Latin Rhotacism for Real

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Introduction

By regular sound change, Proto-Italic intervocalic *s became Old Latin [r].

(1)   *s > Old Latin [r] / V __ V

This change is thought to have gone to completion in the 4th century BCE (Sommer 1902:210, Safarewicz 1932:18), and in 312 BCE, censor Appius Caecus Claudius eliminated the ⟨Z⟩ character (once used to spell intervocalic *s) from the Latin alphabet. This *s is the source of *s* ~ *r* patterns in classical Latin (e.g., *honōs*/*honōris* 'honor' in the writings of Plautus, c. 200 BCE).[1] It is generally thought that the sound change introduced a parallel synchronic rule of RHOTACISM (e.g., Foley 1965:62, Matthews 1972:19, Touratier 1975:264f., Klausenburger 1976:314, Kiparsky 1982:64f., Heslin 1987:134, Kenstowicz 1996:377).

(2)   RHOTACISM (to be rejected):
      s → r / V __ V

However, this description of the *honōs*/*honōris* grammar merits reconsideration, as the *s* ~ *r* pattern can in many cases derive from another independently-motivated rule (§1). Deriving these alternations in this way is a potential solution to the decadence of RHOTACISM (§2), and makes it possible to understand the later leveling of *s* ~ *r* patterns (e.g., *honor*/*honōris* in the writings of authors such as Apuleius, c. 180 CE) as a change in nom.sg. suffix allomorphy, an account which predicts the direction and scope of this leveling (§3). The final section concludes (§4).

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[1] This paper was inspired by a conversation with Elan Dresher and an unpublished manuscript by Charles Yang (Yang 2006). Thanks also to Mark Hale, Daniel Ezra Johnson, and Kobey Schwayder. Nouns and adjectives are cited by giving their nominative singular (nom.sg.) and genitive singular (gen.sg.) forms. A star (*) indicates a form not attested in any of the texts from antiquity (defined here as 200 BCE–200 CE) as compiled by the *Library of Latin Texts*. Long monophthongs are indicated with macrons. Note that *i, u* indicate [j, w] in onset and post-vocalic position, and [i, u] otherwise, ⟨x⟩ indicates [ks], and ⟨ae⟩ corresponds to [aj].

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1 Rhotacism and coronal cluster simplification

This and the following section present a morphophonemic sketch of a portion of the third declension for the purpose of evaluating the coverage of RHOTACISM. This analysis is situated in a grammatical architecture corresponding roughly to the one outlined in *The Sound Pattern of English* (*SPE*; Chomsky and Halle 1968), in which extrinsically-ordered rules apply if and only if their structural descriptions are met. Following that work, I assume a distinction between phonologically-general rules, which have only phonological primitives in their structural descriptions and are therefore not characterized by exceptionality, and readjustment rules, which also specify morphological or lexical contexts for application, thereby providing a locus for lexical exceptionality. This distinction is formalized in §3 below.

1.1 Third declension /t, d/-final roots

The third declension is the sole source for $s \sim r$ alternations in nouns and adjectives. Masculines and feminines in this declension fall largely into two subclasses: those words with a null nom.sg. suffix (e.g., *uigil/uigilis* 'sentinel'), and those with nom.sg. /-s/, as in (3).[2]

(3)   Third declension nouns with nom.sg. /-s/:

	UR	nom.sg.	gen.sg.	gloss
a.	/stirp-/	*stirps*	*stirpis*	'scion'
	/urb-/	*ur*[ps]	*urbis*	'city'
	/fak-/	*fax*	*facis*	'torch'
	/reːg-/	*rēx*	*rēgis*	'king'
b.	/koːt-/	*cōs*	*cōtis*	'flint'
	/ped-/	*pēs*	*pedis*	'foot'

In (3a), suffixation of nom.sg. /-s/ to roots ending in labial or dorsal consonants in underlying representation (UR) neutralizes the root-final voicing contrast.

