Quantifying Greek Rhyme

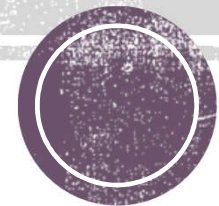## ISTAL 23

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What is (poetic) rhyme?

- Rhyme: sound correspondence between one or more syllables at – usually – the ends of poetic lines, e.g. kr<u>ína</u> - elaf<u>ína</u>

- Although related, poetic rhyme and phonological rime are different. We'll be mostly talking about the former here

Why rhyme?

- Rather under-studied in comparison to other metrical components (Köhnlein & van Oostendorp 2014)
  - In Greek, virtually unexplored [but see Κοκόλης (1993), for a philological study]

- It's phonologically interesting too!
  - Patterns commonly attested in various poetic traditions correspond to patterns languages employ in their general phonological systems (Fabb 2010)
  - Rhyme is reminiscent of phonological reduplication

This project

- Funded by AUTH Research Committee: grant to first author

- Also with the support of The Centre for the Greek Language (ΚΕΓ), and especially Dr. Vasilis Vasileiadis

- Construction of a pilot database with a sample of rhymes as they appear in the poetic works of diverse Greek poets, including Karyotakis, Palamas, Solomos, Valaoritis, Varnalis among others

- Database URL: http://greek-rhyme.web.auth.gr/index.php/home
  - Not fully accessible to the public yet!

Project initiatives

- Online repository of rhymes
  - Web site
  - Library of poems
  - Provision of statistics

- Theoretical rhyme analysis

- Database population tools
  - Analyst expert knowledge integration productivity GUI (graphical user interface)
  - Rhyme detection/classification algorithm

- Expandability
  - Independent application and rules expression
  - Future goals

Our aims

- Descriptive: to better understand rhyme in Greek → which patterns are found and which are common

- Theoretical and/or typological

  - how does Greek rhyme fit in the typology of rhyme in general? For instance, Holtman (1996: 32) suggests – based on Middle English – that languages with rich inflectional morphology prefer feminine over masculine rhymes. Does Greek corroborate this claim?

  - how common are certain patterns, such as rich or imperfect rhyme?

Outline of the talk

- Methodological Issues
  - Rhyme Classification & Basic Patterns
  - Algorithms & Meta-information

