

Brainstorming on the Encoding of Eastern Music Scripts, Middle-Byzantine Neumes as a Case-Study

by *Maria Alexandru, Elsa De Luca & Ichiro Fujinaga*

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Brainstorming on the Encoding of Eastern Music Scripts, Middle-Byzantine Neumes as a Case-Study¹

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Abstract: The effort to encode neumatic scripts has primarily focused on Western European repertoires, with little attention given to the neumes employed in the East. To address this gap, we propose to raise awareness on some methodological issues that have hindered modern scholars from encoding Eastern neumes. Our case study is the Middle-Byzantine music script, employed from the mid-12th century to about 1815 across a large geographical area encompassing mainly Eastern Europe and part of the Middle East. This music script has been chosen since it has many points of contacts with Western neumatic scripts but, at the same time, its basics differ radically from what we encounter in the West. Indeed, music scripts in the East are of the ‘articulatory’ type, serving as a guide on how to make music, almost similar to a tablature style of notation. In Western neumatic scripts instead, the performance is captured mostly within the neume.

Compared to the encoding of Western neumes, the encoding of Byzantine neumes in a machine-readable format entails further challenges. Middle-Byzantine neumes are rich in metadata; thus their encoding should include 1) information on historically informed practice, which is available through musical treatises, manuscripts, and the oral tradition of Byzantine Chant; 2) the names of the neumes in Greek, possibly with transliteration, translation, and etymology. This article contributes to the ongoing discussions on encoding of non-Western early music, particularly the Middle-Byzantine neumatic script, and encourages a collaborative effort to find the most effective way to encode Eastern neumes in general.

Keywords: Byzantine chant; plainchant; neumes; music encoding; MEI Neumes module.

¹ This paper was presented at the “Encoding Cultures – joint MEC and TEI Conference” in Paderborn, 8th September 2023.

1. Introduction

The annual conference of the Music Encoding Initiative (MEI) marked a turning point in 2023. The conference was jointly organized with the Text Encoding Initiative (TEI) and the conference theme was “encoding cultures”. Furthermore, the call for proposals explicitly encouraged “contributions that engage with multilingual and multicultural aspects of text and music encoding, such as multilingual metadata, support for non-Latin scripts and non-Western music notation etc.”² This approach represents a step towards openness and inclusivity, especially if compared with the statement on the MEI website regarding the kind of repertoires that fall under the umbrella of this international encoding effort. Indeed, among the goals of MEI one can read that “the Music Encoding Initiative strives to create a semantically rich model for music notation that accommodates the encoding of common Western music but is not limited to common music notation”.³ This statement leaves the door open to the encoding of repertoires such as tablature and early music, either mensural or monodic (plainchant). However, it leaves out non-Western repertoires. It must be said, nevertheless, that MEI has already welcomed contributions that aimed at enhancing its interoperability and applicability to non-Western repertoires. In 2022, a paper on the encoding of Armenian neumes was presented at the Music Encoding Conference (MEC) in Halifax,⁴ thus suggesting some interest in broadening the horizon of MEI to other non-Western musical traditions. This article stemmed from our previous work on the development and refinement of the MEI Neumes Module (De Luca et al. 2019).⁵ The research question that triggered this research was “can the MEI Neumes module - tested only on Western music scripts—be applied to the encoding of Eastern neumes?”. To answer this question, we provide first some background information on the development of neumes in the East and the West and then we provide a rich introduction on our case-study, the Middle-Byzantine music script, where we outline its most significant musical and graphical characteristics. In

² <https://teimec2023.uni-paderborn.de/cfp.html> (27/12/2024).

³ <https://music-encoding.org/about/> (27/12/2024).

⁴ The talk is available on YouTube: <https://www.youtube.com/watch?v=OKlu7lu2AZg> and it was subsequently published in the MEC proceedings: Elsa De Luca and Haig Utidjian, “Challenging the MEI Neumes Module: Encoding Armenian Neumes,” in *Proceedings of the Music Encoding Conference, Dalhousie University, 19–22 May 2022*, eds. Ailynn Ang, Jennifer Bain, and David M. Weigl (Halifax, 2023), 27–39, <https://works.hcommons.org/records/m3yr7-f4586> (27/12/2024).

⁵ The MEI Guidelines for the Neumes repertoire are available at <https://music-encoding.org/guidelines/v5/content/neumes.html> (27/12/2024).

the last section, we explain how these features have an impact on the encoding of Byzantine neumes in a machine-readable format and explain that the current MEI Neumes module needs to be further developed for the encoding of Byzantine chant.⁶

2. The Eastern and Western neumes: Some background information

Modern scholars have already acknowledged that Eastern and Western neumes share some graphical and historical similarities and, from a methodological point of view, they also pose similar challenges to modern scholars. The surviving commonalities existing among liturgical chants and the neumatic dialects found across Western and Eastern Europe, the Middle East, and the Levant suggest that music scribes shared, to some degree, writing techniques and notational signs.

In the East and the West, we deal with notations that convert only partial musical information since the main means of transmission are oral. The written records were introduced in support of that orality. Medieval scribes from this large geographical area faced similar challenges when they tried to shape chant into a written form for the first time. Neumes could provide information about an extraordinary range of elements of musical sound: besides the direction of melodic movement, they communicate information about duration, intensity, articulation, tone-colour, even voice-production. But not each neumatic script provided all this information. Local scribes gave priority to certain musical meaning which they chose to capture in a written form. Scribes made their own peculiar selection of musical signs and techniques at a regional—and sometimes local—level. Eventually, how this musical meaning was encapsulated in a written form was based on some graphical conventions shared by the writers and readers familiar with that notational system.

The earliest surviving sources do not represent the earliest days of music writing, but they mirror a slightly later stage in the development and refinement of music script. Modern musicologists, from the East or the West, rely on the stability of the liturgical chant tradition to interpret retrospectively earlier sources of plainchant. Indeed, the

⁶ This article can also be seen complementary to a highly interesting approach to means of encoding Byzantine Neumes by Polykarpos Polykarpidis, Christina Anagnostopoulou, and Dionysios Kalofonos, “Towards the Digitization of Middle Byzantine Notation: A Formal Model and Knowledge Representation,” in *Proceedings of the Music Encoding Conference, Dalhousie University, 19–22 May 2022*, eds. Ailynn Ang, Jennifer Bain, and David M. Weigl (Halifax, 2023), 99–111, <https://works.hcommons.org/records/m3yr7-f4586> (27/12/2024).

earliest neumes (so-called ‘adiastematic’) do not provide exact information on the music intervals and it is only in later centuries that neumatic music scripts became more pitch focused. As such, later versions of the same chants written with a more modern (thus pitch-focused) music script are now used for comparison and to work out the meaning of the earlier neumes.

