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On the Evidence that Confirms the Continuity of Georgian Chant Tradition

ABSTRACT

The texts of Georgian polyphonic chants (heirmoi), written down in the 19th century using the European notational system, can be found in mediaeval musical manuscripts as well. Is there any connection between these two sources with at least ten century-long time difference? The article reveals nine heirmoi with the final cadences of their last clauses having similar patterns of neume symbol arrangement and similar melodies in corresponding musical scores. The correlation between the earliest and latest melody types has been established. By obtaining the exact probability of occurring this kind of correspondence the strength of the relationship has been assessed. Based on the fact, that the probability obtained proved to be very small, the hypothesis of pure chance has been rejected. The following conclusion has been drawn: it is very likely that despite the faults of the oral transmission method mediaeval hymns safely reached the 19th century due to the non-interrupted musical tradition.

KEYWORDS

Chant
Music
Neumes
Ecclesiastical

Introduction

Georgian ecclesiastical music reached the 19th century in two ways: manuscripts with neumatic notation and oral tradition. Nowadays, several bulky manuscripts dating from the 10th-12th centuries, containing Georgian hymns and musical notation¹ are at our disposal.²

The second way proved to be more difficult: as the old notation did not allow precise fixation and reproduction of melodies, Georgian ecclesiastical music has been transmitted from generation to generation orally. In the 19th century, master chanters were still to be found, bearing the knowledge retrieved from this musical heritage. By the efforts of Georgian society and contemporary professional chanters, hymns were transcribed into European musical notation. As a result, several thousands of hymns have been written on paper, several books of hymns have been published and part of the material has come down to us as manuscripts³. European five-line notational system was not capable of exactly reflecting the tuning of the melodies performed by master chanters (this problem became evident as soon as the process of writing down chants has begun), although the melodic line and the polyphonic structure of Georgian chants were written with a certain level of accuracy. Thus, the heritage has been saved.

At the moment, thanks to the timely measures applied in the 19th century, old Georgian three-part polyphonic chants are sung in churches. It is natural to ask the question: how old is this music? Is there any connection between the mediaeval Georgian documents with neumatic notation and the melodies heard today in Georgian churches? Was chanting tradition continuous during the whole period of the 10th-19th centuries? Did there emerge, at some point in the history of Georgia, the necessity to create new hymns as knowledge of the old music was completely lost?

¹ The oldest Georgian manuscripts, bearing texts with mediaeval neumes, are nowadays located in several book depositories. The most important and voluminous sources are kept in Korneli Kekelidze Georgian National Centre of Manuscripts (Tbilisi, manuscripts S-425 and A-603) and the library of St Catherine's Monastery (Mount Sinai, manuscripts Sin1, Sin14 and Sin21).

² There are some later musical manuscripts; however, in this article, we consider only the earliest ones and their relationship with the hymns written down in the 19th century using modern musical notation.

³ The most significant nucleus of the chants written down using European staff notation is to be found in the Georgian National Centre of Manuscripts, National Archive of Georgia and Folklore State Centre.

Nine heirmoi and the mediaeval musical manuscript

The problem of the existence of the relationship between two sources is important in and of itself. Moreover, it is directly connected to the deciphering of Georgian neumes. The problem of mediaeval Georgian neumes has been studied by generations of scholars since the beginning of the 20th century. The scientists mostly restricted themselves to visual characterization of this musical notation and by pointing out possible ways of approaching this ungraspable problem. Only Ingorokva (1958) suggested the interpretation of musical signs in his theory, which proved to be unconvincing for other researchers. One of the remarkable representatives of the contemporary generation of scholars is E. Oniani. In her studies, she usually provides an outstanding and consistent approach to the subject (Oniani, 2016).

In studies dedicated to the deciphering of the neumes, I revealed some shreds of evidence indicating the existence of such a connection, although this study is not yet finished. (Tsereteli, 2004; 2008) To prove, finally, the relationship between the ecclesiastical music of the 19th century (and thus, between the music of today) and that of the Middle Ages, and to decipher the neumes completely, exhaustive research of mediaeval musical manuscripts and the hymns written down in the 19th century has to be undertaken.