- Concrete examples of RPs

- Phonological Implications

- Further issues and future work
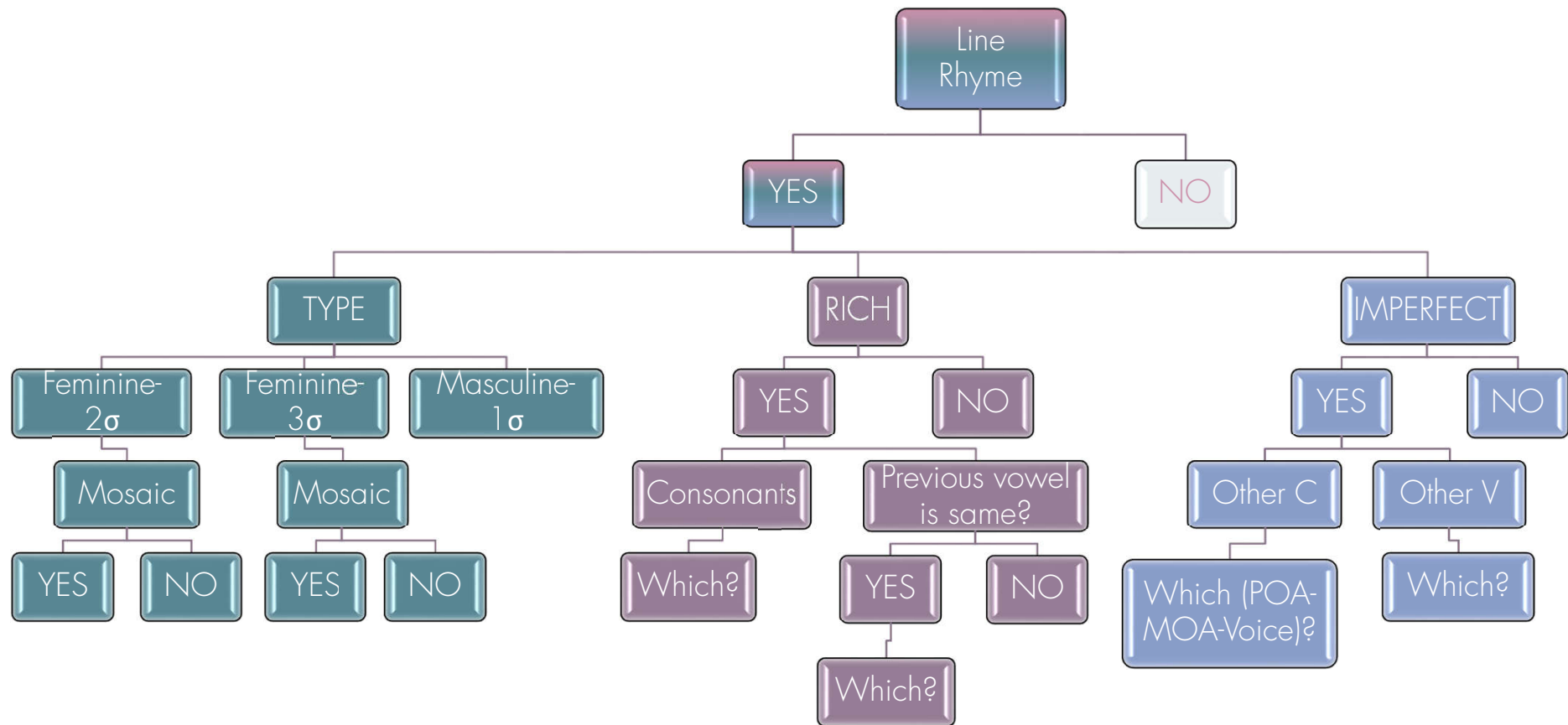
Rhyme Patterns & Algorithms
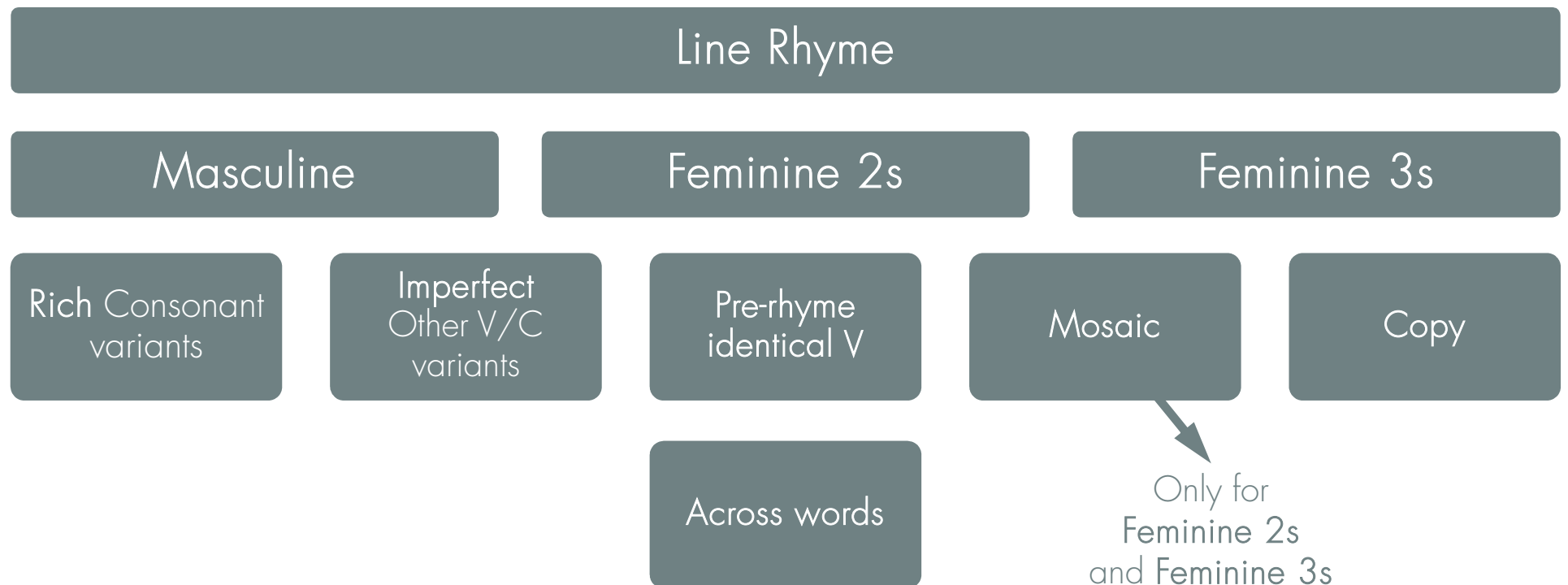
Patterns to identify