Liturgies from the medieval Christendom use many of the same texts but in different languages and associated with different melodies. Plainchant is used in similar contexts to achieve similar purposes, but we should not automatically assume that the Christian medieval chant traditions are historically derived from one another, even if they shared a selection of graphical signs found across different notational systems. For instance, the conventional signs of Middle-Byzantine notation designate the number of steps up or down between each note and the note succeeding it. Although this principle of interpretation was new, the repertory of signs was mainly taken over from Coislin neumatic script. In the West, we find many examples of the ‘same neumes’ (at least from a purely graphical point of view) in Old Hispanic, Catalanian, and Italian neumatic scripts ascribed to the Frankish family. Nevertheless, it is important to emphasize that it would be conceptually wrong to assume that a sign used in coeval notation(s) carried the same meaning across all the related music scripts. Indeed, previous studies have demonstrated that the same sign could have multiple interpretations in different neumatic systems. Susan Rankin, for example, identifies such a case in East Frankish and Breton scripts, concluding that “the similarity of these graphs is no guarantee of their cognate relation, and their direct association would be an example of a ‘false etymology’.”⁷

Both in the East and the West scholars attempt to solve the same issues of interpretation of the graphical signs, for example, understanding which notes belong to a certain syllable, and also issues related to the terminology employed for research. Indeed, one may question whether the technical vocabulary adopted to describe one specific local chant tradition can be translated and applied to another local chant tradition and maintain the same significance.

To answer our research question on the applicability of the MEI Neumes module to Eastern neumes we selected one case-study among the various neumatic scripts

⁷ This example is thoroughly discussed in Susan Rankin, *Writing Sounds in Carolingian Europe: The Invention of Musical Notation* (Cambridge: Cambridge University Press, 2018), 185–6. CH-SGs cod. sang. 359 is available at <https://www.e-codices.unifr.ch/en/list/one/csg/0359> (27/12/2024). For the facsimile of F-CHR 47 see André Mocquereau, ed., *Codex 47 de la bibliothèque de Chartres Antiphonale missarum (Xe s.)*, Paléographie musicale, première série, XI (Tournai: Desclée, 1912).

found in Eastern Europe, the Middle East, and the Levant. We chose to analyze the Middle-Byzantine neumatic script. We favored this notational system over the others for its cultural importance. Being a living art that existed for more than 2,000 years, it was inscribed in 2019 on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity.⁸ In addition to its long-lasting history, there are already several studies that managed to nail down the significance of several Middle-Byzantine neumes, and these could be a useful point of departure for the encoding.

3. Byzantine Chant

From a historical point of view, Byzantine music can be defined as the music of the Eastern Roman Empire (324–1453), with its capital in Constantinople (the ancient city of Byzantium), viewed in all its expressions: ecclesiastic, secular, and folk music. From a stylistical point of view, Byzantine music can also be identified with the ecclesiastic music of the churches observing the Byzantine rite, from the times of the Eastern Roman Empire until today (mainly in the Orthodox Church). In the latter sense, it is known also as Psaltic Art (Ψαλτική τέχνη) and Psaltic Science (Ψαλτική ἐπιστήμη, science of chanting).⁹ It is characterized by the following features: monophonic chant, usually sung with a *bordun-tone*, the so-called *isokrátima*, based on the eight-mode system (ὀκτωηχία – *oktoichía*), and passed over from generation to generation through oral tradition and neumatic notation (known as *παράσημαντική* – *parasimandikí*).¹⁰ In this paper we are going to focus on some main aspects of the Byzantine neumes.

Byzantine chant is found in approximately 10,000 musical manuscripts, kept in different libraries all over the world, with main repositories in Greece, Mt Sinai, Russia, Romania, Italy, France, and other countries.¹¹ Around 1,500 manuscripts stem

⁸ <https://ich.unesco.org/en/RL/byzantine-chant-01508> (27/12/2024).

⁹ Manuel Chrysaphes, ed. by Dimitri Conomos, *The Treatise of Manuel Chrysaphes, The Lampadarios: On the Theory of the Art of Chanting and on Certain Erroneous Views That Some Hold About it*, Monumenta Musicae Byzantinae, Corpus Scriptorum de Re Musica, II (Wien: Verlag der Österreichischen Akademie der Wissenschaften, 1985), p. 38, line 52, and p. 39.

¹⁰ For further details and bibliography, see Maria Alexandru, *Introduction to Byzantine Music* (Thessaloniki: University Studio Press, 2020), 11–31.

¹¹ See e.g. Grigorios Stathis, *The Manuscripts of Byzantine Music, Holy Mountain Athos*, 4 vols. (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 1975, 1976, 1993, 2015). Id., *The manuscripts of Byzantine music, Meteora* (Athens: Holy Synod of the Church of Greece – Institute of

from the Byzantine era and the rest date to the post-Byzantine and newer periods.¹² The oldest surviving manuscripts of Byzantine chant known today come from the 9th and 10th centuries (ekphonic and melodic notations, respectively), but the prehistory of Byzantine neumes can be traced back in various sources of the first Christian millennium.¹³

Byzantine Musicology, 2006). Id., *The first manuscripts with the exegeseis in the New Method of musical, vol. I. The Prolegomena, and vol. II. The Catalogue* (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 2016). Dimitrios Balageorgos and Flora Kritikou, *The Manuscripts of Byzantine Music, Sinai, Analytical description I* (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 2008). Flora Kritikou and Dimitrios Balageorgos, *The manuscripts of Byzantine Music, Sinai, Analytical description II* (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 2021). Manolis Chatzigiakoumis, *Manuscripts of Ecclesiastic Music 1453–1820* (Athens: National Bank of Greece Cultural Foundation, 1980). Donatella Bucca, *Catalogo dei manoscritti musicali greci del SS. Salvatore di Messina* (Biblioteca Regionale Universitaria di Messina) (Rome: Comitato Nazionale per le Celebrazioni del Millennio della Fondazione dell'Abbazia di S. Nilo a Grottaferrata, 2011). Emmanouil Giannopoulos, *The manuscripts of Byzantine music, England, Analytical Catalogue* (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 2008). Id., “Basic bibliography for the manuscripts of Psaltic Art,” in *The Psaltic Art. Word and Music in the Worship of the Orthodox Church*, ed. Emmanouil Giannopoulos, vol II (Thessaloniki: Kyriakidi, 2016), 473–530. Achillefs Chaldeakis, *The manuscripts of Church music, Islands of Greece, Analytical Catalogue, I, Ydra* (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 2005). Evgenios Gertsman, *The Greek musical manuscripts of St Petersburg, Catalogue, I, National Library of Russia* (St Petersburg: Glagol, 1996). Asen Atanasov, “Musical Manuscripts in Ochrid and Tirana,” in *Byzantium without Borders: Hymnography and Music in the Byzantine World, 22nd International Congress of Byzantine Studies, Sofia, 22–27 August 2011*, eds. Christian Hannick, Christian Troelsgård, Svetlana Kujumdzieva (ed. in chief), and Stefan Harkov, *Bulgarian Musicology* 3–4 (2012), 81–8.