As more and more of the material is studied, new pieces of evidence indicating the continuity of the tradition are revealed, forcing us to reject the hypothesis of a break caused by historical misfortune. Here I shall consider one such piece of evidence, which is found in the nativity canon created by Kosmas of Jerusalem. First I shall examine nine heirmoi of this canon in the most important Georgian musical source of the 10th century, manuscript S-425. Then I shall look at the musical scores of those nine hymns in the 19th-century musical manuscripts. I shall focus only on the final cadences of the hymns. Finally, based on a comparison of the material in the two kinds of musical sources, we will conclude the possibility of the existence of a relationship between mediaeval and 19th-century versions of these nine chants.

I will begin with S-425 — the Iadgari of Michael Modrekili (10th century)⁴. Before considering the details of the heirmoi in this important hymnographical source, I will first

⁴ The manuscript S-425 is located in the Korneli Kekelidze Georgian National Centre of Manuscripts (Tbilisi). There is no doubt that this is the most important musical source from the Middle Ages. It contains

give a brief description of its textual organization. The manuscript has two sections: 1) it begins with the section that was supposed to contain dozens of pages, most of which have been lost. Here, the heirmoi, classified in modes and odes, are given. Texts are written without titlos and have musical signs (neumes) accompanying them. This section can be considered as a reference book of heirmoi, i.e., hymn-models; 2) the second part contains several hundreds of pages and collects works by foreign and Georgian hymnographers dedicated to important Christian feasts. Among them, naturally, are, canons. Most of the texts bear musical notation — the neumes.

All of the nine odes of the Nativity Canon are present on pp. 72-74 in S-425. (Gvakharia, 1978) Each ode is preceded by the abbreviated reference to the corresponding heirmos. Several troparia of the ode follow this reference. Here are nine heirmoi of the canon:

Ode	Title of the Heirmos	Georgian Title of the Heirmos
I	<i>From Harsh Slavery</i>	მონებისა მისგან მწარისა
II	<i>Attend, O Heaven and Let us Say</i>	მოიხილე ცაო და ვიტყოდი რამეთუ
III	<i>Cry Unto the Only Begotten Son</i>	წინასაუკუნეთა
IV	<i>From the Rod of the Root of Jesse</i>	კვერთხი იესეს ძირისაგან
V	<i>Thou art a God of Peace</i>	ღმერთი ხარ მშვიდობისა
VI	<i>Jonah Was Cast from the Monster</i>	პირველ იონა
VII	<i>The Youths Reared in Faith</i>	ყრმანი სარწმუნოებით
VIII	<i>The Bedewed Furnace</i>	სახუმბილი შეცვრეული
IX	<i>All creatures were surprised</i>	დაუკვირდა საიდუმლო

Table 1. List of the heirmoi of Nativity Canon.

All of the heirmoi from Table 1 belong to the first mode (I follow E. Wellesz and use the term “modes” for the Eχοi of oktoechos). In general, mediaeval Christian hymns are built up from the clauses and Georgian ecclesiastical music is no exception. The hymns listed

hundreds of heirmoi, Georgian translations of the works by foreign hymnographers, and original hymnographic compositions of Georgian authors. Most of the texts bear mediaeval Georgian musical signs - the neumes. The manuscript was written in the period of 978-988. Currently, it contains 272 (37,5 x 29,5 cm) sheets of parchment. Most of the manuscript is lost.

above are constructed of a varied number of clauses. I will focus only on the last clauses of each hymn.


Neume pattern types of final cadences

Before I proceed, it should be noted that none of these heirmoi is found in the reference section of S-425 (see description of its structure above): it would seem that the pages bearing them have been lost. On the other hand, fortunately, there are troparia in the second part of the manuscript, scattered across various canons, modelled according to the heirmoi listed in Table 2. The texts of these troparia are accompanied by mediaeval neumes. This makes possible the restoration of the neume patterns of the lost heirmoi. Let us examine the last clauses of troparia composed according to the model of the first heirmos *'From Harsh Slavery'*.

Trop.	Syllables													
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1		\							↗			\	↗	
2			\						↗			\	↗	
3		\							↗			\	↗	
4		\								↗		\	↗	
5		\							↗			\	↗	
6	\								↗			\	↗	
7	\								↗			\	↗	
8	\								↗			\	↗	
9			\						↗			\	↗	
10	\								↗			\	↗	
11		\							↗			\	↗	
12		\							↗			\	↗	
13		\							↗			\	↗	

Table 2. Final clause neume-patterns of troparia modelled by the 1st ode heirmos “From Harsh Slavery”.

