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RESULTS AND PERSPECTIVES OF STUDYING GEORGIAN NEUMATIC NOTATION WITH COMPUTER ASSISTANCE (CEAP)

Our presentation continues the theme of Paul Rouse's paper and reflects the results and future perspectives of musicological research carried out with the help of the CEAP computer programme, within the Bristol University project *"Musical Rhetoric in Early Medieval Old Hispanic and Georgian Liturgical Chant: New Directions in Computer-aided Comparative Analysis."*

The research was conducted based on the most complete source of Georgian neumatic notation – Michael Modrekili's *Iadgari*.[1] For the study, 109 chants were selected: *Heirmoi* and *Theotokions*. The present conclusions are drawn from the division dots and musical notation signs recorded in these chants.

As emphasized in Paul Rouse's previous paper, our aim was not to decipher the precise meaning of the neumes, but to determine the peculiarities of their functioning. The research tasks were carried out in this direction.

During the study, it became necessary to compare with another important neumatic manuscript – Iordane's *Irmologion*[2].

We would like to present the effectiveness of the mentioned computer programme in the research process and share several achieved results.

From the experience of manuscript study, it is evident that before the musical text was fixed, the verbal text was first written down, and its division into phrases was carried out with consideration of musical syntactic units.

Our first research objective was to define the function and meaning of division dots. In the manuscript, this role is fulfilled by signs which appear mainly in different combinations of two colours – red and black.

The issue of division dots has become significantly important in recent research on the neumatic system. Their varied placement in Michael Modrekili's *Iadgari* was first studied by D. Shughliashvili[3].

The relevance of division dots was revealed within the project during the textual

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[1] Georgian National Centre of Manuscripts. MS S-425

[2] Georgian National Centre of Manuscripts. MS A- 603

[3] See Shugliashvili. d. (2018)

comparison of Daniel's Hymns (the VII-VIII Odes of the hymnographic canon) in the Hispanic and Georgian versions, to determine similarities and differences, particularly how phrases are divided in different cultures. In this paper we present the functions of black and red dots and the possible reasons for the occasional disruption of their unity. In X-XI century neumatic manuscripts, division is mainly indicated by combinations of black and red dots.

According to P. Ingorokhva, since the verbal text of a hymn was written in black ink and the neumes in red ink (*singuri*), the black dot marks the verse meter, while the red dot denotes the musical meter, and "as a rule, they coincide at the same place, at the end of metrical-rhythmic divisions" (Ingorokhva, 1958, p. 132).

This opinion is confirmed by manuscript evidence, though not infrequently only a red or only a black dot appears in the text. What is the reason for this – a copyist's error, or the deliberate omission of a mark? With the help of the CEAP programme, it becomes possible to conduct comparative analysis of phrasing in *Heirmoi* and *Theotokions* and their division marks, thereby enabling certain conclusions.

To establish general regularities of division dots, it is necessary to consult another major manuscript of the same period, the X-XI century *Irmologion* of Iordane, where division dots are relatively uniform in placement and do not display the variety found in Modrekili's collection.

It is known that in this manuscript the *Theotokions* are not notated with neumes – they are sung to the melody of the *Heirmoi*. Presumably, the notator did not consider it necessary to record them. However, alongside the black dot, the *Theotokions* always contain a red dot indicating the cadence of the melody – a sign of musical phrasing, ensuring that musical caesuras are placed precisely (fig. 1).

By contrast, in the rare cases where *Heirmoi* are not neumatic, they have only a black dot, with space left for red marks (fig. 2). An interesting case is the *Heirmos* "Didebuli Sakvirveli Sakhe Kaltsulisa" ("Glorious, wondrous face of the Virgin"), which is partly neumatic. Where the neumatic notation ceases, the red dots also cease (fig. 3).

Thus, we may conclude that the verbal text was first prepared with black dots, and red dots were added later during the neumatic notation. Even the *Theotokions*, although not neumatic, received red dots during the notation of the *Heirmoi*, to indicate musical phrasing and division into verses. Accordingly, if somewhere a black dot is missing and only a red one is present, this more likely means that no black dot was required there, rather than that it was accidentally omitted – though errors are, of course, possible.

The comparison of division dots in *Heirmoi* and *Theotokions* recorded in the CEAP programme provides an efficient and quick means of clarifying the function of individual marks. We present several examples to illustrate different cases: the *Heirmos* "Kerobinta Zeda Mjdomareo" (MS S-425, 13r) and its corresponding *Theotokion*. In the *Heirmos*, the first verse – *ke-ro-bin-ta ze-da mjdo-ma-re-o ma-tskho-va-ro* – contains 14 syllables and

ends with both black and red marks, indicating both verbal and musical caesura (ex. 1).