(4)   DEVOICING:
  $[-\text{SONORANT}] \rightarrow [-\text{VOICE}] / \_\_ [-\text{VOICE}]$

In (3b), however, root-final /t, d/ does not surface in the nom.sg. The sequence [ts] (from /ts/, or /ds/ and DEVOICIING) does not occur in word-final position (Devine and Stephens 1977:129), and its medial occurrences are limited to syllable contact, allowing a rule of deletion to be stated generally (cf. Heslin 1987:142).

(5)   PRE-/s/ DELETION (to be revised):
  $[\text{CORONAL}, +\text{ORAL}, -\text{CONTINUANT}] \rightarrow \emptyset / \_\_ \text{s}]_\sigma$

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[2] The long vowel in the nom.sg. of *pēs/pedis* is the result of a lengthening process which targets subminimal words (Mester 1994:20f.) which can be observed throughout this paper.

An alternative segmentation, with /-is, -tis, -dis/ as suppletive allomorphs of the gen.sg. requires a considerable expansion of the case/number desinences, since /t, d/ would also need to appear as the initial segments for all other suffixes (e.g., genitive plural /-um, -tum, -dum/). In contrast, PRE-/s/ DELETION enables the complete paradigms of the words in (3) to be described without any suppletive allomorphy.

1.2 "Anouroboric" PRE-/s/ DELETION

A few nouns (e.g., *pollis/pollinis* 'flour', *sanguis/sanguinis* 'blood') delete root-final /n/ before nom.sg. /-s/. This can be generated by a revised version of PRE-/s/ DELETION by eliminating the [+ORAL] specification on the target (under the standard assumption that nasals are [−CONTINUANT]; see Anderson 1976:327f.). However, syllable-final [ns] is found in many nom.sg. forms.

(6) Surface word-final [ns] sequences:

	UR	nom.sg.	gen.sg.	gloss
a.	/mont-/	*mōns*	*montis*	'mountain'
	/front-/	*frōns*	*frontis*	'forehead'
b.	/capi-eːnt-/	*capiēns*	*capientis*	'capturing'
	/awdi-eːnt-/	*audiēns*	*audientis*	'hearing'

If PRE-/s/ DELETION is permitted to apply to all [CORONAL, −CONTINUANT] segments, then the correspondences in (6) require that it does not reapply; from *mōns/montis* 'mountain', one can discern an underlying /mont-/, but allowing PRE-/s/ DELETION to reapply to its own output would incorrectly derive **mōs*. Stampe (1979:ix) generates the deletion of /n, t, d/ with two different processes, with deletion of /n/ preceding, and counterfeeding, deletion of /t, d/. While this produces the correct outputs, this is an unnecessary duplication if one rejects the assumption that rules must reapply until exhausted.[3] PRE-/s/ DELETION is then "self-bleeding" (Howard 1972:65), or "non-iterative" (McCarthy 2003:148). Recalling the mythical snake devouring its own tail, a process which applies to its own output (e.g., the analysis of Yakut whole-word harmony in Kenstowicz and Kisseberth 1973:30) can be called "ouroboric", and conversely, PRE-/s/ DELETION is "anouoroboric", as it does not apply to its output.

I assume that rules are specified as to their direction of application (Johnson 1972, Kaplan and Kay 1994). Marking PRE-/s/ DELETION a rightward-applying rule gives rise to the anouroboric pattern. In processing /mont-s/, the rule "sees" /t-s/, but the resulting [ns] is not scanned by the rule.[4]

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[3] The extensional properties of this assumption appear in *SPE*, as well as the radically-different architectures of classic Optimality Theory and the Albright and Hayes (2003) morphology learner.

[4] The only syllable-final [ns] sequence which is not clearly derived by PRE-/s/ DELETION is the preposition *trāns* 'across' (though exceptionality could be derived from an abstract UR /trants/).

