LATIN ⟨X⟩: SEEING DOUBLE

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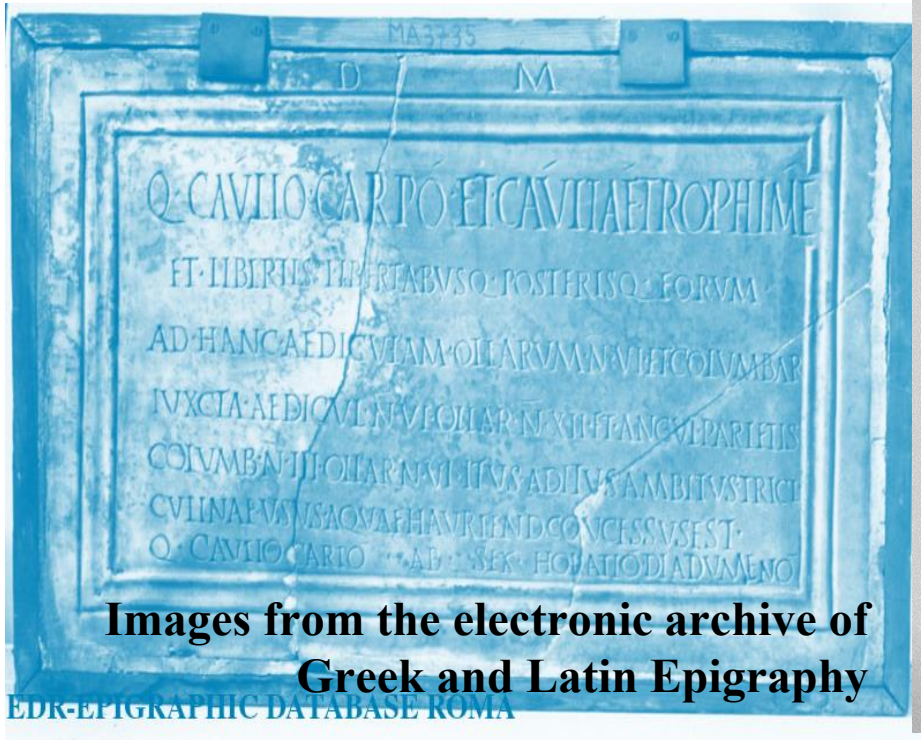
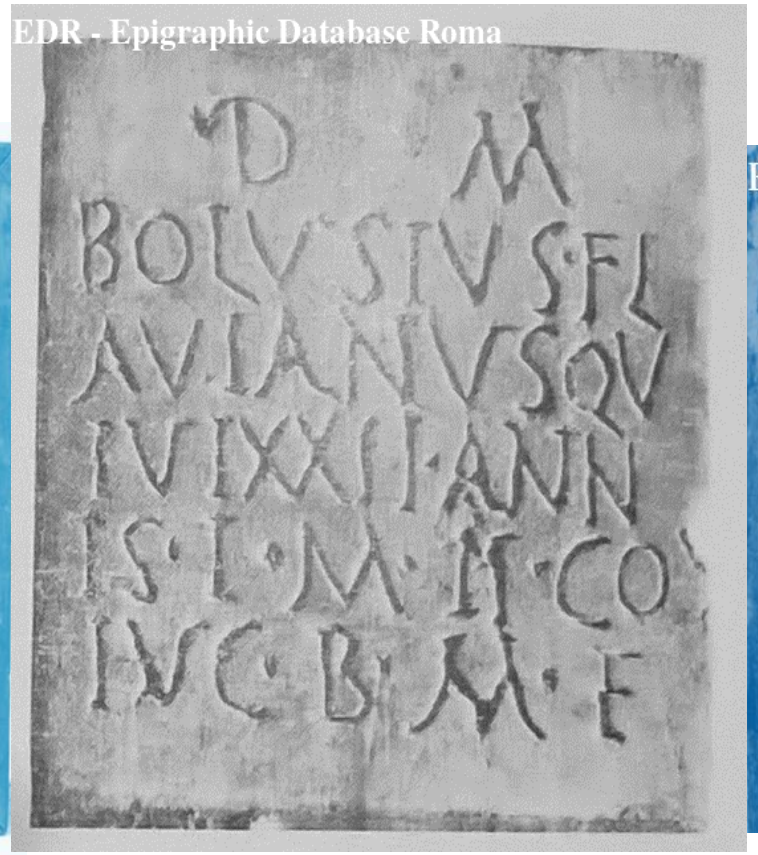
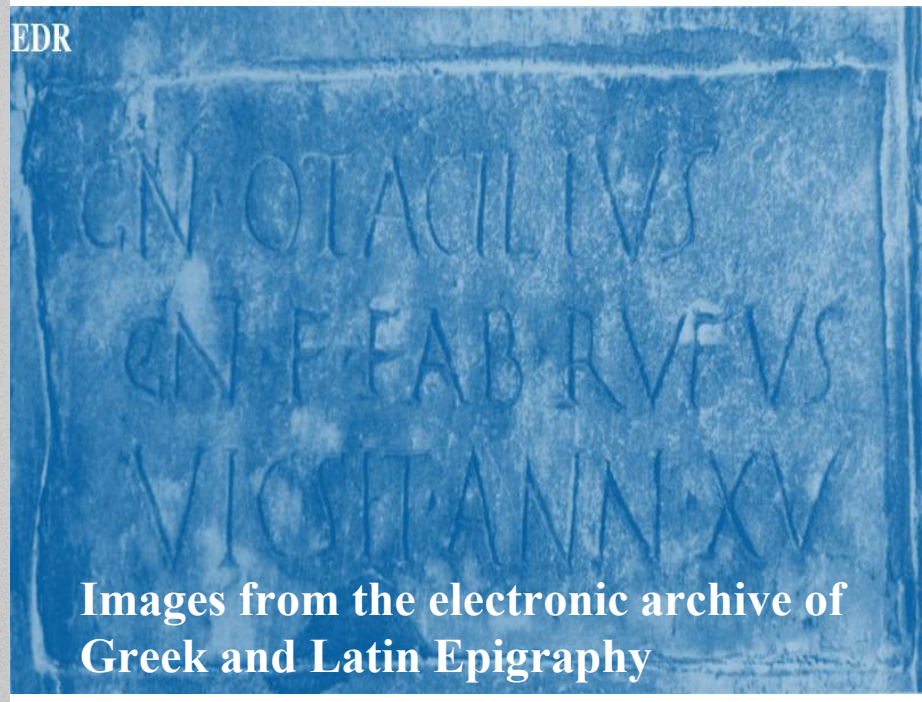






THE APPEARENCE OF <XS> FOR /KS/ : BETWEEN TWO FERNS

- The appearance of <XS> is concurrent with two phenomena in the evolution of the Latin language:
  I. The introduction of *geminatio consonantium*, which means the orthographical representation of geminates.
  II. The beginning of prosodic and phonological changes, which slowly led the phonological system of Latin to the system of romance languages.

- I would also like to propose that such orthographic changes are not purely dirigiste in origin and that the observed variance of the spelling system of Latin has been boosted by increasing contact with Latin/Greek bilinguals.
- Furthermore, such contact is transversal to social classes.

CLASSICAL LATIN SEGMENTS AND THEIR SPELLINGS

Segment	Spelling	Example
[p]	⟨p⟩	*pars* 'part', *quippe* 'naturally'
[t]	⟨t⟩	*tegere* 'cover', *caput* 'head'
[k]	⟨c⟩ mostly ⟨q⟩ _[w], i.e. ⟨qu⟩ = [kw] ⟨k⟩ in some words ⟨x⟩ = [ks]	*cicer* [kiker] 'pea', *hinc* 'from here' *aqua* [akwa] 'water', *quippe* 'naturally' *Kalendae* [kalendaj] '1st day of month' *dux* [duks] 'leader, guide', *rexi* 'I ruled'
[b]	⟨b⟩	*bibere* 'drink', *imber* 'rain'
[d]	⟨d⟩	*dare* 'give', *quod* 'which, that'
[g]	⟨g⟩	*gravis* 'heavy', *agger* 'heap'
[f]	⟨f⟩	*frangere* 'break', *fuit* 'was'
[s]	⟨s⟩ ⟨x⟩ = [ks]	*spissus* 'dense' *dux* [duks] 'leader, guide'
[h]	⟨h⟩	*homo* 'man', *vehere* 'carry'
[m]	⟨m⟩	*mensis* 'month', *summus* 'topmost'
[n]	⟨n⟩	*nomen* 'name', *annus* 'year'
[l]	⟨l⟩	*linquere* 'leave', *puellula* 'little girl'
[r]	⟨r⟩	*rarus* 'rare', *cruor* 'blood'
[j]	⟨i⟩ or ⟨j⟩ _V (depending on editorial tradition) ⟨e⟩ V_C and V_#	*iungere* or *jungere* [juŋgere] 'join', *ieiunus* or *jejunus* [jejju:nus] 'hungry, fasting' *aes* [ajs] 'bronze', *stellae* [stellaj] 'stars'
[w]	⟨u⟩ or ⟨v⟩ _V (depending on editorial tradition) ⟨u⟩ V_C and V_#; #[s]_ and [k]_ (=⟨qu⟩)	*uelle* or *velle* [welle] 'want' *haud* [hawd] 'not', *suavis* [swa:wis] 'sweet'; *aqua* 'water', *quippe* 'naturally'

Cser (2020: 14)

SOME METHODOLOGICAL CAVEATS

- **The *Doctrinal Corpus* of Pandolfini & Prosdocimi (1990: 190-191); the spelling system as a multi-layered system of interconnected variables:**

I. «The question arises whether to describe the language development in 100 BC – AD 100 as a standardisation is an oversimplification, and whether the notion of standard literary Latin relies too much on the texts of language normalisers and on the preconceived notion of Latin literature as a uniform system. To what extent does Latin really become a standard language in this period and to what extent was any standardising movement successful at forming a fixed literary variety?»