The corresponding place in the *Theotokion* – the first verse of 15 syllables –follows the melody of the *Heirmos*, its syllabic structure, and has a musical caesura but not a verbal one: *va-di-debt ma-ma-sa da u-ga-lobt dze-sa da su-lsa* (red dot). The word *tsmida-sa* belongs to the next verse, therefore this phrase has only a red dot – a musical pause – and not a black dot indicating a verbal caesura (ex. 2).

The second verse (22 syllables in both *Heirmos* and *Theotokion*) is divided by a black dot in the *Theotokion*. Here there is a verbal caesura: *tsmi-da-sa ta-qva-nis vtsemt chven, da vgha-gha-debt kurtkhe-ul khar shen u-ku-ni-sam-de.* But the melody of the *Theotokion*, subordinated to the *Heirmos*, does not pause at the verbal caesura; in other words, there is no red dot, only a black one (ex. 3).

A more interesting example is the *Heirmos* "Sakhumilsa Shina Kerubimtasa" (MS S-425, 13r), where in the *Theotokion*, subordinated to the metrical scheme of the *Heirmos*, the word is divided by two red dots. The syllable count of the *Heirmos* verse – 5 syllables – is preserved, and a musical caesura is indicated, but not a verbal one: *ma-mi-sa da su-li-sa* (ex. 4).

From this, we see confirmation of Pavle Ingorokhva's well-known opinion: the red dot marks a musical pause, while the black dot indicates a verbal caesura. If only a red dot is given, this does not always mean that a black dot should also have been present but was omitted.

The analysis also revealed cases where the black dot, as a marker of verbal caesura, was clearly omitted. In the *Heirmos* "Abrameanta Qrmata" (MS S-425, 4r), the phrase *"Kurtheul khar shen upalo"* ends with a red dot indicating a musical caesura (ex. 5).

But in the *Theotokion*, with the same text and the same neumatic notation, the red dot appears together with a black one (ex. 6). This case shows that, presumably, in the *Heirmos* the black dot was omitted.

The issue of division marks is, of course, not exhausted by this research. With the help of the computer programme, new conclusions may be drawn or already established opinions further substantiated.

As is known, the structure of a hymn is subordinated to division into verses, which is precisely served by division dots. The universal principle of chant formation is the method of constructing melody through ready-made melodic formulas. This method is clearly manifested in the structure of neumatic hymns, which means that within the neumatic system stable neumatic combinations correspond to firm melodic turns, and their totality creates the graphic texture of the hymn[4].

The computer programme significantly simplifies the process of identifying common formulas and supports the effective continuation of further research.

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[4] For stable neumatic formulas, see Oniani, E. (2016).

Formulaic thinking is characteristic also of chants that emerged in other ecclesiastical centers, and the meaning of a melodic formula is defined similarly by different scholars: *"A formula is a melodic unit singled out from its surroundings, and in its simplest form… contains a characteristic core… A segment of the motif remains unchanged, while others become objects of transformation, mainly through compression or expansion"* (Alekseeva, 1997, p. 33). Thus, a formula contains a stable core (recognizable in all combinations) and a mobile element. The mobility, depending on the scope of the verbal text, is mainly connected with its expansion or contraction.

In the Georgian neumatic system, under conditions of non-syllabic placement of signs (that is, neumes are not placed on every syllable of the verbal text, as in Byzantine or Slavic neumatic notation), the correlation between neumed and free syllables plays an important role in the structure of formulas. Therefore, when we speak of expansion or compression of a combination, we mean precisely the variability in the number of syllables without neumes.

The statistical analysis of identical neumatic combinations found through the programme allows us to identify the basic form of a neumatic formula and its modification – by way of expansion or contraction. For example, we present the combination of signs: two short strokes below the line and two arcs above the line. The first three neumes are distributed on consecutive syllables of the verbal text, while the distance between the last two arcs above the line is variable. The free syllable may be one, two, or three; in some cases, there may be no space at all. From the chants entered the programme, this graphic combination with identical neumes and their sequence was recorded in 15 hymns. Statistical analysis shows that in most cases (15 examples), this formula appears with the following correlation of neumes and syllables of the verbal text: two short strokes below the line and one arc above the line on consecutive syllables, and then, with the omission of one syllable, again an arc above the line (MS S-425, 4r) (ex. 7).

Other variants – with two or three syllables between the last two neumes – were represented five times each (MS S-425, 10r) (ex. 8), (MS S-425, 17r) (ex. 9).

Based on the frequency of repetition, the first variant may be considered the basic form, while the others represent transformations of the formula through expansion of the text. Thus, with the help of the computer programme, both basic and derived graphic formulas can be distinguished.