Three main distinctions

- Rhyme Type: Feminine (=non-final) or Masculine (=final)
  - Feminine-3σ (προπαροξύτονη): π<u>έρασα</u> - γ<u>έρασα</u> / Feminine-2σ (παροξύτονη): ελ<u>άφι</u> - χωρ<u>άφι</u>
  - Masculine (οξύτονη): κοιν<u>ός</u> - καλ<u>ός</u>
    - Mosaic refers to rhymes that span word boundaries, e.g. δ<u>ώς μου</u> - φ<u>ώς μου</u>
- Rich: when the onset(s) of the stressed syllable match across rhyme pair (RP)
  - For some poets, e.g. Solomos, it is common to get rich rhymes, when the directly previous vowel matches too
- Imperfect: a vowel or consonant within the rhyme differs across RP
  - αγ<u>έρι</u> - λογ<u>άρι</u> : vowel differs
  - ξαφν<u>ίζει</u> - τεχν<u>ίτη</u>: consonant differs

Initial Rhyme Classification chart

Actual Rhyme Classification chart

Line Rhyme		

Masculine	Feminine 2s	Feminine 3s

Rich Consonant variants	Imperfect Other V/C variants	Pre-rhyme identical V	Mosaic	Copy

		Across words	

Only for
Feminine 2s
and Feminine 3s

Algorithm outline

Three step process

- Poem pre-processing
  - Rule-based syllabification
  - Rule-based orthographic to phonetic transcription (use of SAMPA; see Appendix for SAMPA-IPA correspondence)
  - Per-line Synchronous multi layered representation
    (word, syllable, cluster, phoneme)

- Line analysis
  - Standardized syntax of hierarchical rhyme detection rules
  - Rule-based line pair rhyme detection

- Rhyme post-processing
  - Line pair characterization (πλεχτή, ζευγαρωτή, κτλ.)
  - Database wide statistics

Multi layered representation

Line	Χαίρε, ω χαίρε Ελευθεριά!																	
Word	'Cere			'o	'Cere			elefTe'rj\a										
Syllable	'Ce	re		'o	'Ce	re	e	lef		Te		'rj\a						
Cluster	C	e	r	e	o	C	e	r	e	e	l	e	f	T	e	'rj\	a	
Phoneme	C	e	r	e	o	C	e	r	e	e	l	e	f	T	e	r	j\	a
Index	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Representation node 2:

Word:	ortho → **ελευθεριά**,	phono → elefTe'rj\a		
Syllable:	ortho → **ριά**,	phono → 'rj\a,	stressed→ **yes**	**} +** Layer relative indices
Cluster:	ortho → **ρι**,	phono → 'rj\,	type→ **consonant**	
Phoneme:	ortho → **ρ**,	phono → r		

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Rhyme detection rules

- Queues of successive comparison steps of respective line representation nodes in reverse order
- Node level property in index position operants → Operator condition syntax
- Suitable repertoire of comparison operators
- Hierarchy support by rules inheritance
- Match if all queue comparison steps are true

Comparison step definition

1: syllable.r_index.line   → 0
    cluster.type   → V
    cluster.phono   → op:eq
    cluster.f_index.syllable   → op:and:lte:1