¹² Kenneth Levi and Christian Troelsgård, “Byzantine Chant,” in *The New Grove Dictionary of Music and Musicians*, 2nd ed. by Stanley Sadie and John Tyrell (London: Macmillan Publishers, 2001), vol. 4, 734–56.

¹³ Ioannis Papathanasiou and Nikolaos Boukas, “Early diastematic notation in Greek Christian hymnographic texts of Coptic origin. A Reconsideration of the Source Material,” in *Palaeobyzantine Notations III, Acta of the Congress held at Hernen Castle, The Netherlands, in March 2001*, ed. Gerda Wolfram, *Eastern Christian Studies* 4 (Leuven, Paris, Dudley MA: A. A. Bredius Foundation, Peeters, 2004), 1–25. See also Maria Alexandru, “Writing music on Greek texts during the first Christian millennium,” in *Scriptor, Cantor & Notator. The Materiality of Sound in Chant Manuscripts*, eds. Elsa De Luca, rev. Ivan Moody, and Jean-François Goudesenne, *Musicalia Antiquitatis & Medii Aevi* (MUSAM) (Turnhout: Brepols, forthcoming).

The main periods in the development of Byzantine melodic notations can be seen in table 1.

Table 1

The development of Byzantine neumes over time.

Period	Dating	Basic characteristics
Palaeobyzantine notations with two families: Coislin/Agiopolite and Chartres/Athonite	10 th –12 th century	Adiastematic and steno- graphic notations
Middle-Byzantine notation	ca. middle of 12 th –ca. middle of 19 th century	Diastematic notation with different layers of stenographicity
New Byzantine notation	in use since 1814 until today	Diastematic and analytic no- tation.

As many palaeographers noticed, Byzantine neumatic notation moves in a continuous way through the centuries, with great consistency in the transmission of the repertories from one period to the other. A very refined balance between old and new elements resulted into an uninterrupted flow of Psaltic Art, which serves the liturgical life of the church, as music of the Logos, in the octomodal frame, and expressed in millenary forms of songs, such as stichera, cheroubika, heirmoi, and many others.¹⁴

Middle-Byzantine notation contains different categories of neumes:

A. intervallic signs (ἔμφωνα – émfonta, measured in ‘voices’ i.e., intervals of seconds),

B. subsidiary signs (μεγάλα σημάδια, μεγάλοι ὑποστάσεις, ἄφωνα σημάδια, τὰ τῆς χειρονομίας – megála simadia, megále ypostásis, áfona simádia, ta tis chironomías, i.e. big signs, great hypostases, voiceless signs, serving for cheironomy),

¹⁴ See Grigorios Stathis, *The anagrammatisms and the mathemata of the Byzantine melopoeia*, Series Meletai 3, 2nd ed. (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 1992). Ewald Jammers, *Musik in Byzanz, im päpstlichen Rom und im Frankenreich. Der Choral als Musik der Textausssprache*, Abhandlungen der Heidelberger Akademie der Wissenschaften, Philosophisch-historische Klasse (Heidelberg: Carl Winter, Universitätsverlag, 1962), 204. Jørgen Raasted, “Byzantine Chant in Popular Tradition,” *Cahiers de l’Institut du Moyen-Âge Grec et Latin* 31 (1979), A, 39–49: 40.

indicating the musical ‘Gestaltung’ on the level of the rhythm, phrasing, ornamenting on different levels, dynamics.

C. modal signatures and modulation signs (μαρτυρίαί – martyrie and φθοραί – ftoaré).

In table 2 the basic neumes of the Middle-Byzantine notation are given with their names (in phonetic transcription to the latin alphabet) and the most recurrent shapes.

Table 2

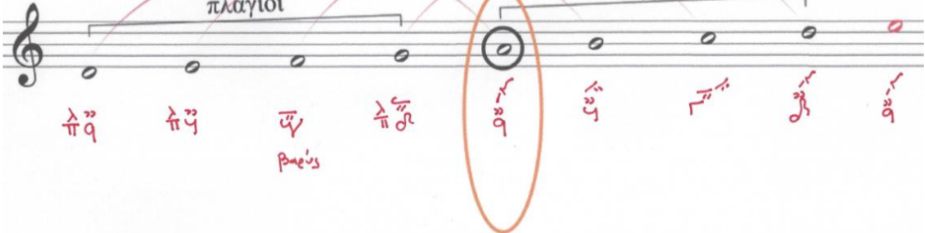
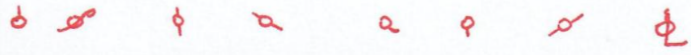
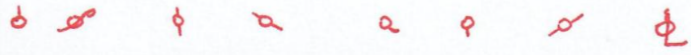
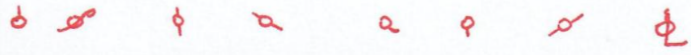
Synopsis of the Middle-Byzantine notation.¹⁵

Synopsis table of neumes of the Middle Byzantine notation	
A. Tones	Names in ascendent movement: <i>ananés</i> (D, a), <i>neanés</i> (E, h), <i>nana</i> (F, c), <i>ághia</i> (G, d) Names in descendent movement: <i>áanes</i> (c, F), <i>neéanes</i> (h, E), <i>anéanes</i> (a, D), <i>neághie</i> (G, C)
B. Basic intervallic signs <i>Size of intervals measured in ‘voices’ (i.e., intervals of seconds)</i>	1. Prime: íson  = 0 voices/ ‘voiceless’ 2. Ascending: olígon  oxía  petasthí  kúfizma  pelastón  dýo kendímata  = all +1 (i.e., an ascending second) kéndima  = +2 ipsilí  = +4 3. Descending: apóstrofes  = -1 dýo apóstrofi sýndezmi  = -1 with double length iporói  = -1-1 kratimokatávazma  = -1-1 kratimokatavatoanástama  = -1-1+1 elafrón  = -2 hamilí  = -4

¹⁵ See Jørgen Raasted, *Intonation formulas and modal signatures in Byzantine musical manuscripts*, MMB, Subsidia VII (Copenhagen: Munksgaard, 1966), 8 and “A Key to the Round Notation” at the end of the aforementioned book. Christian Troelsgård, *Byzantine Neumes. A New Introduction to the Middle Byzantine Musical Notation*, MMB, Subsidia IX (Copenhagen: Tusculanum Press), 41–75 and the “Quick reference card” at the end of the aforementioned book. Maria Alexandru, *Palaeography of Byzantine Music: Musicological and Artistic Inquiries* (Athens: Hellenic Academic Electronic Textbooks, 2017), 328–36, 412, 418, 540, <https://repository.kallipos.gr/handle/11419/6487> (27/12/2024).