It is also noteworthy to mention the combinations indicating cadential turns[5]. The cadential turn is the most stable element in a chant and is therefore expressed by stable graphic formulas. This stability is manifested not only in the set of signs but also in the uniformity of their placement on the verbal text. According to the material entered into the programme, statistical analysis revealed the most widely used cadential combination:

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[5] For cadential graphic formulas, see Oniani, E. (2009).

double-pronged neume below the line and a short stroke, placed on the third and second syllables from the end of the phrase, while the final syllable of the phrase is usually unmarked (MS S-425, 13r) (ex. 10).

However, exceptional cases are also found, when neumes are placed on the last two syllables of the phrase (MS S-425, 13v) (ex. 11). In this case too, statistical analysis by the programme allows us to distinguish the basic placement and its derived variant.

The systematization and classification of graphic combinations carried out with the help of the computer programme creates broad perspectives for further comparison with other notated samples. It becomes possible to identify the corresponding melodic formulas of the basic combinations and to determine what kind of variability we encounter in the modification of a graphic formula.

Thus, the presented computer programme CEAP provides the possibility of conducting effective musicological research. After the full corpus of neumed chants is entered into the system, new perspectives will open for the study of the regularities of the neumatic system, and well-argued results will be achieved.

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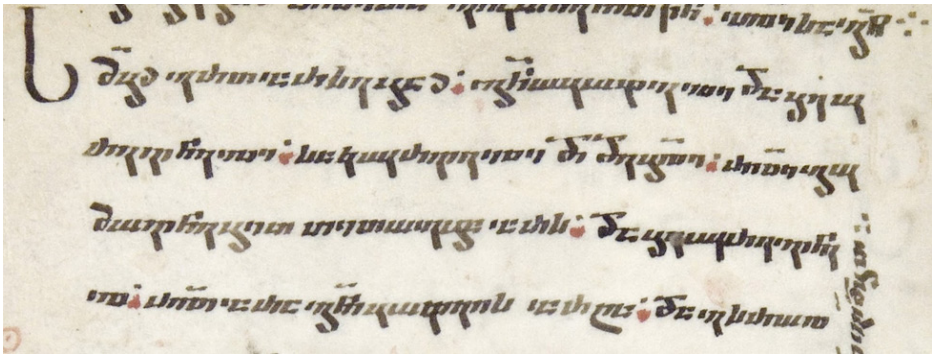
სურათი 1.
Figure 1.



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სურათი 2.
Figure 2.