Nikitina (2015: 7)

II. «For many scholars, Latin is essentially a literary object. The very label 'Classical Latin' crucially makes reference to the literary canon (vide infra). However, if someone chooses to imagine Latin as a natural language, i.e. as a culturally and socially constrained symbolic structure, the dimensions of speech and sociolinguistic variation cannot be ignored. Consequently, Latin should be conceived in oral terms in addition to its written form, with obvious methodological caveats»

Marotta (2015: 39)

- **Written languages and Diffusion Studies:**

Four types of diffusion:

I. «three types of innovation-decisions range on a continuum from optional decisions (where the adopting individual has almost complete responsibility for the decision), through collective decisions (where the individual has a say in the decision), to authority decisions (where the adopting individual has no influence in the innovation-decision) […] There is yet a fourth type of innovation-decision that is a sequential combination of two or more of the three types we just discussed»

Rogers (1995: 29-30)

- **Written languages and Diffusion Studies:**

Parallel sources of innovation:

II. «The diffusionists claimed that all innovations spread from one original source, which, of course, argued against the existence of parallel invention (today we know that such parallel invention of new ideas frequently occurs)»

Rogers (1995: 43)

- **Written languages and Diffusion Studies:**

  The social actors of diffusion, social hubs, and social networks:

  1. innovators; 2. early adopters (Opinion leaders); 3. early majority; 4. late majority; 5 laggards

I. «The most innovative member of a system is very often perceived as a deviant from the social system, and is accorded a somewhat dubious status of low credibility by the average members of the system. This individual's role in diffusion (especially in persuading others about the innovation) is therefore likely to be limited. Other members of the system function as opinion leaders. They provide information and advice about innovations to many in the system»

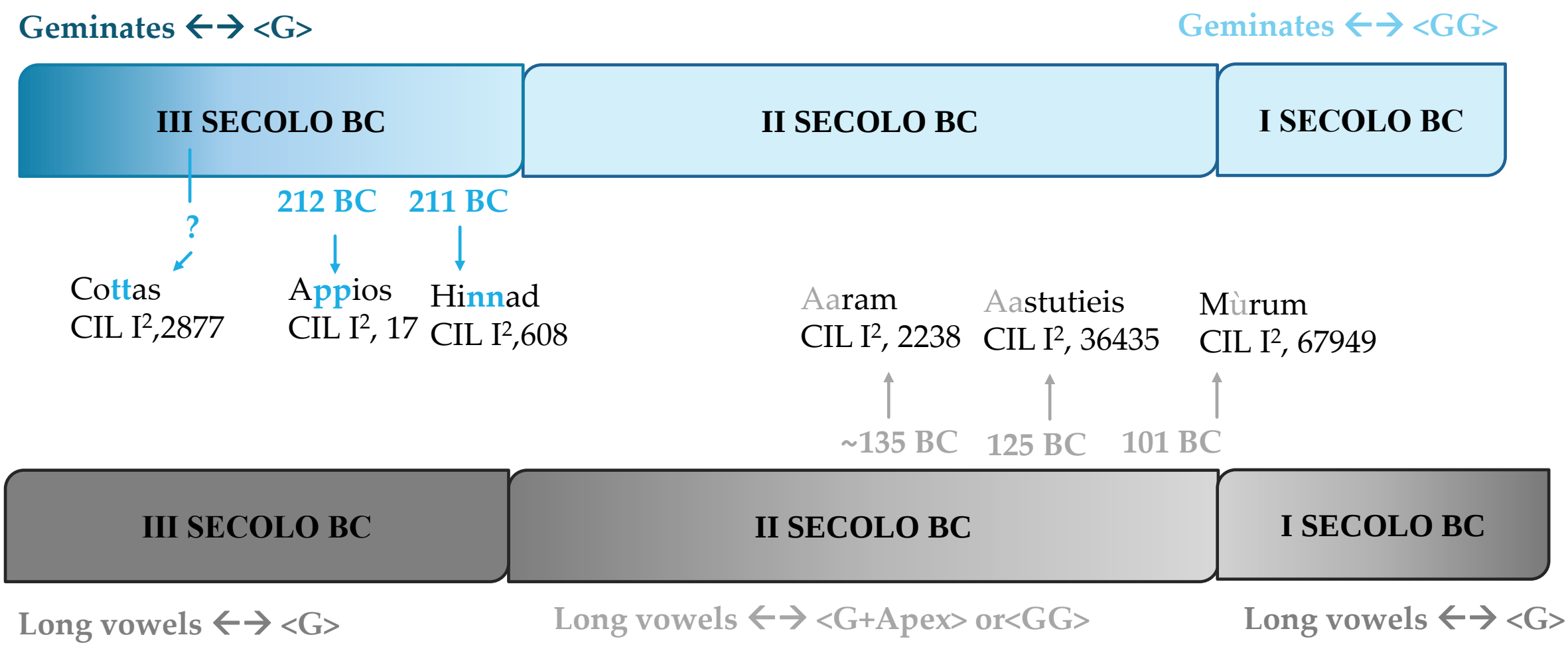
Rogers (1995: 26-27)

- **The importance of considering sub-élites: writers and speakers as possible innovators or active-early adopters. Giving voice to the voiceless:**

III. «Bilingualism among those below the intellectual/social ´elite, whether involving Latin and Greek, Latin and another language, or other combinations of languages, has not received the same attention as the bilingualism of the upper classes. Yet it is well attested. It must be acknowledged that the notion of a 'sub-´elite' is a vague one. I include within this category all speakers of Latin (and another language) who there is reason to believe did not belong to the small class which had received a literary education»

Adams (2003: 14)

ORTHOGRAPHIC CHANGES IN LATIN FROM THE III AND II CENTURY BC



VERTICAL AND DIRIGISTE DIFFUSION OF <XS> VS. HORIZONTAL DIFFUSION

- **The vertical hypothesis:**

I. «The new usage rules, which have a clear prosodic footprint (he is talking about geminates and <XS>), sprang from literary philhellenic circles and their sensitivity to metrical transposition (also metric) in poetry [...] it is, thus, plausible to assume that such variants emanated from an orthographic dirigism, which should be identified with the newly created collegium poetarum led by Ennius around the III BC o, again, with the collegium scribarum histrionumque in Numana's age» (*my translation*)

Mancini (2019: 45-46)

- **The horizontal hypothesis:**

I. As reported by Mancini (2019: 44); Rudolf Wachter (1987: 498) was the only scholar who tried to explain the innovation of <XS> as deriving from direct language contact with Greek and its subsequent diffusion in horizontal terms.

II. <XS> would have been coined from a paleo-attic <χσ>. Wachter assumed that its diffusion traveled through the trade of decorated pots and amphoras, particularly the ones of the famous ceramist EXSEKIAS.