For the rendition of the neumes, the Koukouzelis font was used: Nikolaos Siklaidis and Maria Alexandru, “Font Design of Psaltic (Byzantine) Notation for Greek Musical Repertories,” in *Proceedings of the Music Encoding Conference, Alicante 2021*, eds. Stefan Münnich and David Rizo, 173–180 (2022), <https://hcommons.org/deposits/item/hc:46011/> (27/12/2024).

C. Combi- nations of inter- vallic signs	Nr. of 'voi- ces'	'Voiceless'	
		Ascending intervals	Descending intervals
Mea- sured in voices. Always add +1 in order to find the corre- sponding interval in Western music theory (e.g., 2 voices = interval of a third etc.)	1	— / ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘
	2	— ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘
	3	— ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘
	4	— ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘
	5	— ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘
	6	— ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘
	7	— ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘
	8	— ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘
	9	— ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘
	10	— ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘ ˘	˘ ˘ ˘ ˘ ˘ ˘
D. Subsidiary signs with rhythmical implications		a. big lengtheners (megále árgie): diplí ˘ dýo apóstrofi síndezmi ˘ krátima ✓ b. small lengthener: klázma ˘ c. other signs: gorgón ˘ (quick) argón ˘ (slow)	

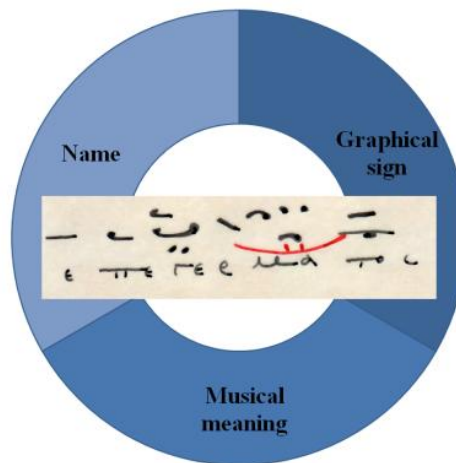
E. List of great signs (megála simádia, áfona [‘voiceless’], chironomic signs). Many of them occur also in red ink in the mss	íson diplí paraklitikí krátima kýlizma andikenokýlizma tromikón ekstreptón tromikosýnagma psifistón psifistosýnagma gorgón argón stavrós andikénoma omalón thematizmós éso thematizmós éxo epéggherma parakálezma éteron parakálezma xirón klázma argosýntheton gorgosýntheton uránizma apóderma thés ke apóthes théma aplún hórevma psifistoparakálezma tromikoparakálezma and píazma sízma sýnagma énarxis tzákizma varía lýghizma																																			
F. Signatures (martyrie), occurring both as Main Signatures at the beginning of pieces, and as Medial Signatures in the interior of the chants. They represent abbreviations of correspondent intonation formulas	Plagal modes Authentic modes πλάγιοι κύριοι 																																			
G. Alteration and modulation signs (ftoré)	<table><tr><th rowspan="2">Modes</th><th colspan="4">Authentic</th><th colspan="4">Plagals</th></tr><tr><th>1st</th><th>2nd</th><th>3rd</th><th>4th</th><th>of 1st</th><th>of 2nd</th><th>nenano</th><th>of 4th</th></tr><tr><td>Shapes</td><td colspan="8"></td></tr><tr><td>Other alteration signs</td><td colspan="4">imífonon</td><td colspan="4">imíftoron</td></tr></table>	Modes	Authentic				Plagals				1 st	2 nd	3 rd	4 th	of 1 st	of 2 nd	nenano	of 4 th	Shapes									Other alteration signs	imífonon				imíftoron			
Modes	Authentic				Plagals																															
	1 st	2 nd	3 rd	4 th	of 1 st	of 2 nd	nenano	of 4 th																												
Shapes																																				
Other alteration signs	imífonon				imíftoron																															

In order to explore a neume in depth, one can follow the heuristic triptychon described by Floros, namely the comparative study of the name – shape – musical

meaning of each sign in the context of specific formulas, types, and styles of chant¹⁶ (fig. 1). This can be combined with the method of the regressive comparison of manuscripts containing the same chant (fig. 2) and with the broader foundation of the entire research on the comparative study of manuscripts, oral tradition, theoretical texts and Greek folk music (especially for tunings and ornamentation techniques) (fig. 3).

Figure 1

The heuristic triptychon devised by Floros (*Neumenkunde*, especially vols. I and III) for the study of Byzantine neumes. Formula called epégerma (=awakening), copy from the ms GR-Athens NLG 2458, f. 4v, A.D. 1336.¹⁷



¹⁶ Cf. Constantin Floros, *Universale Neumenkunde*, 3 vols. (Kassel: Bärenreiter Antiquariat, Kassel-Wilhelmshöhe, 1970).

¹⁷ See Alexandru, *Palaeography*, 562.

Figure 2

Regressive approaches in studying the Byzantine neumes: from the received tradition in the New Method (since A.D. 1814) backwards in time to the manuscripts in Middle Byzantine and Palaeobyzantine notations, step by step, as proposed by Konstantinos Psachos.¹⁸ In this diagram, the red line represents the melody, which is transmitted orally, whereas the black line stands for the musical writing, which developed from stenographic to analytic ways of encoding.¹⁹