1.3   The proper treatment of *honōs*

The remaining coronal consonants that have not yet been considered as possible targets of PRE-/s/ DELETION are /s/ and the liquids /l, r/. One cannot expect to discern whether or not /s/ is a target for this rule, since final geminates are simplified in Latin. This process can be observed with third declension geminate-final roots which take the null nom.sg. suffix (e.g., *mel/mellis* from /mell-/). Thus *as/assis* 'unit' is structurally ambiguous: the nom.sg. suffix may be /-∅/ or /-s/.

With respect to root-final /l/, there is only one word, *puls/pultis* 'porridge (for a ritual)', that ends in [ls] and the coda is itself derived by PRE-/s/ DELETION (e.g., /lt-s/). Similarly, there are many syllable-final [rs] sequences in Latin declension, but they are all derived by PRE-/s/ DELETION.

(7)   *ars/artis* 'skill', *cohors/cohortis* 'courtyard', *concors/concordis* 'of the same mind', *consors/consortis* 'having a common lot', *discors/discordis* 'discordant', *expers/expertis* 'devoid of', *fors/fortis* 'chance', *iners/inertis* 'without skill', *mauors/mauortis* '(s.t. pertaining to) Mars', *mors/mortis* 'death'

If /r/ is a target of PRE-/s/ DELETION, then the $s \sim r$ alternations below, previously attributed to RHOTACISM, come as no surprise.

(8)   *aes/aeris* 'copper', *arbōs/arbōris* 'tree', *calōs/calōris* 'warmth', *clāmōs/ clāmōris* 'shout', *colōs/colōris* 'color', *flōs/flōris* 'blossom', *glīs/glīris* 'dormouse', *honōs/honōris* 'honor', *labōs/labōris* 'labor', *lepōs/lepōris* 'charm', *mōs/mōris* 'habit', *mūs/mūris* 'mouse', *odōs/odōris* 'smell', *ōs/ōris* 'mouth', *pauōs/pauōris* 'trembling', *rōs/rōris* 'dew'

By expanding the scope of PRE-/s/ DELETION to all coronal consonants (by eliminating the requirement that the target be [−CONTINUANT]), RHOTACISM is no longer needed to derive these patterns.[5]

(9)   PRE-/s/ DELETION (revised):
      [CORONAL] → ∅ / __ s]$_\sigma$ (direction: rightward)

Thus, it is preferable to treat *honōs* as /honōr-s/ with PRE-/s/ DELETION producing the $s \sim r$ alternation.

(10)   Pre-Latin *honōs/*honōsis > Old Latin /honoːr-s, -is/ [honoːs, honoːris]

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[5] There is one potential exception to this expanded rule: *fers* 'you bear'. It is possible that this is not a true exception, however: if the [i] theme vowel that appears in certain forms of this verb (e.g., *ferimus*, *ferimur*; Matthews 1972:78f.) is underlying, and deleted by readjustment, then the underapplication of PRE-/s/ DELETION to *fers* is only apparent, the result of counterfeeding between theme-vowel deletion and PRE-/s/ DELETION (e.g., /fer-i-s/). Such an analysis is necessary to rescue the proposal (e.g., Foley 1965:64, fn. 8, Embick 2010:73f.), not assumed here, that the underlying form of the present infinitive is /-se/ (as in *esse* 'to be') and [re] is derived by RHOTACISM.

2   The decadence of rhotacism

This analysis of *s* ∼ *r* alternations is desirable, because there are several reasons to believe RHOTACISM is unproductive in ancient Latin.

2.1   Surface [VsV] sequences

A phonologically-general, recently innovated RHOTACISM predicts that [VsV] sequences should be rare, yet they are quite common in Latin.

Non-derived [VsV] sequences   There are 22 root-internal [VsV] sequences.