- **Innovators or early adopters? One thing is for sure; Ennio was an opinion leader**

I. «The earliness of Latin consonant gemination in Sicily, or related to Sicily (Hinnad), is presumably not caused by graphic exteriority but, instead, by the awareness of prosodic gemination, prompted by contact with Greek; the reform, or if we wish, the use posed by the poet Ennio is a confirmation of it and, in turn, is warranted by it» (*my translation*)

Del Tutto, Prosdocimi, & Rocca (2002: 244)

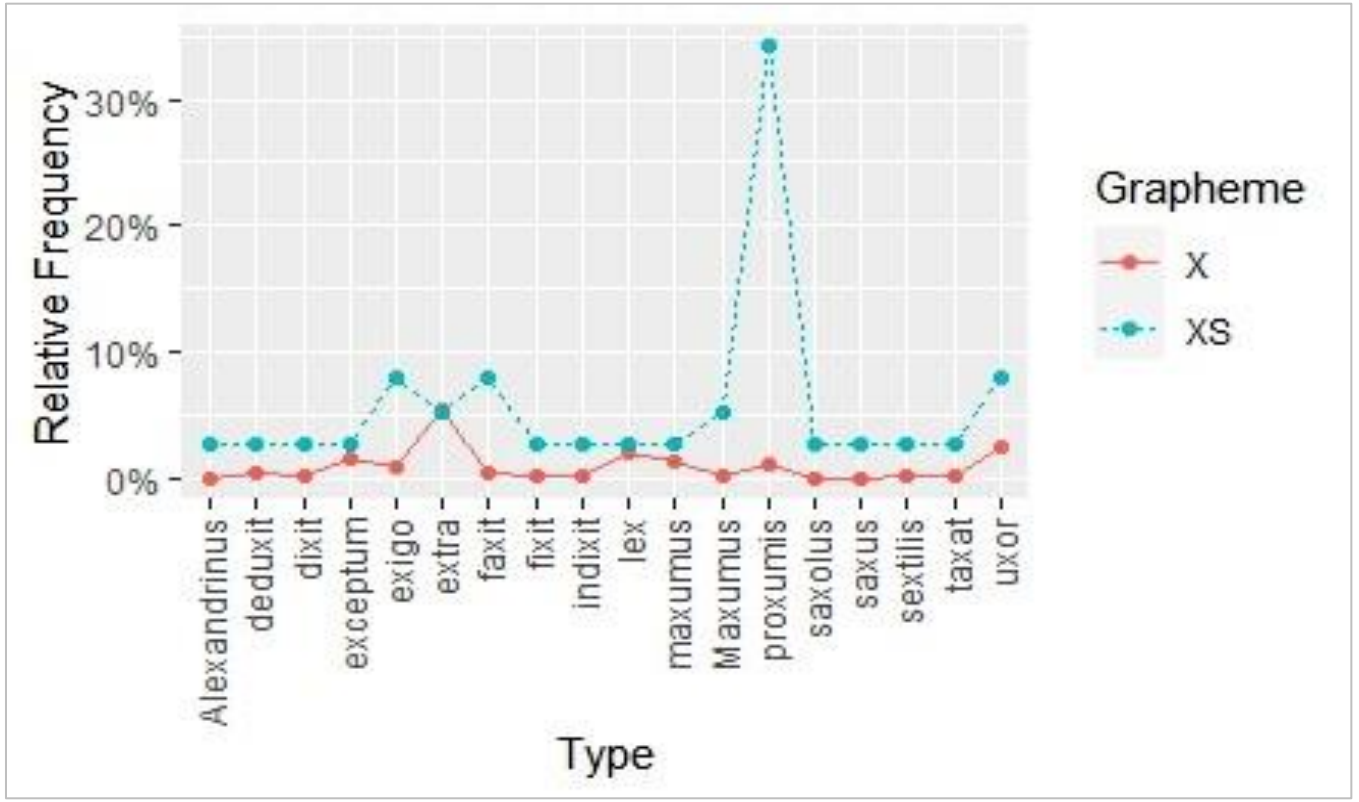
II. «the anticipation of orthographic gemination in the Sicilian landscape implies a more deeply rooted *graecity*, more than a simple imitation» (*my translation*)

Del Tutto, Prosdocimi, & Rocca (2002: 248)

EARLIEST RECORDS OF <XS>: II BC
LEXICAL DISTRIBUTION

- In the first period of its appearance, <XS> is not evenly distributed among lexemes.
- If we consider the group of lexical types in which we can find the <XS> allograph, we notice a high concentration of occurrences associated with the lexeme *proxumis*.

QUANTITATIVE ANALYSIS



❖ In the Scatter-plot above, we used blue to represent the relative frequency of the different types among all the instances of <XS>. While in red it is represented the relative frequency of the same types written with <X> among all the instances of <X>.

- To test the distribution of <XS> among the different types in the *Corpus*, we conducted a $\chi 2$ – test of homogeneity between two groups: lexical types with <X> vs. lexical types with <XS>:

  a) **The p-value was highly significant p > 8.54e-26**

- Having observed expected values < 5, we simulated the p-value to obtain more reliable results, rejecting the hypothesis of homogeneous distribution between the two groups:

  b) **Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)**

  X-squared = 262.07, df = NA, p-value = 0.000499

- Due to the particular interest of some of the *Pearson residuals*, such as:

Type	X	XS
proxumus	-2.85815102	10.11572120
faxit	-1.22238118	4.32631694
Ex	1.27166829	-4.50075653
exigo	-0.97502695	3.45086760

- We conducted a *post-hoc* row-wise *fisher test,* using the most conservative adjustment method of 'Bonferroni' , to test the breaking points of homogeneity:

	TYPE_GROUP	n	p	p.adj.	p.adj.sign
Higher than expected	proxumis	514	1.52e-12	9.88e-11	****
Lower than expected	ex	514	4.97e-14	3.23e-12	****
	exigo	514	1.06e-02	6.89e-01	ns
	Faxit	514	3.37e-03	2.19e-01	ns
	uxor	514	9.13e-02	1.00e+00	ns
	Maxumus	514	1.52e-02	9.88e-01	ns
	…	…	…	…	ns

- The number of * represents the grade of significance of the p-value

POSSIBLE EXPLANATION FOR ITS INITIAL LEXICAL DISTRIBUTION

- In this case, the abnormal distribution of <XS> concerning the type *proxsumus* could be related to the individual preference of one particular scribe. Indeed, 8 of the 13 occurrences of the type proxsumus are from an official inscription *(CIL 01, 0200)* of the fasti, leges type.
- Instead, the unexpected distribution observed for *ex* is probably related to a more abstract relation between <XS> and syllable structure. We conducted a $\chi 2$ – test of independence between syllable structures and the presence of the allograph:

a) **X-squared = 94.627, df = 2, p-value < 2.2e-16**

Syllable Type	Expected X	Expected XS
VxV	117.15789	8.842105
VxC	67.87719	5.122807
V/Cx#	291.96491	22.035088

Syllable Type	Observed X	Observed XS
VxV	93	33
VxC	71	2
V/Cx#	313	1

EARLIEST RECORDS OF <XS>: II BC
TITULI DISTRIBUTION

- We applied the same test to observe the homogeneity of distribution among epigraphic title types.

I. X-squared = 20.357, df = 4, p-value = 0.0004245

II. With simulated p-values:

X-squared = 20.357, df = NA, p-value = 0.004498

QUANTITATIVE ANALYSIS

Type of Epigraphy	Observed X	Observed XS	Expected X	Expected XS
fasti, leges, acta	387	27	381.465619	32.5343811
sepulcralis	48	5	48.834971	4.1650295
sacer	7	5	11.056974	0.9430255
oper. publ. priv.que	19	2	19.349705	1.6502947
tit. in artis operib. inscr.	8	1	8.292731	0.7072692

- The only unexpected distribution that we have found, adopting a row-wise Fisher test with the p-adjustment method of Bonferroni, was:

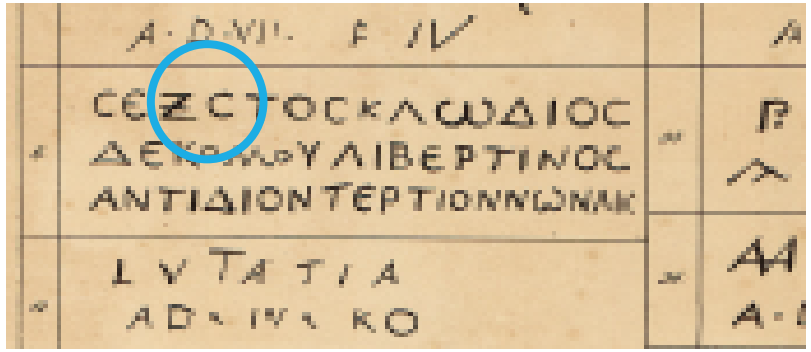
Group	n	p	p.adj	p.adj.signif
sacer	509	0.00123	0.00615	**

GREEK ATTESTATIONS OF <ΞΣ> IN THE ITALIAN PENINSULA – STRANGE COINCIDENCES

- As reported by Manganaro (2004: 63) we find:
  ἐχσελ[ε|υ]θερο[ς]
  on an Etruscan kantharos in Leontini, which according to Dubois (2005: 589) could be dated ca. 400 BCE
- However, as observed by Dosuna (2017: 257), a transcription:
  ἐξσελευθερος
  with redundant sigma cannot be ruled out
- Moreover, we can find other examples of the use of **ξσ** in inscriptions by bilingual *liberti.*