Interpretation

1: Each line last syllable
    cluster types are vowels and
    are phonemically same and
    are both first or second in syllable,

Example:
Step match: εντροπαλή, πεί
Step mismatch: εντροπαλή, ακαρτερούσες

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15 Some concrete examples

- F2 = Feminine rhyme on penult
- M = Masculine/final rhyme

29	8/1	Τότε εσήκωνες το βλέμμα	(1) 'to-te e-'si-ko-nes 'to 'vle-ma
31	8/3	και εις το ρούχο σου έσταζ' αίμα, F2	F2
30	8/2	μες στα κλάιματα θολό,	(1) 'mes 'sta 'klai-ma-ta To-'lo
32	8/4	πλήθος αίμα Ελληνικό. M	M
31	8/3	και εις το ρούχο σου έσταζ' αίμα,	(0) 'ce 'is 'to 'ru-xo 'su 'e-sta-'ze-ma
32	8/4	πλήθος αίμα Ελληνικό.	(0) 'pli-Tos 'e-ma e-li-ni-'ko

Pure rhymes

Solomos - Imnos

- M (TR-S, IDV)
  - M = masculine/final rhyme
  - TR-S = singleton rich rhyme
  - IDV = pre-rhymal V is identical

Rich rhyme & V-identity

Seferis - Arnisi

1	1/1	Στο περιγιάλι το κρυφό	(1) 'sto pe-ri-'j\a-li 'to kri-'fo
4	1/4	μα το νερό γλυφό.	M
		M (TR-S, IDV)	
2	1/2	κι άσπρο σαν περιστέρι	(1) 'ci 'a-spro 'san pe-ri-'ste-ri
3	1/3	διψάσαμε το μεσημέρι·	(0) Di-'psa-sa-me 'to me-si-'me-ri
4	1/4	μα το νερό γλυφό.	(0) 'ma 'to ne-'ro Gli-'fo

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- TR-S = singleton rich rhyme
- PR-CC2 = partial rich rhyme with clusters; C2 is same

5	2/1	Αγάλματα θεών ζωντανεμένα	(1) a-'Gal-ma-ta Te-'on zo-da-ne-'me-na
8	2/4	Τα στήθια θα χαρούν τα πονεμένα.	F2
		F2 (TR-S, IDV)	
6	2/2	θ΄ αγναντέψουν στη Νίμπρο εκεί την πρώτη	(1) T΄ a-Gna-'de-psun 'sti 'ni-bro e-'ci 'tin 'pro-ti
7	2/3	της λεφτεριάς αστραφτερή λαμπρότη.	F2
		F2 (PR-CC2)	
7	2/3	της λεφτεριάς αστραφτερή λαμπρότη.	(0) 'tis le-fte-'rj\as a-stra-fte-'ri la-'bro-ti
8	2/4	Τα στήθια θα χαρούν τα πονεμένα.	(0) 'ta 'sti-TCa 'Ta xa-'run 'ta po-ne-'me-na

Full vs. Partial Rich rhyme

Mavilis – Excelsior!

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- F2 = feminine rhyme on penult
- IDV (IDV-2W) = pre-rhymal V is identical and found in previous word

5	2/1	Βαρύ μέσ' στο[ν] πρασινισμένο δρόμο,	(1) va-'ri 'me-ston pra-si-ni-'zme-no 'Dro-mo
8	2/4	σαν του Χριστού τον σταυρωμένον ώμο.	F2
		F2 (IDV (IDV-2W))	
6	2/2	που εγώ μονάχος έχω καθαρίσει,	(1) 'pu e-'Go mo-'na-xos 'e-xo ka-Ta-'ri-si
7	2/3	το δάκρυ το χορτάρι έχει λυγίσει	F2
		F2	
7	2/3	το δάκρυ το χορτάρι έχει λυγίσει	(0) 'to 'Da-kri 'to xor-'ta-ri 'e-Ci li-'j\i-si
8	2/4	σαν του Χριστού τον σταυρωμένον ώμο.	(0) 'san 'tu xri-'stu 'ton sta-vro-'me-non 'o-mo