> (11)   *agāsō* 'groom, lackey', *aser* 'ritual blood/wine mixture', *asinus* 'donkey', *basis* 'pedestal', *bāsiāre* 'to kiss', *bisontes* 'bison (pl.)', *caesius* 'blue-eyed', *caesar* 'head of hair', *casa* 'hut', *causa* 'cause', *crīsāre* 'to grind (said of a receptive sexual partner)', *glaesum* 'amber', *miser* 'wretched', *musica* 'music', *nausea* 'nausea', *pisum* 'pea', *poēsis* 'poetry', *pusillus* 'petty', *pūsus* 'little boy', *quaesere* 'to beg', *rosa* 'rose', *uesica* 'bladder'

Sommer (1902:211) proposes that some exceptions might arise from the presence of an /r/ already in the word (e.g., *rosa*), but such an analysis must contend with *rūs/rūris* 'village'. It has also been noted that many of the exceptions correspond to reconstructed *ss: Sommer (loc. cit.) gives the example **pussillus* > *pusillus*. But to suggest that these exceptions result from underlying /ss/, degeminated only after RHOTACISM has applied, is an "opportunistic" use of absolute neutralization, insofar as there are no attested instances of e.g, **caessius*. These exceptions are only problematic if one assumes that RHOTACISM is phonologically-general.

Phonologically-derived [VsV]   A root-final coronal consonant is deleted in verbs that select the /s/-initial allomorphs in the perfect active indicative (12a) and/or the perfect passive participle (12b).[6]

> (12)   [VsV] derived by perfective PRE-/s/ DELETION:
> | | | | | |
> |---|---|---|---|---|
> | a. | /luːd-s-iː/ | → | *lūsī* | 'I played' (cf. *lūdere* 'to play') |
> | | /hajr-s-iː/ | → | *haesī* | 'I clung' (cf. *haerēre* 'to cling') |
> | b. | /raːd-s-us/ | → | *rāsus* | 'rubbed' (cf. *rādere* 'to rub') |
> | | /kʷajr-sīt-us/ | → | *quaesītus* | 'sought' (cf. *quaerere* 'to seek') |

There is a good reason to analyze *quaerere* as deriving from a root /kʷajr-/ (rather than /kʷajs-/ plus RHOTACISM), namely the existence of a verb *quaesere* 'to beg'.

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[6] I remain agnostic about the rule that generates this deletion, and whether it is related to PRE-/s/ DELETION and/or syllable contact assimilation (e.g., *cessus* 'yielded'; cf. *cedere* 'to yield').

Morphologically-derived [VsV]   Prefixation may create a [VsV] sequence, but never triggers rhotacism (e.g., *resurgere* 'to be resurrected'; cf. *surgere* 'to rise'), nor does rhotacism apply to adjectives formed with the denominal /-oːs-/, which is invariably followed by vowel-initial case/number suffixes (e.g., /...Vs-V.../).

(13)   [VsV] derived by denominal adjective-forming /-oːs-/:

    a. /went-oːs-us/ → *uentōsus* 'windy' (cf. *uentus* 'wind')
    b. /nimb-oːs-us/ → *nimbōsus* 'stormy' (cf. *nimbus* 'cloud')

An appeal to non-derived environment blocking (e.g., Heslin 1987:134f., Blumenfeld 2003:90f., McCarthy 2003:148f., Kiparsky forthcoming) has no force, since other $s \sim r$ alternations reviewed thus far are also the result of morphological concatenation. A morphologically-derived environment is a necessary, but not sufficient, condition for the application of RHOTACISM.

2.2   Rule reordering

Watkins (1970) notes that RHOTACISM's interaction with other rules would be a rare counterexample to the hypothesis of rule addition (e.g., King 1973), by which a newer rule (in the sense of "innovated more recently") occurs later in the derivation than an older one. The case in question concerns the interaction of RHOTACISM with two phonologically-conditioned allomorphs of a denominal adjective-forming suffix. The basic form of this suffix is *-āli-* (e.g., *manuālis* 'for the hand'; cf. *manus* 'hand'), and the derived allomorph *-āri-* occurs when the first liquid to the left of the suffix is /l/ (e.g., *populāris* 'popular'); this morpheme-specific pattern is labeled DISSIMILATION here. Watkins claims that DISSIMILATION is an ancient rule, shared by the rest of Italic, whereas the sound change corresponding to RHOTACISM is of more recent vintage. However, permitting these rules to apply in their chronological order (with DISSIMILATION preceding RHOTACISM) derives an incorrect surface realization (SR).