- «the corpus of Greek dialect inscriptions is replete with examples of redundant spelling of consonant clusters that consist of the fricative /s/ Furthermore, in addition to the spelling ξσ for /k + s/, one also encounters the spelling ξξ »

  Woodard & Scott (2014: 44)



Tabulae Ritschl. (1862, n. XIV)

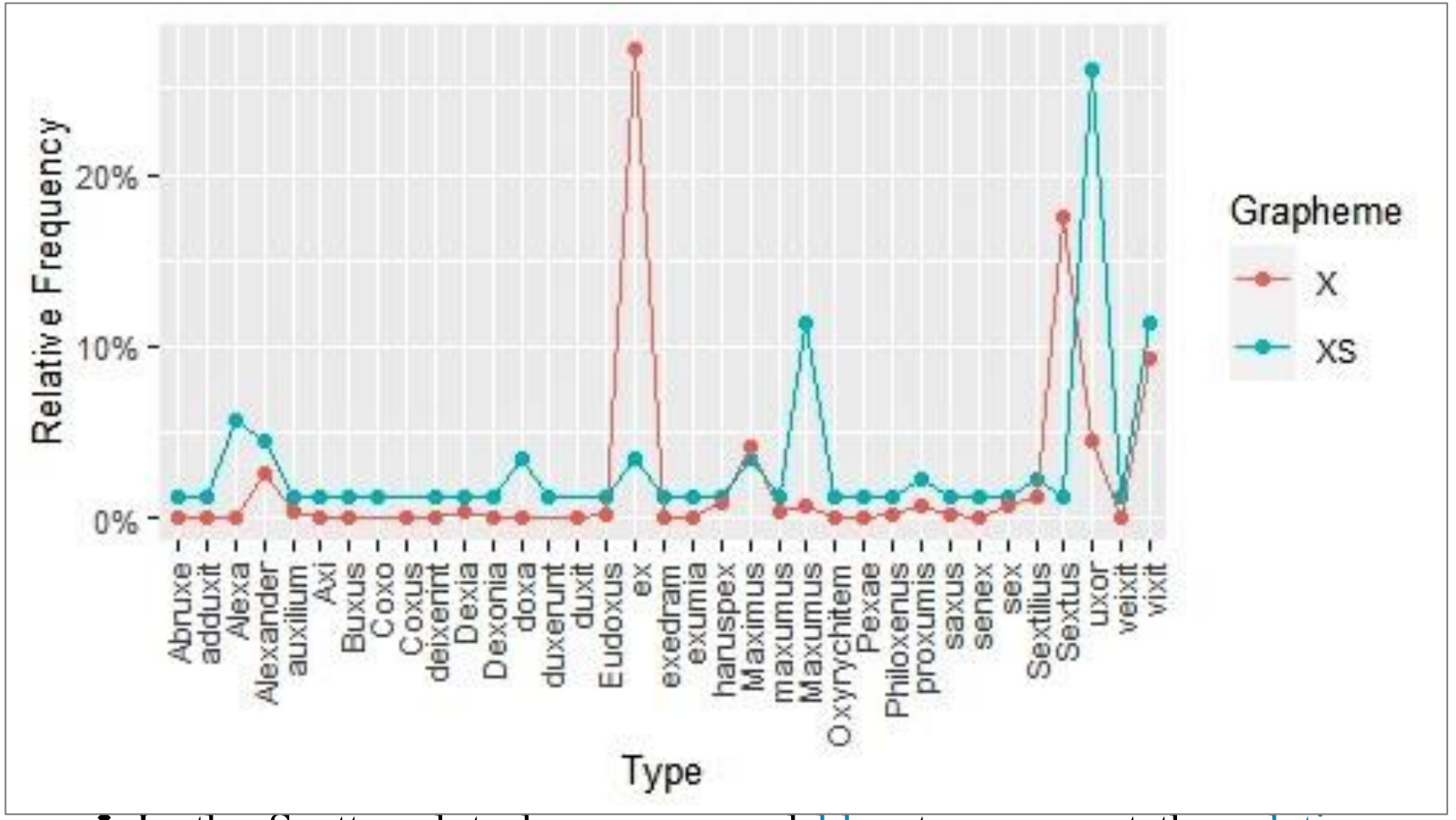
- As purported by Benelli (2020: 111-112), it is possible to assume that at the time of the expansion of the Greek alphabet, its structure was not strictly organized in the classic polyadic alphabets. Instead, they could be conceptualized as a system of possible variants.

EDR ID	FORM	TITULI	LOCUS	MATERIA	DATING
CIL 06, 08247 (1) Schedae scriptor: ANTONELLA FERRARO (VERONICA ITRI)	Σέξστος	Sepulcralis	Roma	Creta	200 a.C. / 50 a.C.
Sicilia occidentale. Studi, rassegne, ricerche (a cura di C. Ampolo) Schedae scriptor: Antonietta BRUGNONE	Σέξστος	honorarius	Soluntum	Lapis	100 a.C. / 51 a.C.
IGIt Locri, Roma 2013, p. 118, nr. 58, con foto (L. Del Monaco) (1) Schedae scriptor: Paola GRANDINETTI	εὐξσά(μενος)	sacer	Locri	creta	450 a.C. / 401 a.C.

DIFFUSION OF <XS>:
I BC
LEXICAL DISTRIBUTION

- Some interesting cases of types with <XS> only. It is difficult to link such examples to an influence of the proposals of highly educated scholars:
  I. COXSUS
  II. BUXSUS < πύξος?
  III. DOXSA < δόξα?
- The beginning of a social trend: the increasing desire for self-display.
  (Lloris 2015: 144-145)

QUANTITATIVE ANALYSIS



❖ In the Scatter-plot above, we used blue to represent the relative frequency of the different types among all the instances of <XS>. While in red it is represented the relative frequency of the same types written with <X> among all the instances of <X>.

- We conducted a *post-hoc* row-wise *fisher test*, using the most conservative adjustment method of 'Bonferroni' , to test the breaking points of homogeneity:

	TYPE_GROUP	n	p	p.adj.	p.adj.sign
Lower than expected	Sextus	1666	1.07e-04	1.72e-02	*
Lower than expected	ex	1666	1.19e-06	1.92e-04	***
Higher than expected	uxor	1666	4.82e-17	7.76e-15	****
Higher than expected	Maxumus	1666	2.03e-17	3.27e-15	****
Higher than expected	Alexa	1666	2.03e-14	3.27e-12	****
Higher than expected	Doxa	1666	1.45e-09	2.33e-07	****
	sextus	1666	1.00e+00	1.00e+00	ns

- The number of * represents the grade of significance of the p-value

- Due to the previous test results, we hypothesized that the non-homogeneous distribution of types could be related to syllable structure. We, therefore, tested the distribution of <XS> and <X> in relation to the four observed syllabic structures: VxV; CxV; VxC; V/Cx# with a $\chi 2$ – test:

X-squared = 102.16, df = 3, p-value < 2.2e-16

- Having observed expected values < 5, we simulated the p-value to obtain more trustworthy results, rejecting the hypothesis of homogeneous distribution between the two groups:

Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)

X-squared = 102.16, df = NA, p-value = 0.0004998

Syllable Structure	Expected X	Expected XS
VxV	596.742651	33.2573485
CxV	1.894421	0.1055789
VxC	377.937013	21.0629874
V/Cx#	602.425915	33.5740852

Syllable Structure	Observed X	Observed XS
VxV	552	78
CxV	2	0
VxC	395	4
V/Cx#	630	6

- We conducted a *post-hoc* row-wise *fisher test*, using the most conservative adjustment method of 'Bonferroni' , to test the breaking points of homogeneity:

Syllable Structure	n	p	p.adj	p.adj.sign
VxV	1667	3.14e-24	1.26e-23	****
CxV	1667	1 e+ 0	1 e+ 0	ns
VxC	1667	1.04e- 6	4.16e- 6	****
V/Cx#	1667	8.3 e-12	3.32e-11	****