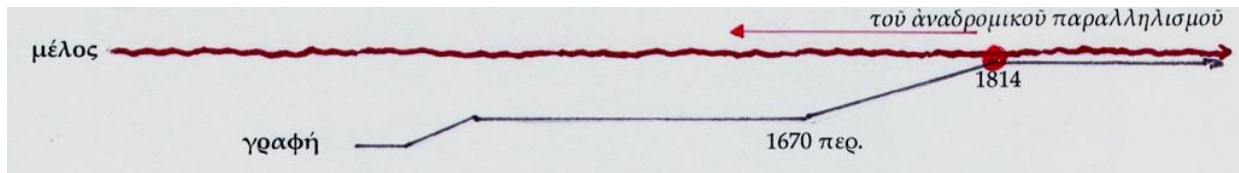
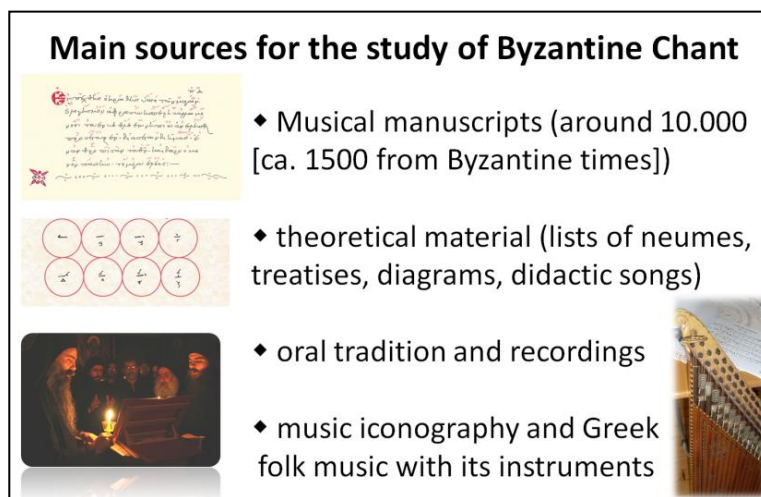


Figure 3

On the methodology of palaeographical study according to Simon Karas, with the corroboration of different types of sources.²⁰



¹⁸ See Konstantinos Psachos, *The notation of Byzantine music, that is, historical and technical survey of the notation of Byzantine music from the first Christian times until our times*, 2nd enlarged ed. by G. Chatzitheodorou (Athens: Dionysos, 1978).

¹⁹ Alexandru, *Palaeography*, 19.

²⁰ See Simon Karas, *The Palaeographical Research on Byzantine Music in Greece* (Athens, 1976). Alexandru, *Introduction*, 25 and 412. On the top left side of figure 3, a copy from the ms BG–Sofia, National State Archives, Rizov F 1650k/op4/3, 10th cent. can be seen, after Atanasov, “Musical Manuscripts,” 84. Below it a copy from the ms RUS–Petrop. gr. 945, f. 2v, 1st half of 13th cent., after Gertsman, *Petersburg Theoreticon*, table LVI. The photo on the bottom of the left side of fig. 3 shows Athonite monks singing at the lectern during Vigil, together with the First Chanter Ioannis Chasanidis (in the center of the photo): <https://www.agiooros.net/forum/viewtopic.php?f=76&t=12093&start=80> (8/10/2023). On the bottom on the right side of fig. 3, a photo of our psaltirion-kanonaki, built by Saglam Mustafa, Constantinople. See also Alexandru, *Palaeography*, 292, 314, 878: key 7.2.

Take the neume called *tromikón* as an example for how the Middle-Byzantine notation works and what the challenges for encoding this type of notation would be. Besides the usual form of the *tromikón* displayed in table 2 (see point E, in the list of subsidiary signs), *tromikón* presents also many other graphic variants and a whole set of combinations with other subsidiary signs, as seen in table 3.

Going a step further, we can explore a case of contextualization of the sign of the *tromikón*, searching for its characteristic formula (θέσις – *thésis*) in the broader frame of the famous didactic poem “Μέγα Ἰσον” (The Great Ison) by St John Koukouzelis (earliest dated copy of the poem survives in the ms GR–Athens NLG 2458 from A.D. 1336).²¹ This poem displays through the eight modes the most common formulas or *theseis* of the classical and kalophonic Byzantine musical repertories, texted with their very names (ἴσον, olígon, oxía, petastí, diplí, krátima, kratimokatávasma, **tromikón**, **streptón**, thés ke apóthes, thematismós, órthion, etc.). It is suited as a high calibrated method of learning to chant and to write the formulas, as well as to conduct them, with precise and very skilful gestures, through the art of **cheironomy** (see fig. 4). The poem has rightly been recognized as a ‘golden key’ for palaeographical and stylistic research in Byzantine chant.

²¹ See Grigorios Stathis, *The maistor John Papadopoulos Koukouzelis (ca. 1270 – first half of the 14th century): His life and his work*, Booklet of LPs in the series Byzantine and post-Byzantine composers 6 (Athens: Holy Synod of the Church of Greece – Institute of Byzantine Musicology, 1988).

Table 3

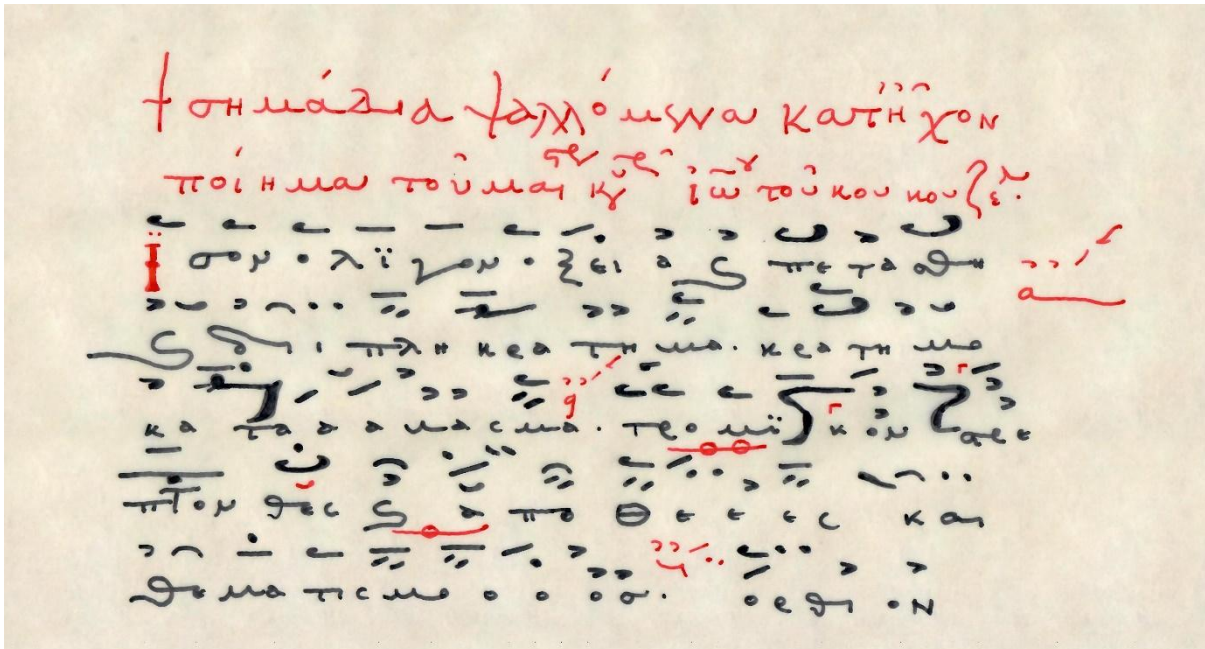
Graphic shapes of the neumes tromikón and ekstreptón, along with various derivated composed neumes.²²