(14)   Ordering arguments for RHOTACISM and DISSIMILATION:

"chronological" ordering		"anachronistic" ordering	
UR	/floːs-aːli-s/	UR	/floːs-aːli-s/
DISSIMILATION	floːsaːris	RHOTACISM	floːraːlis
RHOTACISM	floːraːris	DISSIMILATION	————
SR	*[floːraːris]	SR	[floːraːlis]

The issue of reordering disappears, however, under the assumption that covert lexical restructuring has already occurred (e.g., /flor-/).

2.3   Rhotacizing residue: third declension neuters

There is no unambiguous evidence for an /-s/ nom.sg. in neuters, and therefore there is no source for the /-s/ suffix to trigger PRE-/s/ DELETION. However, rhotacism in these nouns always co-occurs with another readjustment. One class has a lexically restricted $u \sim e$ alternation immediately to the left.

(15) *foedus/foederis* 'treaty', *fūnus/fūneris* 'funeral (procession, service)', *genus/generis* 'race', *glomus/glomeris* 'ball', *holus/holeris* 'vegetable', *latus/lateris* 'flank', *mūnus/mūneris* 'service, show', *onus/oneris* 'load', *opus/operis* 'work', *pondus/ponderis* 'weight', *rūdus/rūderis* 'lump (esp. of bronze)', *scelus/sceleris* 'crime, wickedness', *sīdus/sīderis* 'constellation, star', *ulcus/ulceris* 'sore', *uellus/uelleris* 'fleece, hide', *uenus/ueneris* '(s.t. pertaining to) Venus', *uulnus/uulneris* 'wound, notch'

Another locally co-occurring alternation is between $i \sim e$ and $u \sim o$.

(16)   *cinis/cineris* 'ashes', *cucumis/cucumeris* 'cucumber', *corpus/corporis* 'body', *decus/decoris* 'honor', *facinus/facinoris* 'deed', *femus/femoris* 'thigh', *fēnus/fēnoris* 'interest on an investment', *frīgus/frigoris* 'cold', *lepus/leporis* 'hare', *lītus/lītoris* 'shore', *nemus/nemoris* 'grove, pasture', *pectus/pectoris* 'breast', *pecus/pecoris* 'cattle', *pīgnus/pīgnoris* 'pledge', *puluis/pulueris* 'dust', *stercus/stercoris* 'feces', *tergus/tergoris* 'back, hide', *tempus/temporis* 'portion of time; temple (of the head)'

This pattern also appears in verb inflection (Embick 2010:73f.). Kenstowicz (1996: 378) assumes a phonologically general lowering of high vowels before [r], and thus views the nouns in (16) as first-class instances of RHOTACISM.

(17) LOWERING (Redenbarger 1976:7, to be rejected):
      $[+\text{SYLLABIC}] \rightarrow [-\text{HIGH}] / \_\_ \{r, \#\}$

However, this rule would wreak havoc on the Latin lexicon, since sequences of [ur, uːr, ir, iːr] occur quite freely, in all parts of speech (e.g., *furia* 'anger', *circum* 'around', *ūrīna* 'urine', *turgēre* 'to swell') and the "desiderative" /-ur-/ suffix (e.g., *parturīre* 'to be in labor', cf. *partiō* 'childbirth'; Mignot 1974:147). Since both height and $s \sim r$ alternations are lexical, and co-occur locally, they can be generated by the same readjustment, such as the one formulated for (16) below.

(18) $[+\text{SYLLABIC}] \, s \rightarrow [-\text{HIGH}] \, r / \_\_ V$ (list: $\sqrt{\text{CINIS}}$, $\sqrt{\text{FENUS}}$, ...)

3   The leveling of rhotacism

The lexically-gradual leveling of rhotacism, producing nom.sg. *honor* from older *honōs*, is the parade example of intraparadigmatic leveling. The grammatical sketch

given above mandates a reconsideration of this case. Prior accounts take the leveling to be an expansion of RHOTACISM, or to indicate late lexical restructuring. Neither mechanism is viable: RHOTACISM is by no means productive, and it has been shown in §1.3 above that this lexical restructuring does not imply leveling.