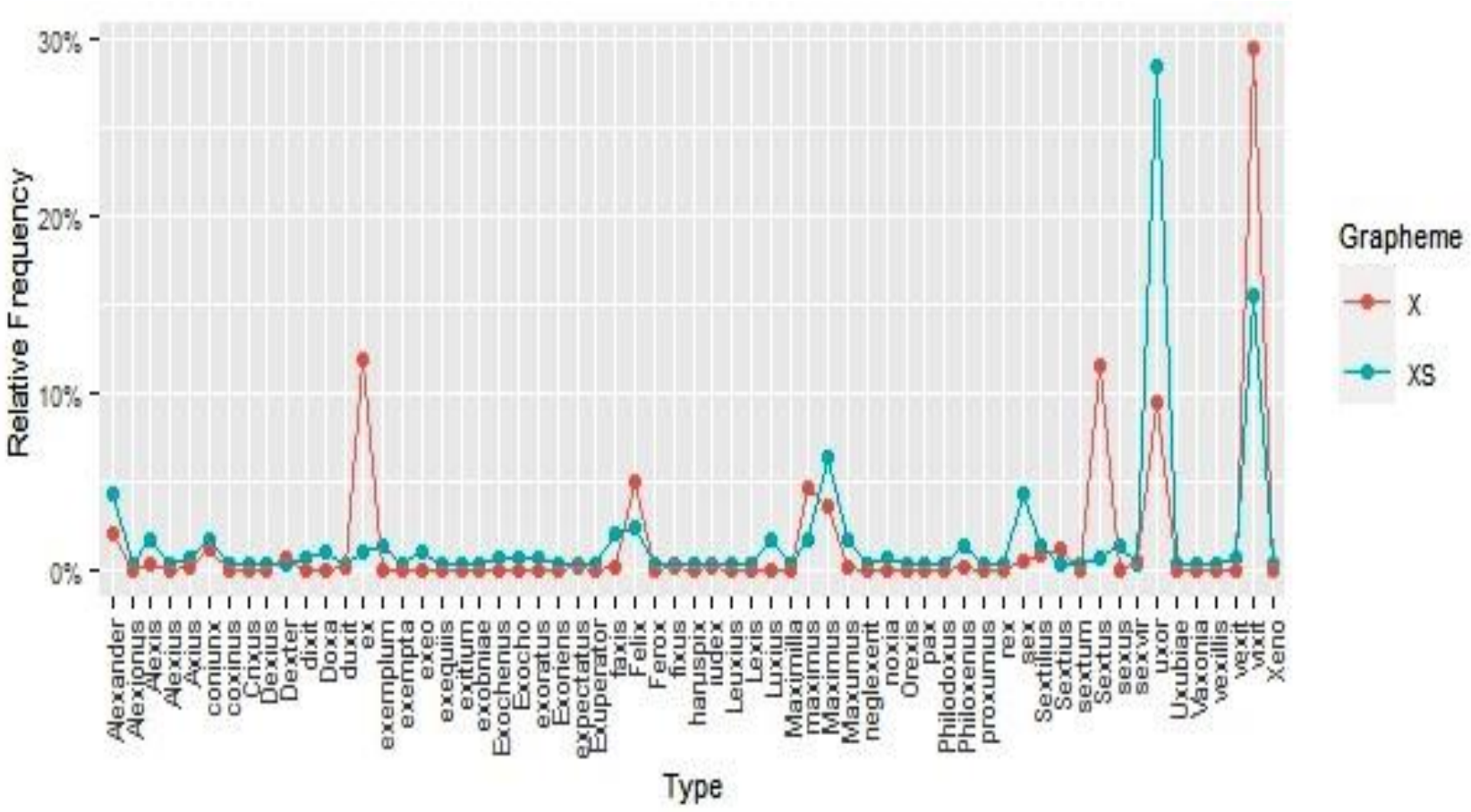
THE APPEARANCE OF VARIANTS OF <XS> IN THE I BC

EDR ID	FORM	TEXT TYPE	PLACE	Support Material	Dating
CIL 04, 04966 (1) Schedae scriptor: Kyle HELMS	deducxstis	Cetera	Pompeii	Tectorium	80 a.C. / 43 a.C.
CIL 11, 03404 (1) Schedae scriptor: CARLO SLAVICH (EDOARDO SCAZZOCCHIO)	vicxit	Sepulcralis	Tarquinii	lapis	100 a.C. / 1 a.C.
Opuscula Epigraphica 13) Schedae scriptor: Lucio BENEDETTI	laxx-	Cetera	Perusia	plumbum	41 a.C. / 40 a.C.
CIL 11, 06078 (1) Schedae scriptor: Fabiola Branchesi	vicsi	Sepulcralis	Urvinum Mataurense	lapis	100 a.C. / 1 a.C.
CIL 06, 35979 (1) Schedae scriptor: Giorgio CRIMI	vicsit	Sepulcralis	Roma	marmor	30 a.C. / 30 d.C.
CIL 11, 07246 (1) Schedae scriptor: Carolina MEGALE	ucsor	sepulcralis	Populonia	marmor	100 a.C. / 50 a.C.

<XS> IN THE I AD: LEXICAL DISTRIBUTION

- In the following century, we observe a similar distribution of the digraph. However, it is slowly expanding. The number of types is much more than in the previous century.

QUANTITATIVE ANALYSIS



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- To test the distribution of <XS> among the different types in the *Corpus*, we conducted a $\chi 2$ – test of homogeneity between two groups: lexical types with <X> vs. lexical types with <XS>:

  a) **The p-value was highly significant p-value < 2.2e-16**

- Having observed expected values < 5, we simulated the p-value to obtain more trustworthy results, rejecting the hypothesis of homogeneous distribution between the 2 groups:

  b) **Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)**

  X-squared = 262.07, df = NA, p-value = 0.000499

- Due to the particular interest in some differences in expected observations, such as:

Type	Expected X	Expected XS
sex	61.9017635	2.09823648
Luxius	6.7705054	0.22949461
uxor	834.7065925	28.29340750
vixit	2365.808024	80.19197538

Type	Observed X	Observed XS
sex	52	12
Luxius	2	5
uxor	784	79
vixit	2403	43

- We conducted a *post-hoc* row-wise *fisher test*, using the most conservative adjustment method of 'Bonferroni' , to test the breaking points of homogeneity:

	TYPE_GROUP	n	p	p.adj.	p.adj.sign
Higher than expected	sex	8449	8.71e-07	2.91e-04	***
Higher than expected	Luxius	8449	7.27e-07	2.43e-04	***
Higher than expected	uxor	8449	3.11e-18	1.04e-15	****
Lower than expected	vixit	8449	1.67e-07	5.58e-05	****
Lower than expected	ex	8449	1.97e-11	6.58e-09	****
Lower than expected	Sextus	8449	4.24e-12	1.42e-09	****
Lower than expected	Maximus	8449	2.13e-02	1.00e+00	ns

- The number of * represents the grade of significance of the p-value

- Even in this case, the distribution of <XS> seems significantly related to syllable structure:

a) **Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)**

X-squared = 83.409, df = NA, p-value = 0.0004998

Syllable Structure	n	p	p.adj	p.adj.sign
VxV	8449	1.59e-20	1.26e-23	****
CxV	8449	1.00e+00	1 e+ 0	ns
VxC	8449	5.10e-12	4.16e- 6	****
V/Cx#	8449	1.94e-07	3.32e-11	****
#x	8449	2.08e-01	1 e+ 0	ns

FROM DATA

TO EXPLANATION

THE LATIN SYLLABLE

1. **Marotta (1999):**
   Only vowels can be the peak of a syllable. Syllabification rules follow the maximum onset principle. It follows the Sonority scale as well as the Strength Hierarchy.

   a) The possible clusters in coda position are:
   - P + /s/
   - C[+son] + C[-son]

   b) The morpheme boundary corresponds to the syllable boundary. Except for C[+son] + Plosive + liquid, the boundary is after two consonants.

$$/s/ \left(C_0^2 \right) V(:) \left(C_0^2 \right) /s/$$

adapted from Marotta (1999: 304)

- Relevant Examples:

1. *carp.si* 3. *vic.sit*

2. *iucs.ta*

VIC.SIT: BUT HOW DID THEY SEGMENT IT?

- Mancini (2019: 40) reported that in a *corpus* of 21030 Latin inscriptions, coming from Rome, in which we find the word <vi**x**it>, we can observe 221 cases of explicit syllabification patterns of the type <vi-xit>.

- In Mancini (2019: 40) we can observe in the entire *corpus Slaby* 34 cases of <vix-sit> and 5 of <ux-sor/i>.