The first column contains a simple numbering of the troparia. These troparia belong to the first odes of various canons, found in S-425, although, for our purposes, it is not important which canon they belong to. This is why I do not specify canons, but only number the hymns. The numbering of columns in the table indicates syllables in the clause, although the numbering is reversed: for our purposes reverse numbering will be

more convenient. Note that the text is not important for solving the problem we are dealing with here: what is important is the distribution of the neumes upon syllables. Highlighted cells indicate the first syllables of the clauses. One can see that lengths of clauses (overall number of syllables) vary between 12 and 14 (e. g. there are 13 syllables in the final clause of the first troparion). Each cell in the table corresponds to one particular syllable. In the cell of the first row beneath the number 6, one can see the sign . This means that in manuscript S-425, the reversed 6th syllable of the last clause of this troparion bears this sign. The reversed 13th, 3rd, and 2nd syllables are marked by some signs as well. The rest of the cells are empty, meaning that corresponding syllables have no signs on them, they are neume-free.⁵

Let us emphasize a very important circumstance. All of the patterns given in Table 2 represent versions of one melody. This statement is based on the general principle of canon creation. According to this principle, texts of the troparia are modelled on the pattern of the text of the heirmos, and their melody on the pattern of the melody of the heirmos. As the patterns given in Table 2 represent the last clauses of troparia modelled on the same heirmos (*'From Harsh Slavery'* in this case), one may claim that all of them, despite the variety of neume arrangement patterns, must represent variants of one melody.

Now let us present similar tables for the troparia modelled according to the heirmoi of the 3rd, 4th, and 6th odes. The explanation, of why I have chosen these particular odes will follow.

⁵ It is characteristic for mediaeval Georgian musical manuscripts that some (often significant) amount of syllables in the clause are neume-free.

Trop.	Syllables						
	7	6	5	4	3	2	1
1			↗			↘	↘
2			↗			↘	↘
3			↗			↘	↘
4			↗	↘	↘	↘	
5		↗			↘	↘	
6			↗		↘	↘	
7			↗		↘	↘	
8			↗		↘	↘	
9			↗		↘	↘	
10			↗		↘	↘	↘
11					↘	↘	
12					↘	↘	
13			↗		↘	↘	
14			↗		↘	↘	↘

Table 3. Final clause neume-patterns of troparia modelled on the 3rd ode heirmos “Cry Unto the Only Begotten Son”.

Trop.	Syllables										
	11	10	9	8	7	6	5	4	3	2	1
1				↗		↘			↘	↘	
2				↗		↘			↘	↗	↘
3	↘			↗		↘			↘	↘	
4		↘		↗		↘			↘	↘	
5			↘			↘			↘	↘	
6				↗		↘			↘	↘	
7				↗		↘			↘	↘	
8				↗		↘			↘	↘	
9				↗		↘			↘	↘	
10				↗		↘			↘	↘	
11						↘			↘	↘	
12	↘						↘		↘		

Table 4. Final clause neume-patterns of troparia modelled on the 4th ode heirmos “From the Rod of the Root of Jesse”.

Trop.	Syllables										
	11	10	9	8	7	6	5	4	3	2	1
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											

Table 5. Final clause neume-patterns of troparia modelled on the 6th ode heirmos “Jonah Was Cast from the Monster”.

The reason why I have displayed final clauses of troparia modelled according to the heirmoi of 1st, 3rd, 4th, and 6th odes is that they have similar final cadences. More specifically, I shall examine the last four syllables of each troparion. One can observe differences between the neume patterns of the last four syllables, although there is one that can be observed in most cases. This pattern can be described verbally as follows:

Type A Pattern: Reversed 4th and 1st syllables are neume-free, the 3rd syllable bears either the short or the long stroke and the 2nd syllable bears the neume .

One can see that 39 of 52 cases (=75%) given in the four tables satisfy the description of the neume pattern for the last four syllables. It seems quite reasonable to assume that if the four heirmoi have come down to us (remember that all of the pages of S-425, bearing the nine heirmoi under consideration here, are lost), they would have the final cadence of Type A.

Now I shall show four more tables, listing the troparia from the 2nd, 5th, 8th, and 9th odes and, this time, the most common final cadence will be different from the one described above:

Trop.	Syllables														
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1				↗		↗	↘		↗	↘			↗	↘	
2	↗				↘					↘			↗	↘	
3					↗				↘	↗			↗	↘	
4							↗			↘				↘	
5						↗				↘		↗		↘	
6							↗			↘			↗	↘	
7						↗				↘			↗	↘	

Table 6. Final clause neume-patterns of troparia modelled on the 2nd ode heirmos “Attend, O Heaven and Let us Say”.