- IMP-C = within the RP, onset Cs differ, viz. [r] vs. [ð]
- IDV = pre-rhymal V is identical

10	2/5	και γιομίστε μαξιλάρες	(1) 'ce j\o-'mi-ste ma-ksi-'la-res
11	2/6	να πλαγιάσουν οι κυράδες	F2
		F2 (IMP-C, IDV)	
11	2/6	να πλαγιάσουν οι κυράδες	(0) 'na pla-'j\a-sun 'i ci-'ra-Des

Imperfect Rhyme

Valaoritis –
Prolegomena
(i Kyra Frosini)

- F3 (IMP-C, IMP-V, PR-C2, IDV (IDV-2W))
  - F3 = feminine rhyme on antepenult
  - IMP-C = C within RP differs, viz. [k] vs. [n]
  - IMP-V = stressed V of RP differs, viz. [e] vs. [i]
  - PR-C2 = partially rich rhyme; one half of RP has cluster, the other has singleton; they agree on C2
  - IDV (IDV-2W) = pre-rhymal V is identical and found in previous word

54	4/19	Και ήταν ως να πλέκονταν	(1) 'ce 'i-tan 'os 'na 'ple-ko-dan
55	4/20	και ήταν ως να λύνονταν	F3
		F3 (IMP-C, IMP-V, PR-C2, IDV (IDV-2W))	
55	4/20	και ήταν ως να λύνονταν	(0) 'ce 'i-tan 'os 'na 'li-no-dan

Complex cases

Palamas – o Dodekalogos tou Gyftou (Logos A')

Phonological Implications

Source

- The following observations are primarily based on
  - Σολωμός – Ύμνος εις την Ελευθερίαν (abbreviated as Sol. + Line No)
  - The poem is written in verses of 4 lines each, that alternate between 8 and 7 syllables, i.e. Verse1: [8-7-8-7], Verse 2: [8-7-8-7], …
  - This rather rigid pattern allows us to form some generalizations with relative certainty

On hiatus

- In current SMG, many [ia] sequences present a single form with either hiatus [i.a] or its avoidance with a glide [ja] and subsequent glide strengthening (see Baltazani et al. 2016) based on whether they receive the traditional label «λόγιο» and «μη λόγιο», respectively, thus [anisiçía] for *ανησυχία* with hiatus and [kormɲá] for *κορμιά* with hiatus avoidance

- Solomos often contravenes this distinction and accepts alternations much more freely!

- For instance:
  - κορμιά – κορμία

432	108/4	και πατούν εις τα κορμιά.	(0) 'ce pa-'tun 'is 'ta kor-'mJa
451	113/3	όλα τ' άψυχα κορμία,	(0) 'o-la 'ta-psi-xa kor-'mi-a

  - ελευθερία - ελευθεριά

327	82/3	εις τον κάμπο, Ελευθερία.	(0) 'is 'ton 'ka-bo e-le-fTe-'ri-a
8	2/4	χαίρε, ω χαίρε, Ελευθεριά!	(0) 'Ce-re 'o 'Ce-re e-le-fTe-'rj\a

- Similarly, although we don't have the full pairs, we get forms like ανησυ.χιά (instead of ανησυ.χί.α, Sol. 558), επι.θύ.μια (instead of επι.θυ.μί.α, Sol. 517)

On /ria/ vs. /rja/ sequences (1)

- Solomos provides evidence that he accepts the onset sequence [r̩ja] even initially
  - Pay attention to line 416

413	104/1	Την αισθάνονται, και αφρίζουν	(1) 'tin e-'sTa-no-de 'ce a-'fri-zun
414	104/2	τα νερά, και τ' αγρικώ	(1) 'ta ne-'ra 'ce ta-Gri-'ko
415	104/3	δυνατά να μουρμουρίζουν	(0) Di-na-'ta 'na mur-mu-'ri-zun
416	104/4	σαν να ρυάζετο θηριό.	(0) 'san 'na 'rj\a-ze-to Ti-'rj\o