THE SEED OF THE PROSODIC DRIFT

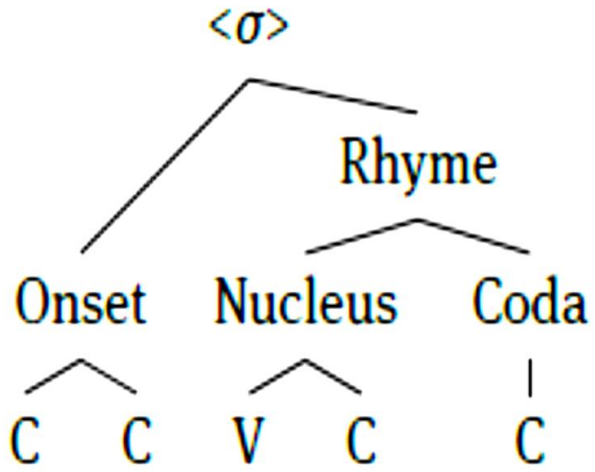
		Short V	Long V	Diphthong	Long V + Diphthong	Total
Stressed	Open syllable	2,445	3,743	292		6,480
		37.7%	57.8%	4.5%	62.3%	100%
	Closed syllable	3,509	646	40		4,195
		83.6%	15.4%	1%	16.4%	100%
Unstressed	Open syllable	8,992	5,252	322		14,566
		61.7%	36.1%	2.2%	38.3%	100%
	Closed syllable	8,450	980	35		9,465
		89.3%	10.3%	0.4%	10.7%	100%

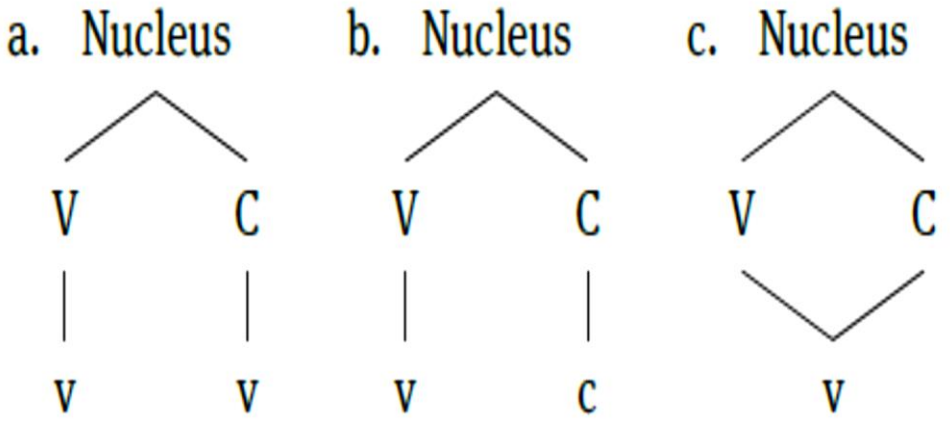
Marotta & De Felice (2020: 448)

EVERTZ (2018: 237-238) THE GRAPHEMATIC SYLLABLE

1. **gPeak:** Every g-syllable has a v-letter in its peak (Evertz & Primus 2013: 5).
2. **branching-gN:** The nucleus of a full g-syllable in a prosodically strong position is branching. All other nuclei do not branch.
3. **Syllabify:** A graphematic syllable starts with exactly one grapheme.

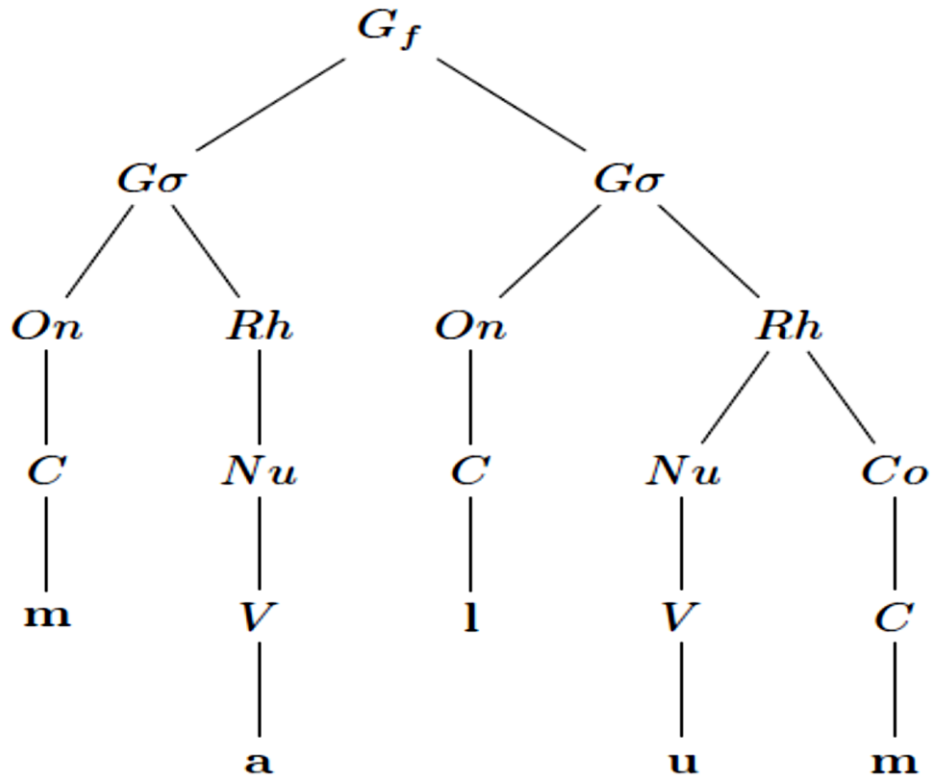
Subsyllabic constituents of the graphematic syllable





Evertz (2018: 57-59)

ORTHOGRAPHIC SYSTEM PRE-GEMINATIO



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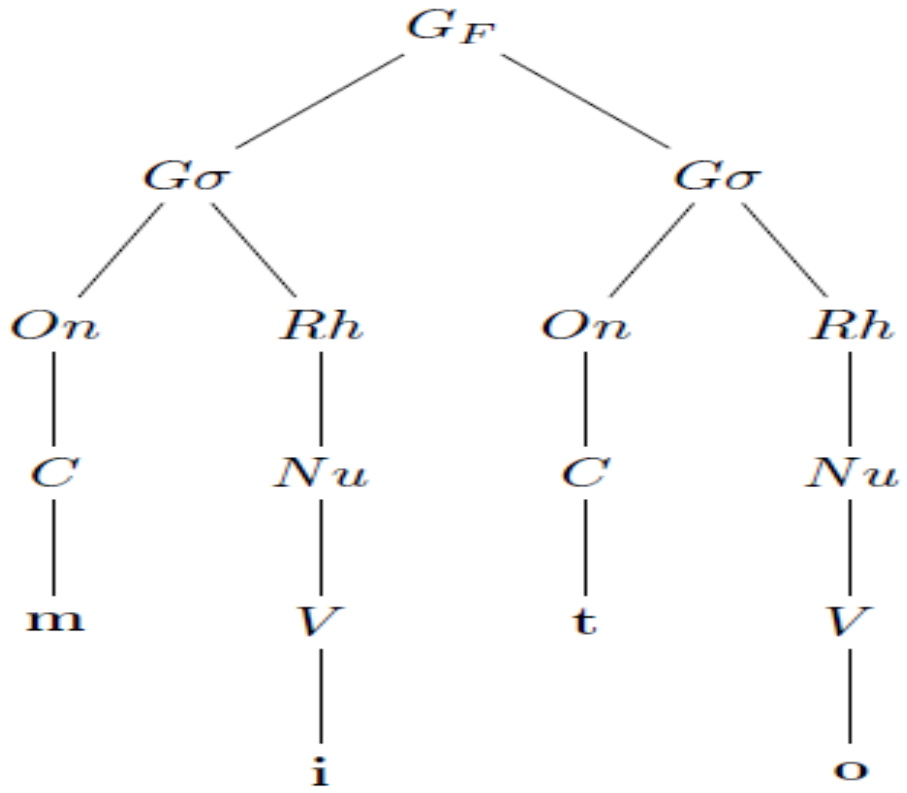
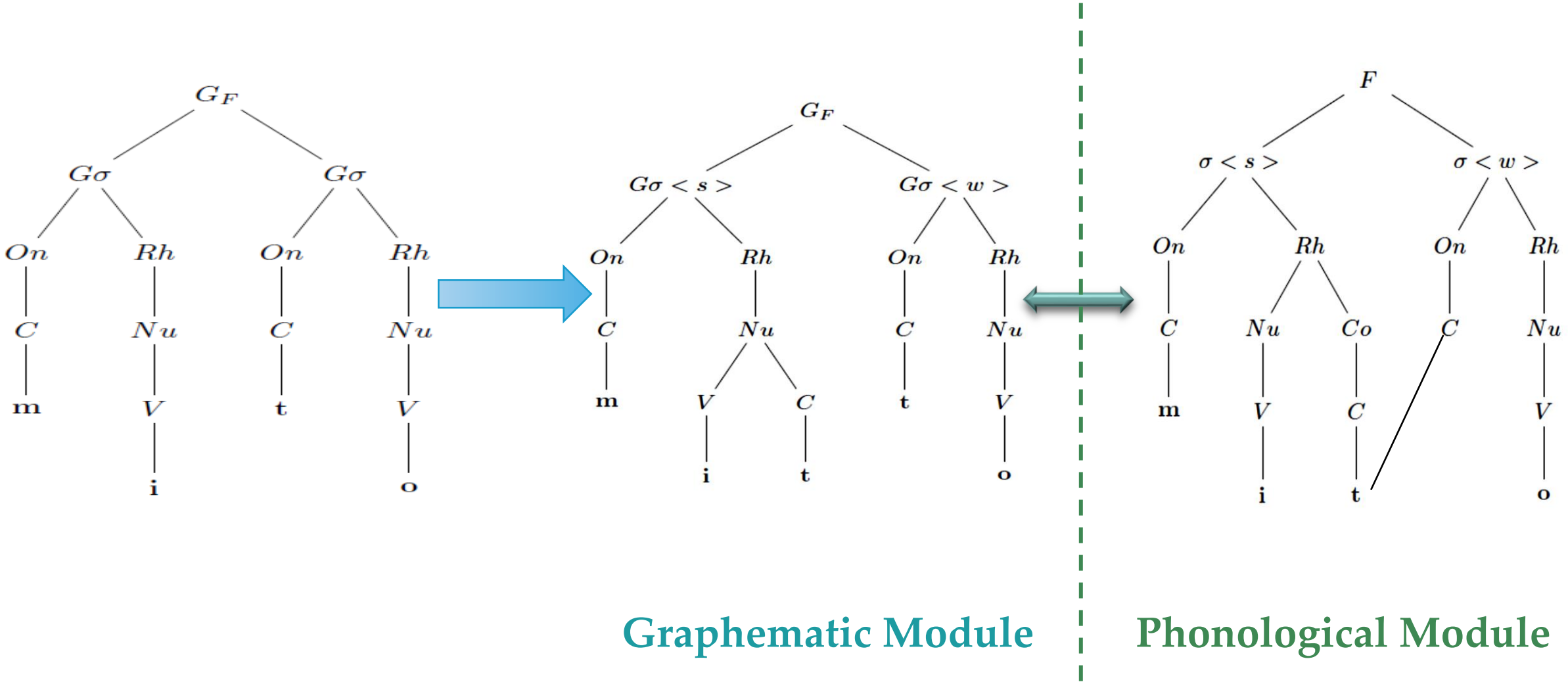