Trop.	Syllables												
	12	11	10	9	8	7	6	5	4	3	2	1	
1					↗		↘			↗	↘		
2					↗		↘			↗	↘		
3					↗		↘			↗	↘		
4					↗		↘			↗	↘		
5				↗			↘			↗	↘		
6				↗	↗		↘			↗	↘		
7					↗					↗	↘		
8					↗		↘						
9							↘			↗	↘		
10					↗		↘			↗	↘		
11					↗		↘			↗	↘		
12					↗		↘			↗	↘		
13			↗				↘			↗	↘		

Table 7. Final clause neume-patterns of troparia modelled on the 5th ode heirmos “Thou art a God of Peace”.


Trop.	Syllables										
	10	9	8	7	6	5	4	3	2	1	
1					↘			↗	↘		
2					↘			↗	↘		
3			↗		↘			↗	↘		

Table 8. Final clause neume-patterns of troparia modelled on the 8th ode heirmos “The Bedewed Furnace”.

Trop.	Syllables														
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1			↘			↗				↘			↗	↘	
2			↘			↗				↘		↗	↗	↘	
3						↗				↘			↗	↘	
4						↗				↘			↗	↘	
5					↗			↗	↘		↗		↗	↘	
6				↗	↗					↘			↗	↘	
7				↗		↗				↘		↗	↗	↘	
8	↘			↗		↗				↘			↗	↘	
9				↗		↗				↘			↗		↘
10							↗			↘			↗	↘	
11						↗				↘			↗	↘	
12							↗			↘			↗	↘	
13						↗				↘			↗		
14										↘			↗	↘	
15						↗				↘			↗	↘	

Table 9. Final clause neume-patterns of troparia modelled on the 9th ode heirmos “All creatures were surprised”.

It is now possible to find six syllable-long final cadences which will be the most characteristic to the troparia of this class. They may be described as follows:

Type B Pattern: Reversed 5th, 4th and 1st syllables are neume-free, 6th and 2nd syllables bear either the short or the long stroke, and the 3rd syllable bears the sign .


27 of 38 cases (=71%) given in Tables 6-9 satisfy the description of the neume pattern for the last six syllables above. Again, it will be reasonable to assume that if the four new heirmoi have come down to us they would have the final cadence of Type B.

Finally, I shall present the one last table, representing the final clauses with the final cadences of different character.

Trop.	Syllables													
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1			∖	∖	/	∩	/		∖		/			∖
2			∖	∖	/	∩			∖			/		∖
3			∖	∖	/	∩	/		∖		/			∖
4			∖	∖	/	∩			∖			/		∖
5			∖	∖	/	∩		/	∖		/			∖
6			∖	∖	/	∩		/	∖			/		∖
7			∖	∖	/	∩		/	∖		/			∖
8						∩	/		∖			/		∖
9	/					∩			∖			/		∖

Table 10. Final clause neume-patterns of troparia modelled on the 7th ode heirmos “The Youths Reared in Faith”.

This one implies the following description:

Type C Pattern: Reversed 5th and 2nd syllables are neume-free, 6th syllable bears either the short or the long stroke, 1st syllable bears the long stroke, and exactly one of the 4th and 3rd syllables bears the neume .

All of the nine clauses in Table 10 satisfy the description of the neume pattern for the last six syllables. Still, it seems quite logical to suppose, that if the heirmos *‘The Youths Reared in Faith’* has come down to us it would have the final cadence of Type C.

Thus, all of the nine heirmoi are covered and the result can be summarized as follows:

Ode	Title of the Heirmos	Type of the Final Cadence Neume Pattern
I	<i>From Harsh Slavery</i>	A
II	<i>Attend, O Heaven and Let us Say</i>	B
III	<i>Cry Unto the Only Begotten Son</i>	A
IV	<i>From the Rod of the Root of Jesse</i>	A
V	<i>Thou art a God of Peace</i>	B
VI	<i>Jonah Was Cast from the Monster</i>	A
VII	<i>The Youths Reared in Faith</i>	C
VIII	<i>The Bedewed Furnace</i>	B
IX	<i>All creatures were surprised</i>	B

Table 11. Three types of final cadence neume-patterns of the heirmoi.

