/	<i>pater</i>	<i>patrum</i> ‘father’
		/le:g-/	<i>lex</i>	<i>legum</i> ‘law’

- 5th declension nouns do not level.

### 4.3 Rhotacism in adjectives

- There are just two adjectives that exhibit rhotacism:
  - *plūs-plūris* ‘more’, a suppletive comparative (cf. *multus* ‘much’, *plūrimus* ‘most’), resembles 3rd declension masculine/feminine nouns.
  - *vetus-veteris* ‘old’ resembles 3rd declension ablauting neuter nouns.
- These adjectives do not level.

### 4.4 Rhotacism in verbs

- In traditional grammar, Latin verbs are memorized via their four “principal parts”:
  1. the first person singular (1sg.) active indicative singular: *videō* ‘I see’
  2. the present infinitive: *vidēre* ‘to see’
  3. the 1sg. perfect active: *vīdī* ‘I saw’
  4. the nom.sg. masc. perfect passive participle:<sup>14</sup> *vīsus* ‘seen’
- In traditional grammar, the relationship between the present stem (the first two principal parts) and the perfect stems (the latter two) is treated as arbitrary. Matthews (1972) and Aronoff (1994) also appear to endorse this approach.
- In contrast, Embick and Halle (2005) and Steriade (2012) take the perfect stems to be largely predictable from the present stem once the allomorph of the perfect (or perfect passive participle, resp.) is known. For sake of argument, let us assume the latter position.
- There are a few verbs which have a final *r* in the present stem and a *s* in the perfect stems.

<sup>14</sup>Some pedagogical traditions use the supine neuter instead of the perfect passive participle.

(29)	a.	<i>gero</i>	<i>gerere</i>	<i>gessī</i>	<i>gestus</i>	‘carry’
		<i>ūrō</i>	<i>ūrere</i>	<i>ussī</i>	<i>ustus</i>	‘burn’
	b.	<i>hauriō</i>	<i>haurire</i>	<i>hausī</i>	<i>haustus</i>	‘draw (water)’
		<i>haereō</i>	<i>haerere</i>	<i>haesī</i>	<i>haesus</i>	‘cling’
		<i>quaerō</i>	<i>quaerere</i>	<i>quaesivī</i>	<i>quaesītus</i>	‘seek’

- One can obtain the (29a) surface forms, for example, by assuming a *-s-* perfect suffix and a *-t-* perfect passive participle suffix—both are independently attested—and then applying rules (15–16).
- These verbs do not level.

## 5 Ramifications for the theory of wordlikeness

- Phonotactic modeling is now a major part of day-to-day phonological description:
  - Since Halle (1962) and Chomsky and Halle (1965), it has been claimed speakers have knowledge of *wordlikeness*, the distinction between “possible” and “impossible” words.
  - For quite some time (e.g., Mester 1988, McCarthy 1988) it is assumed that knowledge of wordlikeness is induced from a statistical summary of the lexicon; i.e., that (im)possible really means (im)probable.<sup>15</sup>
  - Constructing these statistical summaries—and debating what to count, and how—has become something of a cottage industry (see ? :83).
- Should we reconsider this given how quickly 4th C. BCE Latin squandered a near-exceptionless constraint against intervocalic *s*?
  - Perhaps wordlikeness is simply powerless in the face of Neogrammarian sound change.
  - If so, it must be powerless in the face of borrowing, too.<sup>16</sup>
- Iverson and Salmons (2005) draw attention to a similar case in the history of English:
  - Modern /*f*/ is largely a reflex of OE /*sk*/; many of the remaining /*sk*/-words are borrowings from Dutch (*skipper*) or Norse (*sky*).
  - Because OE long vowels—corresponding to Modern English tense vowels, or diphthongs in the case of *ī* or *ū*—did not occur before tautosyllabic clusters, /*Ŵf*#/ is now quite rare.
  - According to Iverson and Salmons, words that match this template tend to:

<sup>15</sup>This idea has even earlier precedents in the Danish structuralist tradition (e.g. Fischer-Jørgensen 1952).

<sup>16</sup>There are many cases where otherwise-robust phonotactic generalizations are inactive for loanword adaptation (e.g., Davidson and Noyer 1997, Ussishkin and Wedel 2003). Perhaps the best-known example is the well-charactered “Sino-Japanese” sub-lexicon of Japanese (Itô and Mester 1995, 2015).

1. be markedly foreign, (e.g., *cartouche*),
  2. be proper names (e.g., *LaRouche*), or
  3. convey an “affective, onomatopoeic quality” (e.g., *sheesh*, *woosh*).
- This “gap” is statistically robust (?:85).<sup>17</sup>

	{ɪ, ɛ, æ, ʌ, ʊ}—	{i, e, a, ɔ, u}—	% tense
(30) ___s#	78	9	8
___ʃ#	410	107	16

There is a significant interaction between vowel tenseness and the following final segment (Fisher exact test,  $p = .026$ ).

- Iverson and Salmons claim this gap has filled, slowly but systematically, since c. 1100; dozens of generations of English speakers have essentially ignored this constraint.
  - Hayes and White (2013) find that variants of this constraint have little impact on speakers’ judgments in a wordlikeness task.<sup>18</sup>
- Finally, Turkish *labial attraction* (Lees 1966), another statistically-robust “gap” (?:85f.), has little impact on wordlikeness judgments (Zimmer 1969).

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<sup>17</sup>This sample consists of all words in the CMU pronunciation dictionary with SUBTLEX-US (Brysbaert and New 2009) with frequencies greater than or equal to one per million words. Less restrictive samples give similar results.

<sup>18</sup>Hayes and White claim this is because the constraint is unnatural, but do not operationalize (un)naturalness.

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