3.1 Description of the leveling

Leveling began before the earliest texts and through the ancient Latin period.

(19) *s-final roots leveled before Old Latin (cf. Quellet 1969:59):
angor 'anguish', *amor* 'love', *ardor* 'heat', *candor* 'radiance', *cruor* 'blood', *decor* 'beauty', *fulgor* 'lightning', *furor* 'rage', *horror* 'horror', *plangor* 'lamentation', *pudor* 'shame'

(20) Nom.sg. doublets in ancient Latin texts:[7]
arbōs ∼ *arbor* 'tree', *calōs* ∼ *calor* 'warmth', *clamōs* ∼ *clamor* 'shout', *honōs* ∼ *honor* 'honor', *Lās* ∼ *Lar* 'household god', *odōs* ∼ *odor* 'smell', *pauōs* ∼ *pauor* 'trembling', *rōbus*, *rōboris* 'oak; strength'

No noun gains non-alternating [s] (e.g., **honōsis*), and /. . . r-∅/ nouns in the third declension do not join the *s* ∼ *r* pattern, despite occasional [s]-final tokens.

(22) Some nom.sg. doublet counts for *r-final nouns:

soror	337	**sorōs*	0	'sister'
error	224	**errōs*	0	'wandering'
uapor	65	*uapōs*	3	'steam'
femur	61	*femus*	3	'thigh'

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[7] The short nom.sg. vowel is caused by PRE-LIQUID SHORTENING.

(21) PRE-LIQUID SHORTENING:
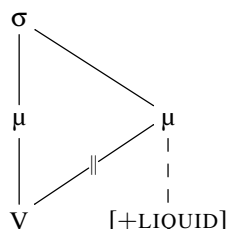
The few surface forms which appear to be exceptions to this rule are monosyllables which undergo later subminimal lengthening (e.g., *pār/paris* 'equal'; cf. Kiparsky forthcoming). Albright (2005:17, fn. 1) claims that long [-oːr] (< *ōs) in the poetry of Ennius suggests that leveling occurred before this rule was activated, but Albright's three examples are compromised by phrasal resyllabification. For instance, *clāmōr ad caelum uoluendus per aethera uāgit* 'he cries a shout fit to be rolled unto heaven' scans as [klaː.moː|rad.kaj|lum.wol|wen.dus.pe|raj.θe.ra|waː.git], in which /oː/ does not meet the structural description of PRE-LIQUID SHORTENING.

3.2   The grammatical change

A traditional view of leveling is that it results from the gradual loss of RHOTACISM (e.g., Saussure 1916:220f., Mańczak 1958:396f., Hock 1991:180f.). However, this alone does not explain why [r] is favored over [s]. The same objection applies to those scholars (Kiparsky 1965:2.48, Hale et al. 1997:70, fn. 11) who assume that the leveling represents late (i.e., Classical period) lexical restructuring, in the absence of additional assumptions.

Kiparsky (1982:64f.) and Kenstowicz (1996) propose that the leveling results from RHOTACISM expanding its scope, either directly or indirectly.[8] Their main argument comes from denominal derivatives which conform to the *s ∼ r* pattern earlier observed, but now lost, in the base noun. However, only three nom.sg. doublet nouns show any trace of *s: arbustus* 'wooded', *honestus* 'esteemed', and *rōbustus* appear to correspond to *arbor*, *honor*, and *rōbur*, but all three show unpredictable vowel changes which cast doubt as to whether noun and derivative share a root (Hale et al. 1997:69). The other four nouns which level during the period in question, *calor*, *color*, *odor*, and *pauor*, have no attested derivatives that would motivate root-final /s/. If the change is still to be regarded as expansion of RHOTACISM (i.e., to word-final context), this is of no synchronic relevance, since it is widely assumed (e.g., Stampe 1979:28f., Kiparsky 1982:127f., Prince and Smolensky 2004:60) a segment uniformly realized as [r] is underlyingly /r/; that is, expansion would result in instantaneous restructuring.