Each of the neume patterns given in Table 11 represents some melody. One can say that melodies are similar if they are variants of each other. I suppose that the melodies behind the same pattern types must have been similar. Further, different pattern types would have represented different melodies. Having in mind the reasoning just given one can conclude, that Table 11 shows which of the three different final cadence melodies the mediaeval musician applied to which of the nine heirmoi.

The 19th-century musical scores of nine hymns

This brings us to the second stage of our study in which I will be searching for the nine heirmoi in the musical scores written down in the 19th century. As above, I shall be focusing on the final cadences of final clauses. As a result of this stage, I hope to develop a table similar to Table 11 this time based on musical scores.

Let us start with the first heirmos "*From Harsh Slavery*". It can be found in two of the 19th-century manuscripts (Gvakharia, Shugliashvili and Razmadze, 2013). Below I reproduce the last clause of the hymn from one of the manuscripts — Q-684⁶ (for ease of reading, the text has been transliterated into the Latin alphabet):

⁶ Manuscript Q-684 is a good copy draft manuscript compiled by Ekvtime Kereselidze in the 1910s from original transcriptions made by Pilimon Koridze in the 1880s and 1890s. The source singer, Anton Dumbadze, was the master of the oral chant tradition associated with the Gelati monastery in central



Figure 1. Last clause of the heirmos “From Harsh Slavery” (three parts).

One can observe three parts in the example, representing the three-part polyphonic nature of this particular chant. This is typical, as Georgian ecclesiastical music is polyphonic.⁷ For the rest of the paper, I will be discussing the topmost voice only, because two other voices depend on it and that is the inherited melody which should most likely correspond to the mediaeval neumes.

Sometimes a hymn in different manuscripts is given in different tonalities, having notes of either double or half duration, with a variety of melodic lines. In addition, in some manuscripts, all three parts of the hymn are written, and in some of them only the first part. Despite such differences, the last investigated clause is given always with a similar melodic line. After removing the second and third parts and removing barlines, irrelevant for ecclesiastical chant built up of clauses, we come to the following result:



Figure 2. Last clause of the 1st heirmos “From Harsh Slavery” (first part).

Below I present the first parts of the last clauses for four more heirmoi, namely the 3rd, 4th, 6th, and 7th (Gvakharia, Shugliashvili and Razmadze, 2013).

Georgia, and with the Shemokmedi monastery in southwest Georgia. The manuscript is currently held in the National Manuscript Centre in Tbilisi, Georgia.

⁷ In Georgian ecclesiastical music, the first part (Mtqmeli) is the main, determinant one, while the second part (Modzakhili) and the third one (Bani) depend on it. Knowing the melody of the first part made possible perfect harmonization of sacred chant in the process of live performance.



Figure 3. Last clause of the 3rd heirmos “Cry Unto the Only Begotten Son” (first part).⁸

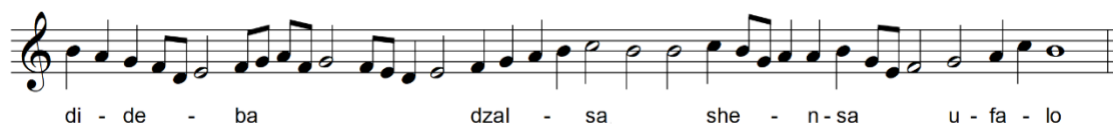


Figure 4. Last clause of the 4th heirmos “From the Rod of the Root of Jesse” (first part).⁹



Figure 5. Last clause of the 6th heirmos “Jonah Was Cast from the Monster” (first part).¹⁰



Figure 6. Last clause of the 7th heirmos “The Youths Reared in Faith” (first part).¹¹

I am not concerned with analysing the melodic lines of whole clauses. Instead, I will be focusing only on the final cadences. The four-syllable long final melodies are collected here in one table:

⁸ The heirmos can be found in several manuscripts. The fragment presented is taken from Q-681.

⁹ The heirmos can be found in several manuscripts. The fragment presented is taken from Q-681.

¹⁰ The heirmos can be found in several manuscripts. The fragment presented is taken from Q-681.

¹¹ The heirmos can be found in several manuscripts. The fragment presented is taken Q-681.






Heirmos	Final cadence melodic formula
I	
III	
IV	
VI	
VII	

Table 12. Versions of the four syllable-long final melodies of five heirmoi.