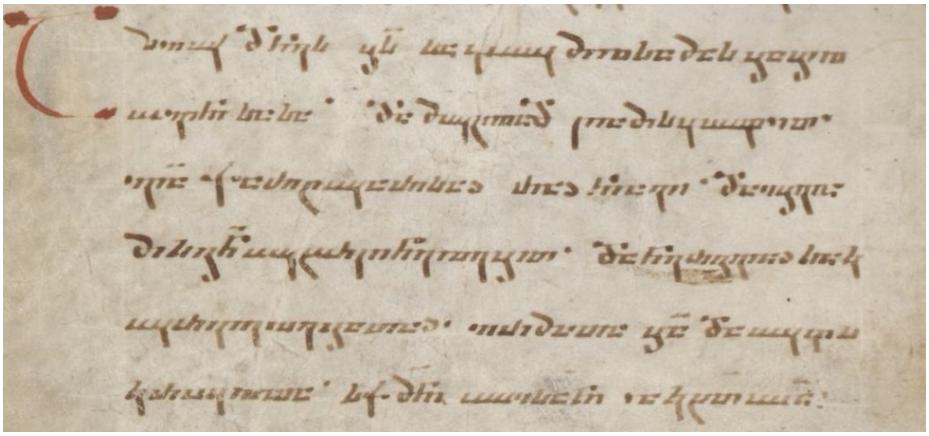

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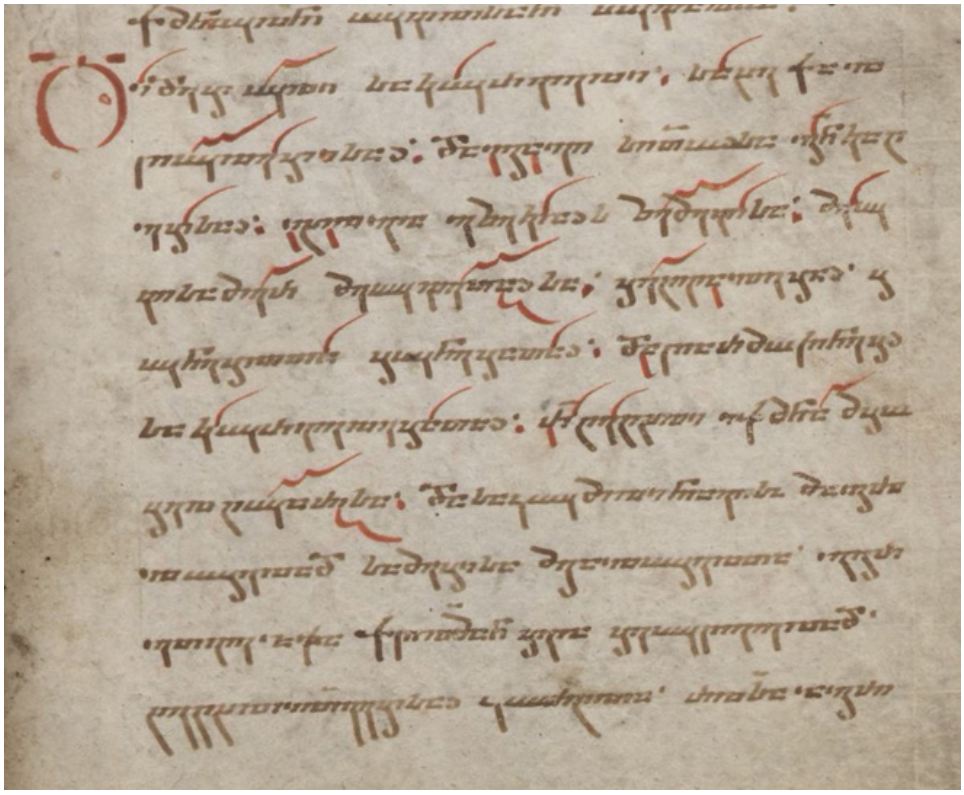
Figure 3.



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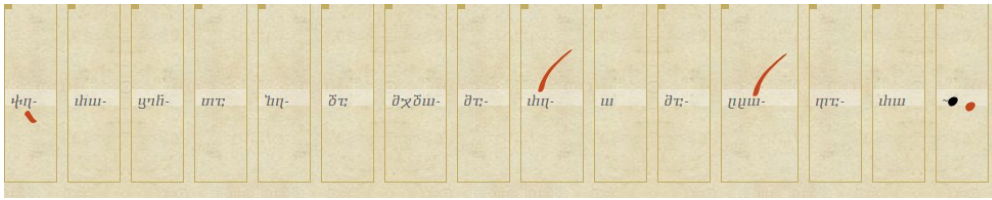
მაგალითი 1.
Example 1.



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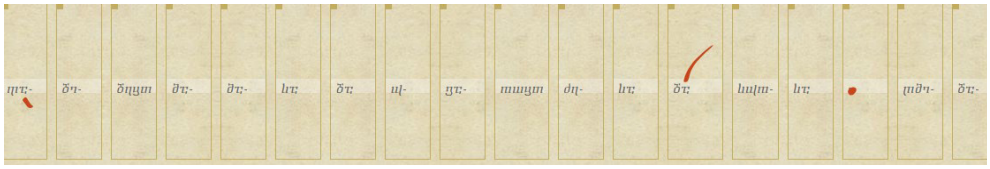

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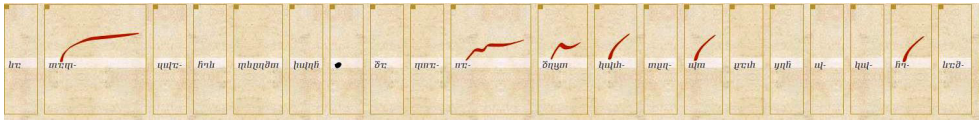
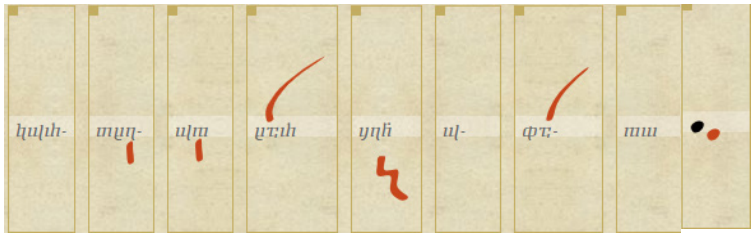


მაგალითი 4.
Example 4.

მაგალითი 5.
Example 5.

მაგალითი 6.
Example 6.



მაგალითი 7.
Example 7.

მაგალითი 8.
Example 8.

მაგალითი 9.
Example 9.

მაგალითი 10.
Example 10.

მაგალითი 11.
Example 11.