  - *ρυάζετο* needs to be syllabified as [r̩já.ze.to] with an onset cluster. The alternative [ri.á.zeto] is impossible, because it would render the line octasyllabic, while it must be heptasyllabic because of metrical restrictions

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On /ria/ vs. /rja/ sequences (2)

- Focus on line 580 of verse 145

577	145/1	»Κειο το σκήπτρο που σας δείχνει
578	145/2	έχει αλήθεια ωραία θωριά·
579	145/3	μην το πιάστε, γιατί ρίχνει
580	145/4	εισέ δάκρυα θλιβερά.

- Can be transcribed as: (a) i-'se 'Da-<u>kri-a</u> Tli-ve-'ra *or* (b) i-'se 'Da-<u>krj\a</u> Tli-ve-'ra

- Line 580 is in a position that must be 7σ-long → (b) must be correct! (a) is wrong

- But ['ða.kri.a] is what Soultatis (2013: 276) argues for, as a sole possibility

- Interestingly, he uses the alleged lack of [Crj] sequences as one of his basic arguments against Topintzi (2011) and the existence of underlying glides

- Upshot: Poetry may put the validity of phonological proposals to the test!

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On palatalization (1)

- Focus on lines 189 and 191 of verse 48

189	48/1	τ' ακαρτέρειε. – Εφαίνοντ' ίσκιοι
190	48/2	αναρίθμητοι γυμνοί,
191	48/3	κόρες, γέροντες, νεανίσκοι,
192	48/4	βρέφη ακόμη εις το βυζί.

- The words *ίσκιοι - νεανίσκοι* form a rhyme pair

- Since Solomos considers it a rhyme, then *ίσκιοι* should be: [i-sci] and not [i-sci-i]. Syllable counting of line suggests the same (189,191 = 8σ ; 190,192 = 7σ)

- The comparison between pairs like [i-sci] and [nea-ni-sci] is phonologically telling with respect to palatalization

On palatalization (2)

- Baltazani & Topintzi (2012) distinguish between 3 types of PAL(atalization)
  - Simple PAL (triggered by front Vs) as in /keˈros/ → [ceˈros] 'weather'
  - Extreme PAL (triggered by pal. glide; glide palatalizes preceding C and gets absorbed by it)
    - in underived environments (EUP), e.g. /xjoni/ → [ˈçoni] 'snow'
    - in morphologically derived environments (EDP), e.g. /ˈnixj+a/ → [ˈniç+a] 'nails'

- B & T (2012) present preliminary evidence that EUP and EDP are phonetically different
  - EDP: longer transition duration from pal.C to V and greater stability of the position of the transition point in the F1XF2 space → maybe less absorption of the palatalizing trigger?
  - EUP: shorter transition duration and more variable position of the transition point → maybe more absorption of the palatalizing trigger?

- But are EDP and EUP phonologically different too? Solomos' lines above suggests not, since [i-sci] and [nea-ni-sci] are treated phonologically on a par

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Considerations & Future Work

Considerations

- Fix glitches, e.g. algorithms may identify more RPs than the poem's structure suggests

- Mavilis's Paliokastritsa is a sonnet; here RPs should be lines 1-4 and 2-3. RPs 1-2, 1-3 are also – incorrectly? – identified as imperfect rhymes. But what to do when the poem has no clear structure (as in Dodekalogos for example)?

1	1/1	Σαν πεθάνω εδώ θάρθω με τα μύρια	(3) 'san pe-'Ta-no e-'Do 'Tar-To 'me 'ta 'mi-rj\a
2	1/2	φαντάσματα άυπνα μέσα σε άυλα γνέφια,	F2
		F2 (IMP-C, IMP-V, IDV (IDV-2W))	
3	1/3	ή σε ασημοβολής μαϊκά σεντέφια	F2
		F2 (IMP-C, IMP-V)	
4	1/4	τ´ άγια της νύχτας να χαρώ μυστήρια·	F2
		F2 (IMP-0F)	
2	1/2	φαντάσματα άυπνα μέσα σε άυλα γνέφια,	(2) fa-'da-zma-ta 'a-i-pna 'me-sa 'se 'a-i-la 'Gne-fCa
3	1/3	ή σε ασημοβολής μαϊκά σεντέφια	(1) 'i 'se a-si-mo-vo-'lis ma-i-'ka se-'de-fCa
4	1/4	τ´ άγια της νύχτας να χαρώ μυστήρια·	(0) t´ 'a-j\a 'tis 'ni-xtas 'na xa-'ro mi-'sti-rj\a·

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On GUI considerations...