Early and developed Middle Byzantine notation	Fully developed and late Middle Byzantine notation
“tromikón 	♦ tromikón with its formula 
in another way 	♦ shapes: 
another one  ” (FR–Parisinus gr. 261, A.D. 1289)	♦ ligatures and conjunctures with tromikón: - tromikoparakálezma  also called éteron gurgúrizma (another gargle)
In musical sources also with the shapes 	and tromikosýntheton (composed tromikón)  - tromikosýnagma  tromikón sínagma  - tromikón metá omalú (tromikón with omalón)  tromikoomalón  - tromikón metá psifistú (tromikón with psifistón)  - tromikón metá psifistú ke omalú (tromikón with psifistón and omalón)  or  - tromikón metá synágmatos ke epeghérmatos (tromikón with sínagma and epégherma)  or  ♦ ekstreptón or existreptón (inversed tromikón) 

²² Translated after Alexandru, *Palaeography*, 540. For the different formulas of the tromikón and related neumes and for their theoretical explanations in Byzantine and post-Byzantine musical treatises, methods and neume-lists, see *ibid.*, 772–5 and 849–50.

Figure 4

The beginning of the oktoecheical didactic poem *Mega íson* by St John Koukouzelis, copy from the ms GR–Athens NLG 2458, A.D. 1336, f. 3r, in late Middle-Byzantine notation. Zone of the first authentic mode.²³

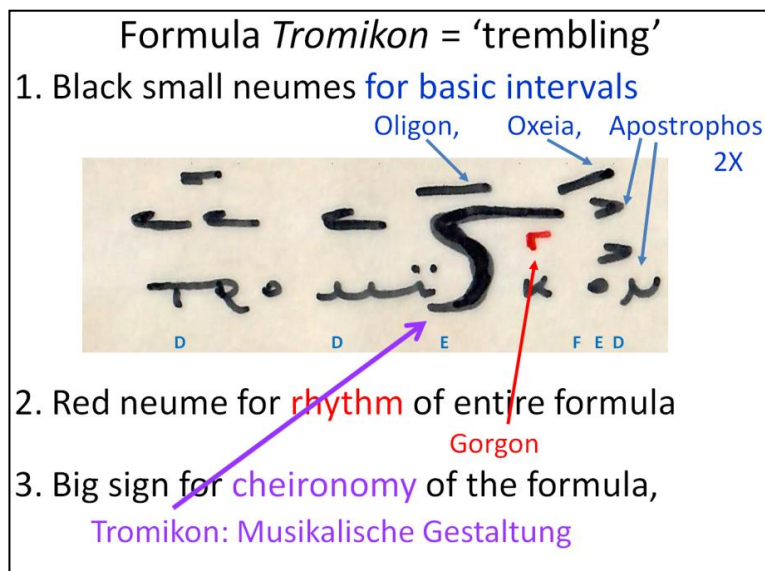


Taking a closer look at the formula of the *tromikón*, one can observe a specific positioning of the interval signs around the big sign, as well as the layering of the musical information on different levels: on top the 'voices', below the 'voiceless' signs of *gorgón* and *tromikón*, taking care of the musical *Gestaltung* of the formula (see fig. 5).

²³ See a facsimile in Alexandru, *Palaeography*, 545, see also 519.

Figure 5

The formula of the tromikón in the first authentic mode, with its different layers of neumes, according to the *Mega íson* by St John Koukouzelis.



The formula of the tromikón is explained in a paradigmatic way for the role of the great signs by Gabriel the Hieromonk (first half of the 15th century):

*"Look, we put an oligon, an oxía and after that three apóstrofi, and we go upwards with the two voices (i.e., intervals of seconds), namely of the oligon and the oxía and then we descend three voices of the three apóstrofi. But we don't know how to perform these voices (intervals), I mean slowly or quickly, if we wouldn't put above them the gorgon. Neither would we know how to shape our voice or how to show with our hand this thesis (formula), if we wouldn't write below the tromikón. And the great signs (subsidiary signs) are useful to this end."*²⁴

For the musicologist today, the way is to consult the so-called **exegeseis** (ἐξήγησις, explanation, writing down with analytic notation of what was sung according to the oral tradition and sing according to what was received from the previous teachers). In the case of the *Mega íson*, the exegesis was notated in the Middle-Byzantine exegetical notation by Petros the Peloponnesian (ca. 1735–1778) and in the fully

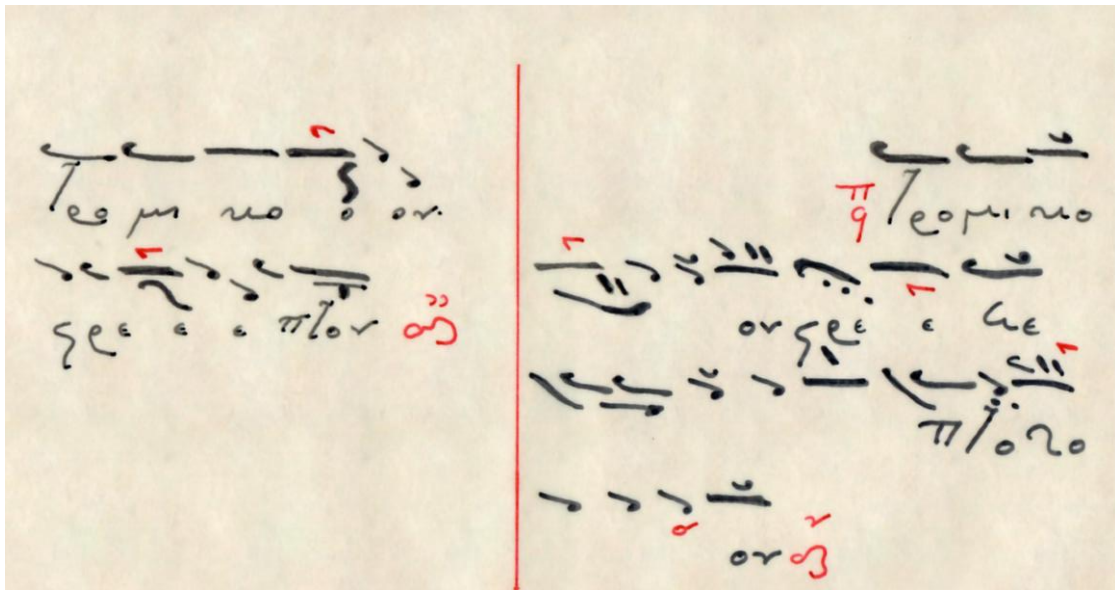
²⁴ Greek text in Gabriel Hieromonachos, *Abhandlung über den Kirchengesang*, eds. Christian Hannick and Gerda Wolfram, MMB, Corpus Scriptorum de Re Musica, I (Wien: Verlag der Österreichischen Akademie der Wissenschaften, 1985), p. 60–1, lines 251–8. The third apóstrofos mentioned by Gabriel Hieromonachos (1985) as belonging to the formula of the tromikón, appears in the didactic poem of St John Koukouzelis as first neume of the following thesis (i.e., the streptón, see fig. 4).

analytical New Byzantine notation by Chourmouzos the Archivar, one of the so-called Three Teachers who did the Reform of 1814 (see fig. 6).