Following the proposal that the sound change resulted in early covert lexical restructuring of 'honor' with underlying /r/, I propose that the much-later *honōs > honor* change is the result of a change in nom.sg. suffix allomorphy (i.e., /-s/ > /-∅/) which reveals root-final /r/. The full chronology is given below.

(23)   *honōs > Old Latin /honoːr-s/ [honoːs] > Late Latin /honoːr-∅/ [honor]

This proposal echoes Lahiri and Dresher's (1983:153) description of Romance reflexes of third declension nouns. Lahiri and Dresher argue that the Proto-Romance extension of the /-is/ nom.sg. suffix eliminated the context for PRE-/s/ DELETION (e.g., Latin *mōns/montis* > Old French nom.sg. *montis*). It is possible to expand their analysis (which mentions only root-final /t/) to understand the fate of *s ∼ r* roots in Romance. The *Appendix Probi*, a collection of grammatical prescriptions (c. 4th century CE), indicates that nom.sg. *gliris* was a common solecism for Classical *glīs/gliris* 'dormouse' (ex hypothesi, /glir-/), and this corresponds to the modern Romance reflexes (e.g., Italian *ghiro*; Meyer-Lübke 1935:323).

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[8] Kiparsky (forthcoming) argues that the application of RHOTACISM to Greek borrowing *tus/turis* 'incense' demonstrates the rule's productivity, but another possibility is simply that "θύος could not have found its way into Latin later than the fourth century B.C," (Thiselton-Dyer 1911:507), the point at which the sound change triggered lexical restructuring.

3.3 Productivity and the Elsewhere Condition

The remaining problem is to motivate the two changes described in (23): the early lexical restructuring of $s \sim r$ patterns as /r-s/, and the much later extension of the nom.sg. /-∅/ at the expense of /-s/.

Productivity and extension   Consider the hypothetical case of a child acquiring English who fails to encounter the past tense *lost* during the critical period. This child then has a grammar which generates *losed* (e.g., [lʊwzd], a token of which is recorded by Marcus et al. 1992). This follows if the child regards the /-t/ as lexically specific, and the /-d/ suffix is the elsewhere rule.

(24)   An implementation of a subset of the English past tense:
      IF root = $\sqrt{\text{HIT}}$ THEN -∅
      IF root = $\sqrt{\text{BEND}}$ THEN -t
      IF root = $\sqrt{\text{LEAVE}}$ THEN -t
            . . .
      ELSE   -d

This model, which has precedents as far back as the Sanskrit grammarians, draws support from many experimental studies which find that irregularly-inflected words are processed faster than equally-frequent regularly-inflected words (e.g., Penke and Krause 2002, Sonnenstuhl and Huth 2002), since generalizations describing exceptions are ordered before the elsewhere rule.

Similarly, if a Latin-learning child failed to encounter *honōs* during acquisition, there is every reason to believe that child would represent the root as /honoːr-/ (Kiparsky 1982:230). Data sparsity of this type is quite likely to be faced by children simply due to the Zipfian statistical properties of speech: surveying large corpora of richly-inflected languages, Chan (2008:77f.) finds that incomplete paradigms occur for virtually every root. However, unless it is possible to determine which of the nom.sg. suffixes for non-neuters is the elsewhere rule, it is not possible to know what form the nom.sg. of 'honor' would take.

One approach affords elsewhere status to the most type-frequent outcome (e.g., Bloomfield 1933:213): call this the Plurality Principle. This principle follows from the assumption that speakers' grammars are maximally concise. While this was once taken as axiomatic (e.g., Cherry et al. 1953), it also has been criticized (e.g., Halle 1975:532; see also Vaux 2003). An alternative formulation is put forth by Yang (2005), who proposes that competing generalizations are ordered in a way that minimizes the average time it takes a speaker retrieve the appropriate rule.