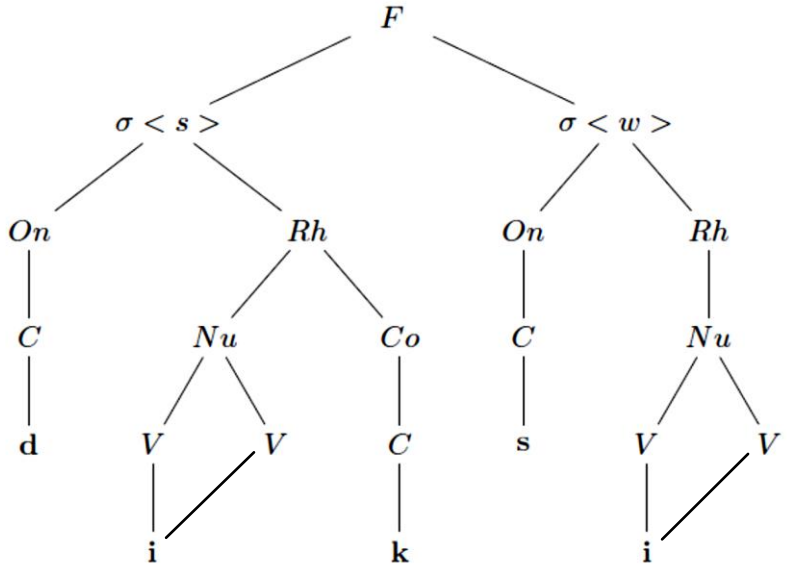
[ˈmaːlum]

[ˈmɪt̪ːoː]

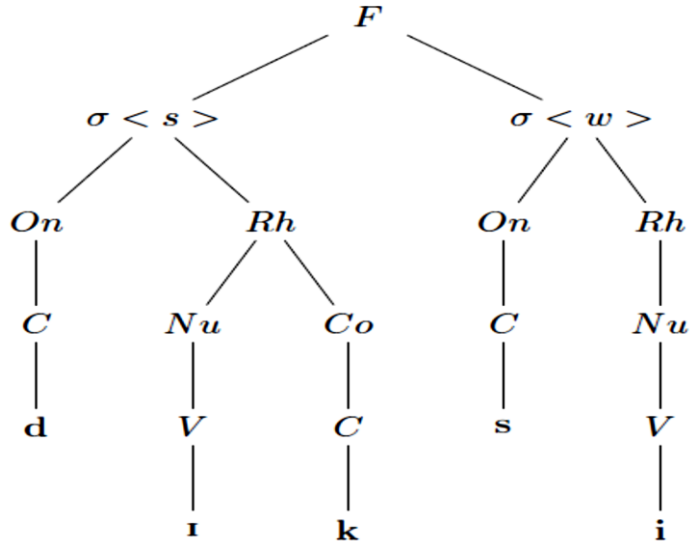
GEMINATIO CONSONANTIUM AT THE END OF THE III CENTURY BC: VISUAL CUES TO STRONG AND WEAK SYLLABLES AND THE EMERGENCE OF THE GRAPHEMATIC FOOT