If exploring the exegesis of the tromikón formula, one should look also at the next formula, the streptón (= inversed tromikón), in order to observe how an apparent intervallic sequence in the Middle-Byzantine notation is interpreted differently through the exegesis, not only because of the variation of the subsidiary sign (streptón instead of tromikón), but also because of the different step on which the second formula occurs, leading to a brief and smooth modulation from the first authentic to the plagal of the fourth mode.

Figure 6

Fragment of the Méga íson of St John Koukouzelis, copied from the ms GR-Mt Athos, Xenophontos 120, f. 8r (beginning of the 19th century). On the left: Middle-Byzantine old stenographic notation of the formulas tromikón–streptón. On the right: the same formulas written in New Byzantine analytic notation, in the exegesis by Chourmouzos the Archivar, A.D. 1818.²⁵



The next figure offers a collation of the Old and New Method neumations for tromikón and streptón, accompanied by transnotation and schematic transcription on staff, respectively (see fig. 7).

²⁵ For a facsimile of this folio, see Georgios Konstantinou, ed., *Byzantine Music through the New Method of Notation (1814–2014): Implementation – Issues – Perspectives, Proceedings of the International Musicological and Psaltic Conference, Thessaloniki (30 October–1 November 2014)* (Holy Mount Athos: Holy Great Monastery Vatopedi, 2021), cover.

Figure 7

Fragment from the Méga ison by St John Koukouzelis, with the formulas of tromikón-streptón in the old stenographic and the new analytic notation.²⁶

Tromikon and Strepton: a figure and its mirror in sequence

Middle Byzantine notation (context sensitive notation):

The first example shows two sequences of Middle Byzantine notation. The first sequence is labeled 'Tromikon' and the second is labeled 'Strepton'. Both sequences are written on a four-line staff with a treble clef. The notation consists of various symbols (neumes) placed on the lines and spaces, with some symbols having a red 'r' or 's' above them. The second example shows two sequences of Middle Byzantine notation, labeled 'Tromikon' and 'Strepton', with a 'New Byzantine notation' section below it. The 'New Byzantine notation' section shows the same sequences written in a more modern notation, with a red line indicating the original notation and a blue line indicating the new notation. The new notation uses a different set of symbols and includes a '4' and '6' below the staff, possibly indicating a different mode or a different way of reading the notation.

Exegesis into New Byzantine notation:

The second example shows two sequences of New Byzantine notation. The first sequence is labeled 'Tromikon' and the second is labeled 'Strepton'. Both sequences are written on a four-line staff with a treble clef. The notation consists of various symbols (neumes) placed on the lines and spaces, with some symbols having a red 'r' or 's' above them. The second example shows two sequences of New Byzantine notation, labeled 'Tromikon' and 'Strepton', with a 'New Byzantine notation' section below it. The 'New Byzantine notation' section shows the same sequences written in a more modern notation, with a red line indicating the original notation and a blue line indicating the new notation. The new notation uses a different set of symbols and includes a '4' and '6' below the staff, possibly indicating a different mode or a different way of reading the notation.

As we can see in the previous figure, Middle-Byzantine notation proves to be ‘context sensitive’.²⁷ The reading of the neumes does not go mechanically, but on the contrary, through the technique and art of exegesis, as the traditional decoding of the notation on the base of the oral tradition, each ‘chanted syllable’²⁸ acquires its own melodic shape, which in a subtle concatenation with the next syllable contributes to the overall musical contour of the formula, the phrase and the entire piece.²⁹

²⁶ The Byzantine neumes are taken from the ms GR-Athens NLG 2458, f. 3r, A.D. 1336, and GR-Mt Athos, Xenophontos 120, f. 8r, A.D. 1818.

²⁷ This is an important formulation coined by Dimitris Giannou in the Proceedings of the Plenary Session no 225/18.12.01 of the Election Board and the General Assembly of the School of Music Studies of the Aristotle University of Thessaloniki (Thessaloniki, School of Music Studies, Aristotle University of Thessaloniki, 2001), 9.

²⁸ Jammers, *Musik*, 70, is speaking about the primordial role of the ‘chanted syllable’ (‘die gesungene Silbe’) in shaping the compositional process, and also in conducting palaeographical research.

²⁹ See Manuel Chrysaphes, *On the Theory of the Art of Chanting*, ed. Conomos, p. 40, lines 91–6.

By singing the famous Méga íson of St John Koukouzelis with its around 65 theseis, one gets the deep feeling of beholding all those old, hieratic formulasas musical icons which crossed over the centuries,³⁰ giving expression to the prayers of generation after generation and echoing the music of the Angels.

“To the Orthodox Christian, the hymns sung in the liturgy are a reflection of the songs of praise sung by the angels; the icons of the saints are the image of their superessential existence in heaven. The artist is a man capable of producing a faint copy of the original which he sees or hears in a moment of inspiration; the superessential alone is the model for the artist who paints his icon in the likeness of Christ or the Apostles, and the same is true for the hymn-writer.”³¹

4. Byzantine Chant Encoding Middle-Byzantine Neumes

Even though Middle-Byzantine neumatic script shares many points of contacts with Western neumatic scripts, the conceptual premises of how Western and Middle-Byzantine neumes work are different. In the West, the performance is captured mostly within the neume. In the East, music scripts are of the ‘articulatory’ type. One of the four fundamental components of the MEI Neumes module³² is the <nc>,³³ along with <syllable>, <sy>, and <neume>. The <nc> appears to be insufficient to capture the meaning of Middle-Byzantine neumes because these are part of an intricate

³⁰ See also <https://www.pemptousia.gr/video/to-mega-iso-tou-ag-ioanni-tou-koukouzeli-th-vizantinomousikologiko-sinedrio-ma%ce%90stores-tis-psaltikis-technis/> (27/12/2024).