(25)   The Tolerance Principle (after Yang 2005):
      Let $\mathbb{R}$ be a rule with scope $m + N$, where m represents the number of roots which conform (non-vacuously) to the rule and N the number of excep-

tions. $\mathbb{R}$ is the elsewhere rule if and only if $N < \frac{m+N}{\ln(m+N)}$.

(See Yang 2005 for the derivation of this threshold.)

The non-productivity of RHOTACISM   The Plurality Principle and the Tolerance Principle make different predictions for the productivity of RHOTACISM. There are 58 nominal roots which show an $s \sim r$ alternation. 16 of them, all non-neuter, have been analyzed as the result of PRE-/s/ DELETION. However, at the stage at which restructuring occurred, they are structurally ambiguous: /hoːr-s/, but also potentially /hoːs-∅/. The number of words conforming to the rule, m, includes both these ambiguous non-neuters and the remaining 42 nouns which have $s \sim r$ alternations. This is as charitable to RHOTACISM as is possible; every one of these types is either structurally ambiguous or also shows another readjustment in ancient Latin. N, the number of exceptions to this rule, is minimally the number of roots with underived [VsV] sequences. Despite being the plurality pattern, RHOTACISM falls short of the Tolerance Principle threshold ($m = 58, N = 22; T = 18 < N$).

Excursus: paradigmatic gaps   The ancient grammarians report that *fās* 'divine law', *nefās* 'wrong', *pūs* 'pus', and *vīrus* 'poison', all potential targets for the application of RHOTACISM, can only be used in non-oblique forms (Neue 1866:502f.). These inflectional gaps follow from the Tolerance Principle's prediction that there is no elsewhere generalization: that is, speakers' grammars do not specify whether the gen.sg. of *fās* is **fāris* or **fāsis* (see Gorman forthcoming).

The productivity of nom.sg. /-∅/   According to the Lewis and Short (1879) dictionary, nom.sg. /-∅/ is far more type-frequent than /-s/, and thus the elsewhere rule picked by the Plurality Principle. Considering only those /r/-final third declension roots, there are 12 /-s/ masculines and 3 feminines. These are easily dwarfed by the many masculine /r/-final third declension roots which select /-∅/, thanks in no small part to the /-oːr/ agent nominal-forming suffix (e.g., *uictor/uictōris* 'conquerer'), which always selects /-∅/. Thus /-∅/ also satisfies the more-stringent Tolerance Principle threshold ($m = 492, N = 15; T = 81 > N$).

The one leveling that that /-∅/ expansion cannot easily explain is the neuter noun, *rōbur/rōboris* 'oak', which has an early nom.sg. *rōbus*. Despite this, the majority of masculines and feminines of the third declension level, many prehistorically, whereas *rōbus* ~ *rōbur* is the only doublet among the third declension neuters. One of the strengths of this account is the ability to predict this asymmetry from independent facts about declension. The erstwhile *rōbur* notwithstanding, this asymmetry is unlikely to be due to chance: a Fisher exact test comparing the counts of *s-final neuters with and without nom.sg. doublets to doublets among *s-final masculine and feminine nouns returns a highly significant result ($p = 9.1 \times 10^{-5}$).

4 Conclusion

If the analysis above—attributing $s \sim r$ alternations to a deletion rule, and to readjustment, but denying the productivity of RHOTACISM—is largely correct, then this corner of Latin has been grossly mischaracterized. There is no motivation for a phonologically-general RHOTACISM: much of its apparent coverage is due to PRE-/s/ DELETION, and what remains is just as well regarded as exceptional. Similarly, the leveling is not the result of a preference for paradigm uniformity, since it may be the natural consequence of a change in suffix allomorphy and is not "intraparadigmatic" except by coincidence, a finding which is largely consonant with Garrett's (2008) proposal that all leveling be viewed as externally motivated extension of patterns found elsewhere in the grammar. Sparsity of the primary data, and the speaker's ability to "make infinite use of finite means" (Chomsky 1965:8, translating Humboldt) doomed this sound change to increasing degrees of peripherality.

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