Decisions on GUI are not as simple as they seem! Compare the two examples below

- Kariotakis - Gala

Τ' αστέρια τρεμουλιάζουνε καθώς

το μάτι ανοιγοκλεί προτού δακρύσει.

Ο κόσμος τω δεντρώνε ρέβει ορθός.

Κλαίει παρακάτου η βρύση.

(1) ta-'ste-rj\a tre-mu-'La-zu-ne ka-'Tos

(1) 'to 'ma-ti a-ni-Go-'kli pro-'tu Da-'kri-si

(0) 'o 'ko-zmos 'to De-'dro-ne 're-vi or-'Tos

(0) 'klei pa-ra-'ka-tu 'i 'vri-si

- Varnalis – Portreto se rimes

Νούρι νούρι μελανούρι

έχει κούτελο και μούρη

η Μιράντα το μωρό·

δε μπορεί να πει το ρο!

(1) 'nu-ri 'nu-ri me-la-'nu-ri

(0) 'e-Ci 'ku-te-lo 'ce 'mu-ri

(1) 'i mi-'ra-da 'to mo-'ro

(0) 'De bo-'ri 'na 'pi 'to 'ro

...On GUI considerations

- Rhyme representation only appears once (the first time it is encountered), thus the RP 1-3 is noted, but not the RP 3-1. Why?

- Rhyme representation only on first line benefits
  - Intuitive inference of rhyme type
    - in examples above: Kariotakis → πλεχτή (1-3, 2-4), but Varnalis → ζευγαρωτή (1-2,3-4)
  - Easy detection of redundant/false detected rhymes
  - Single appearance in statistics
  - In case corrections are needed, there is only a single editing position

Future Work

- Expand database

- Optimize GUI

- Current project does not cover this, but the current structure and rules allow for future integration of metric scheme attributes according to rhyme type characterization (πλεχτή, σταυρωτή, ζευγαρωτή), poem type (e.g. sonnets) or syllabification issues (recognition of synaloepha)

- Extend to other phenomena, e.g. alliteration

- Make this more useful/accessible to philology/poetry scholars and school teachers. How? Ideas?

Thank you!

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	SAMPA	IPA	Description
1	SAMPA	IPA	Description
2	p	p	voiceless bilabial plosive
3	b	b	voiced bilabial plosive
4	t	t	voiceless alveolar plosive
5	d	d	voiced alveolar plosive
6	ts	ts	voiceless alveolar affricate
7	dz	dz	voiced alveolar affricate
8	c	c	voiceless palatal plosive
9	ɟ\	ɟ	voiced palatal plosive
10	k	k	voiceless velar plosive
11	g	g	voiced velar plosive
12	f	f	voiceless labiodental fricative
13	v	v	voiced labiodental fricative
14	T	θ	voiceless dental fricative
15	D	ð	voiced dental fricative
16	s	s	voiceless alveolar fricative
17	z	z	voiced alveolar fricative
18	C	ç	voiceless palatal fricative
19	j\	ʝ	voiced palatal fricative
20	x	x	voiceless velar fricative
21	G	ɣ	voiced velar fricative
22	m	m	bilabial nasal
23	F	ɱ	labiodental nasal
24	n	n	alveolar nasal
25	J	ɲ	palatal nasal
26	N	ŋ	velar nasal
27	l	l	alveolar lateral approximant
28	L	ʎ	palatal lateral approximant
29	r	r	alveolar trill
30	j	j	palatal approximant

Appendix

- Sampa – IPA correspondence for Greek consonants