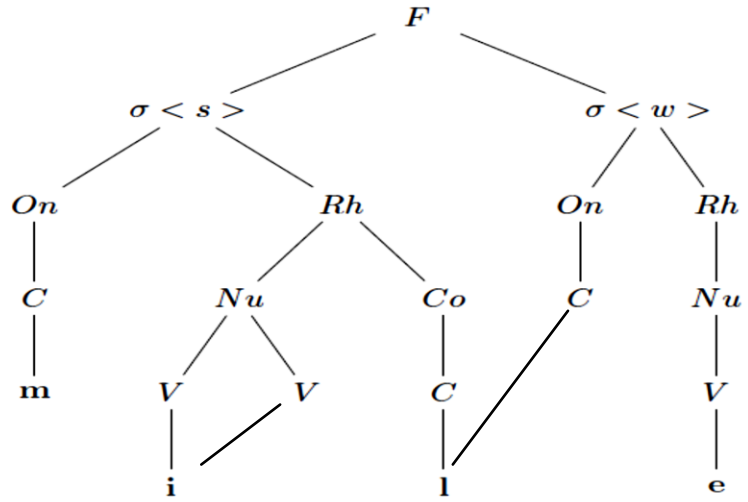


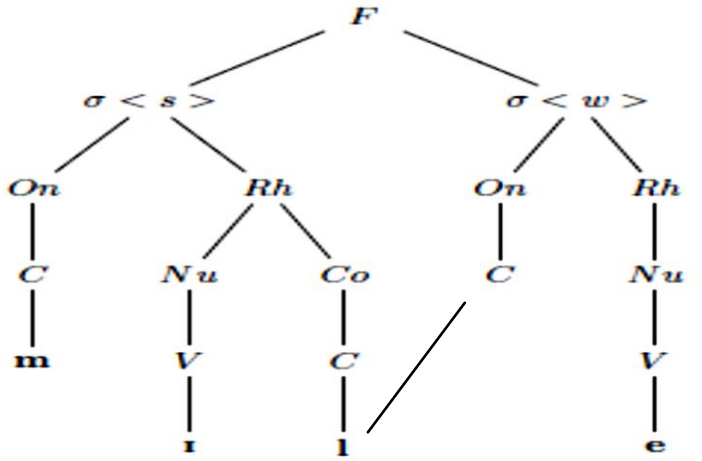
THE BEGINNING OF THE PROSODIC DRIFT
THE LOSS OF SUPERHEAVY RHYME



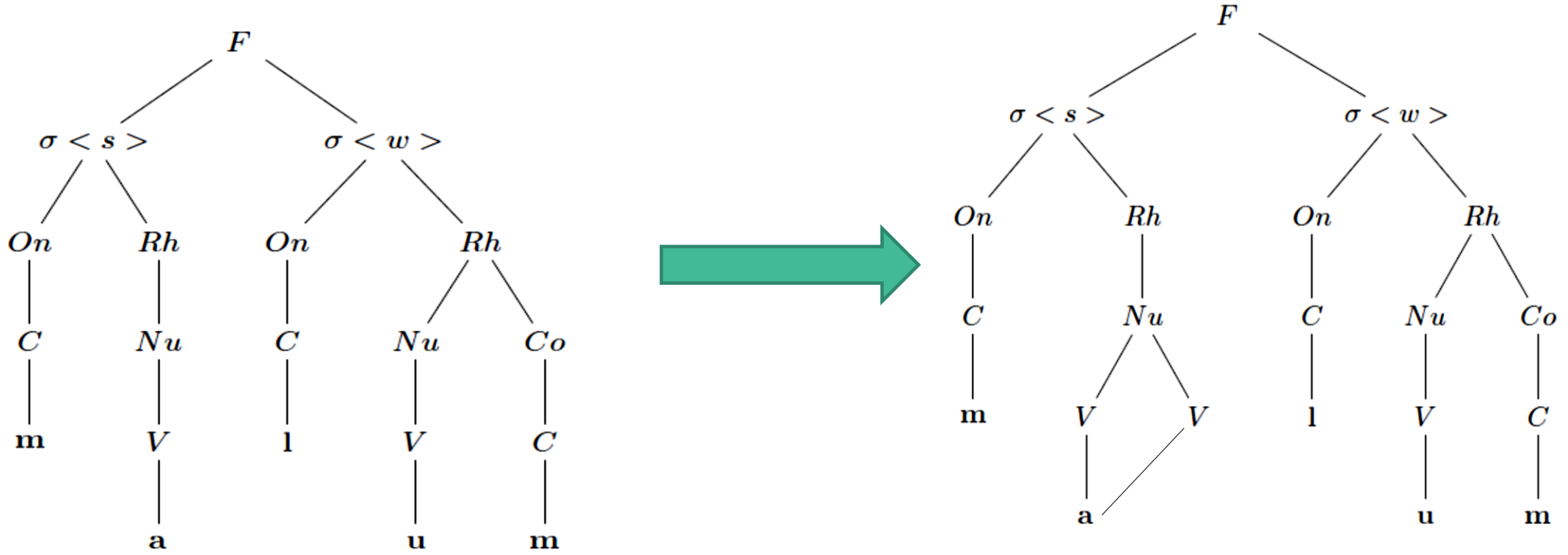
Phonological Module







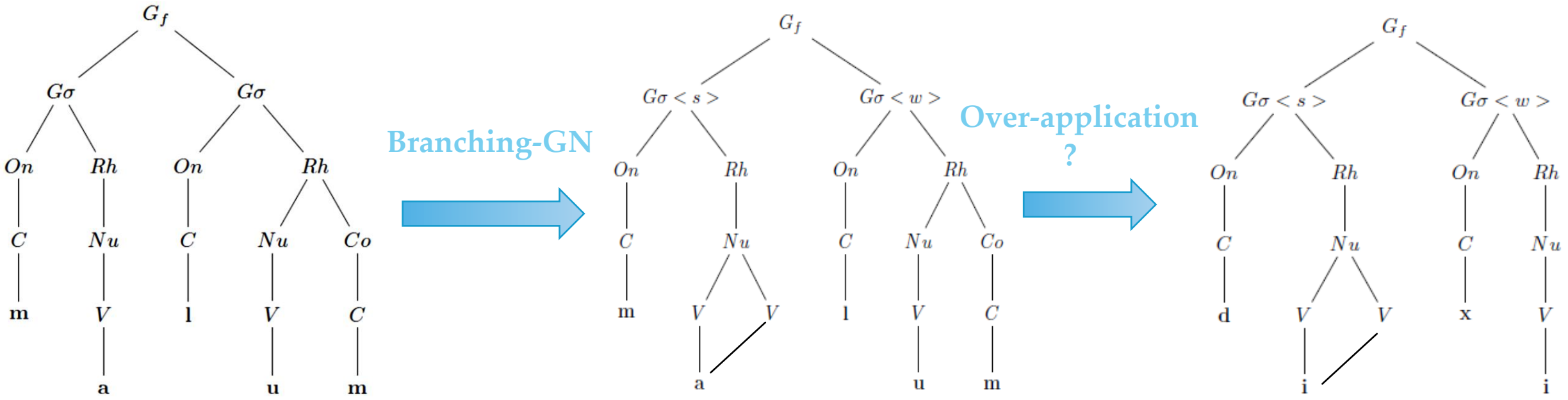
OPEN SYLLABLE BRANCHING



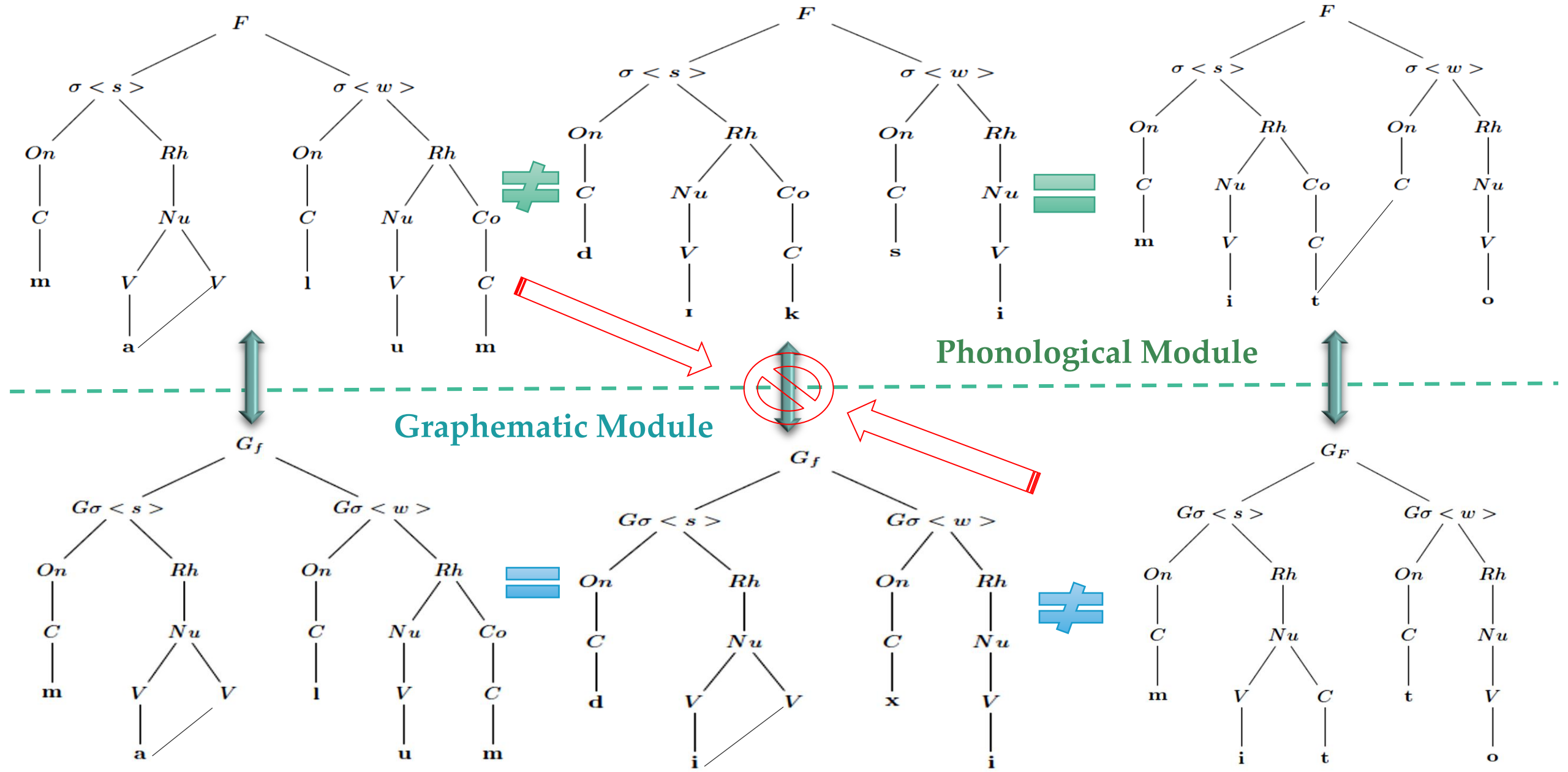
- «Long vowels are more frequent in the open syllables than in the closed ones (with a ratio of almost 6:1). In open stressed syllables only they are even more numerous than short vowels (35.1% vs. 22.9%)»

Marotta & De Felice (2020: 446)

WHY DI.XI DOES NOT SEEM RIGHT



Graphematic Module


Phonological Module
Graphematic Module

CONCLUSIONS

- The <XS> allograph appears in the orthographical structure of Latin through a «conspiration» of different elements:

I. Language contact with greek spellers
II. The development of suprasegmental structures: such as the graphematic foot and the syllable
III. The progressive loss of the phonological value of vowel quantity in relation to an observable stability of consonant length distinctions.

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LINKS TO THE *CORPORA* USED; EDR AND CLASSES:

- **Epigraphic Database Rome of the Electronic archive of Greek and Latin Epigraphy:**

  http://www.edredr.it/edr_programmi/res_complex_comune.php

- **CLaSSES, Corpus for Latin Sociolinguistic Studies on Epigraphic textS. Developed at the *Department of Philology, Literature and Linguistics* of the University of Pisa:**

  http://classes-latin-linguistics.fileli.unipi.it/en