³¹ Egon Wellesz, *A History of Byzantine Music and Hymnography*, 2nd edition revised and enlarged (Oxford: Clarendon Press, 1962), 148. See also the ‘Angelic Hymns’: the Gloria – Great Doxology (at the end of the Mattins Service), and the Hymns of the Divine Liturgy, namely the Ter Sanctus, the Cherubic Hymn, the Axion Estin, and the Sanctus – Seraphic Hymn, mentioned in the works by Alexandros Korakidis, *Ancient Hymns: 2. The Angelic Hymn (Gloria) Glory to God in the Highest and Peace on Earth...* (Athens, 1984). Ioannis Kongoulis, Christos Ikonou, and Panagiotis Skaltsis, *The Divine Liturgy of St John Chrysostomos* (Thessaloniki: Lydia, 2002). Compare further Johannes Quasten, *Music & Worship in Pagan & Christian Antiquity*, transl. Boniface Ramsey (Washington, DC: National Association of Pastoral Musicians, 1983), 69–72, 169. Athanasios Vourlis, *Dogmatic and ethic aspects of the Orthodox Chant* (Athens: University of Athens, Theological School, Editions of the Legacy D. Moraítou, 1, 1994), 27–36. Jammers, *Musik*, 204. Maria Alexandru, “Logos and Light in Byzantine Hymnography and Music. Thoughts on the Meta-aesthetics of Byzantine Chant,” in *Enlightenment & Illumination. Proceedings of the Second International Conference ‘Sacred Music East and West’ (Selection)*, ed. rev. Ivan Moody (Prague: Univerzita Karlova – Pedagogická fakulta, 2020), 9–54.

³² <https://music-encoding.org/guidelines/v5/content/neumes.html> (27/12/2024).

³³ A neume component is intended as a “sign representing a single pitched event, although the exact pitch may not be known”. <https://music-encoding.org/guidelines/v5/elements/nc.html> (27/12/2024).

notational system where the interpretation of a certain shape could vary according to the graphical context where it is placed. Hence, compared to Western neumes, in Middle-Byzantine neumatic script there are many more graphical elements that deserve to be encapsulated in the encoding to faithfully convey the meaning of the neumes. In Byzantine chant, text and music are closely related. The metric of the text is the basis for the rhythmic structure of the chant. Furthermore, Middle-Byzantine neumes are context sensitive. The meaning of the neumes can change depending on their relative positioning (above, below, next to each other) and its interpretation depends on different factors, such as the genre and style of *melopoeia*, the mode, the melodic formula, the place within the musical phrase, the poetic text, and the liturgical frame. Thus, it is important to capture in the encoding not only the relationship of the neume with the text, but also the mutual spatial relationship between the neumes that refer to the same text. Possibly, the relative position of the signs in the notational space (above, below, next) is the most difficult feature to capture in the encoding of Middle-Byzantine script because the neumes' relative positioning can change the overall interpretation of all the related signs. In Western neumatic scripts the spatial placement is, to a certain extent, important for the correct interpretation of the neumes but this is not comparable to the level of graphical sophistication and complexity of the Middle-Byzantine neumatic script. This fundamental difference has also an impact on the kind and number of signs employed. Indeed, the quantity of signs that Middle-Byzantine neumatic script employed over the centuries is much higher than in any of the written music scripts employed in the West. Middle-Byzantine notation employed not only a very large number of neumes, but it also offers manifold graphic variations of the signs and an impressive number of combinations and positioning of signs including neumes that provide specific interval information and subsidiary or cheironomic signs indicating the musical 'Gestaltung', which implies rhythmical properties, grouping, and phrasing of the interval signs, dynamics, ethos of the formulas, as well as different levels of ornamentation and melodic expansion, according to the context.

A proper encoding of Middle-Byzantine notation should retain both the graphic appearance and the semantic of the neumes. It is crucial to be able to capture in the encoding even the finest details because this music script is very precise and conveys musical meaning through the tiniest graphical feature. On the other hand, encoding the semantic of the neumes should remain possible and open since, besides the basic intervallic structure of the pieces, the other dimensions of the music have to be interpreted in the light of oral tradition. Therefore, it would be desirable to include information on historically informed practice, which is available through musical

treatises, manuscripts, and the oral tradition of Byzantine chant. Furthermore, musical and theoretical texts address the neumes with specific names, and this terminology should be retained in the encoding. The names of the neumes in Greek should be provided along with their transliteration, translation, and etymology.

5. Conclusions

All the crucial differences between Middle-Byzantine and Western neumes prevent us from applying directly the MEI Neumes module to the encoding of Middle-Byzantine neumes. Hopefully this overview on the challenges to encode Middle-Byzantine neumes, and Byzantine chant more in general, can actively contribute to the ongoing discussions on the encoding of non-Western repertoires in MEI, and encourage a collaborative effort to find the most effective way to encode Eastern neumatic scripts. Future research could start with the encoding of modern Byzantine neumatic scripts because there is more scholarly agreement on the meaning of the neumes. Then, step by step, we can move backwards to the earlier stages of music writing.

Being able to encode, retrieve, and analyze plainchant from Europe, the Middle East, and the Levant would allow scholars working on chant to be informed about the larger picture of Christian liturgical chant traditions as well as their local peculiarities. The study of any local chant repertory could benefit from an approach that regards early music writing as a wider phenomenon in which scribes from a wider geographical area faced similar challenges when they tried to shape chant into a written form for the first time. Modern-day scholars could increase their understanding of chant by analyzing the ways scribes locally responded to these challenges. They would also gain an understanding of sister traditions, and that in turn will highlight potential analogies and contradistinctions, in a way that may stimulate further research and contribute to substantial new progress in research.

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Biographies

Maria Alexandru is a scholar and musician teaching Byzantine music at the Aristotle University of Thessaloniki (currently also head of the School of Music Studies). Her main investigation themes are Palaeography, Analysis, Didactics and Meta-aesthetics of Byzantine chant.

Affiliation: Aristotle University of Thessaloniki, School of Music Studies.

Email: malexand@mus.auth.gr

Elsa De Luca is an early music scholar pursuing research on medieval notations at the Centre for the Study of the Sociology and Aesthetics of Music, NOVA University Lisbon. She is the PI of the interdisciplinary project *Echoes from the Past: Unveiling a Lost Soundscape with Digital Analysis*.

Affiliation: CESEM - IN2PAST, School of Social Sciences and Humanities, NOVA University of Lisbon

Email: elsadeluca@fcsh.unl.pt

Ichiro Fujinaga is Canada Research Chair in Music Information Retrieval and Professor in the Music Technology Area of the Department of Music Research at the Schulich School of Music, McGill University. He has been working on encoding neume notation into MEI since 2010.

Affiliation: McGill University

Email: ichiro.fujinaga@mcgill.ca

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