A few notes about Table 12 are necessary: a) Key signatures are not given at all: as already mentioned at the beginning of this article, the European five-line notational system was not capable of exactly reflecting the tuning of the melodies performed by master chanters. Because of that, those who were in charge of writing down musical scores for the pieces performed live have always struggled to select the most appropriate tonalities. This is why melodies with almost identical melody lines and harmonization are often given in different signatures. I am focusing not on tunings, however, but on the melodic lines, and these were written with a satisfactory level of accuracy. b) In the cases of the 1st and 7th heirmoi the musical line is transposed one tone up and the duration of the notes is doubled. c) In all cases <S> stands for the syllable in general. In the melodic formula belonging to the 7th heirmos the consonant “l” is ignored, as it does not form a syllable. The assignment of consonants to separate notes is just an artistic technique characteristic of Georgian ecclesiastical chants and is often observed in 19th-century musical manuscripts.

One can observe that formulae given in Table 12 have equal overall durations, identical distributions of syllables on the beats, and melodic lines are variants of each other. In other words, these melodies are similar. We are dealing with the versions of one melodic formula. I will call it Type A.

I shall now apply the same treatment to the rest of the 4 heirmoi:



Figure 7. Last clause of the 2nd heirmos “Attend, O Heaven and Let us Say” (first part).¹²



Figure 8. Last clause of the 5th heirmos “Thou Art a God of Peace” (first part).¹³



Figure 9. Last clause of the 8th heirmos “The Bedewed Furnace” (first part).¹⁴



Figure 10. Last clause of the troparion “We Have Seen a Strange Mystery” modelled on the 9th heirmos “All creatures were surprised” (first part).¹⁵

Now I shall collect the six-syllable long final melodies in one table:

¹² The heirmos can be found only in the manuscript Q-689.

¹³ The heirmos can be found in several manuscripts. The fragment presented is taken from Q-681.

¹⁴ The heirmos can be found in several manuscripts. The fragment presented is taken from Q-681.

¹⁵ The musical score of the heirmos has not come down to us. The fragment presented is taken from Q-681. According to the principles of canon creation, texts of the troparia are modelled on the pattern of the text of the heirmos, and their melody on the pattern of the melody of the heirmos. Thus, the melodic line given in Figure 10 must represent the melody of the last clause of the heirmos itself. The meaning of the words is not important and can be ignored. The way the syllables are distributed along the melody line is important, however.




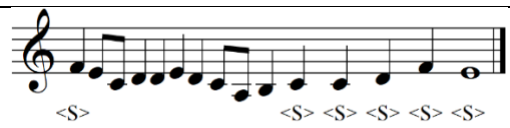
Heirmos	Final cadence melodic formula
II	
V	
VIII	
IX	

Table 13. Versions of the six syllable-long final melodies of four heirmoi.

In the case of the 2nd heirmos, the duration of the notes is doubled.

It is obvious that the formulae given in Table 13 have equal overall durations, identical distributions of syllables on the beats, and melodic lines are variants of each other. This means that these melodies are, again, similar. We are dealing with versions of a melodic formula and this time it is a different one. For this reason, I shall call it Type B.

Summary

It will be helpful to collect and merge the results obtained from Tables 11-13 into one:

Heirmos	Type of mediaeval cadence	Type of 19th-century cadence
I	A _M	A ₁₉
II	B _M	B ₁₉
III	A _M	A ₁₉
IV	A _M	A ₁₉
V	B _M	B ₁₉
VI	A _M	A ₁₉
VII	C _M	A ₁₉
VIII	B _M	B ₁₉
IX	B _M	B ₁₉

Table 14. Correspondence between neume-pattern and melody types of final cadences.

Here the subscripts ('M' for 'Mediaeval' and '19' for '19th century') are introduced to emphasize that in this study I am not pretending to claim that mediaeval and 19th-century cadences are identical. I am focusing on the distribution of cadence types applied to these heirmoi by mediaeval musician(s) and those who lived several centuries later.

Note that three types of melodies are applied to the final cadences of these hymns in the 10th century. Only two types of melodies can be observed in the musical manuscripts written in the 19th century. However, a very important circumstance can be seen in Table 14: wherever type A_M is applied to the mediaeval versions of the heirmoi, only type A_{19} is applied to the 19th-century versions of them. Likewise, wherever type B_M is used in the earliest hymns, only type B_{19} is used in the later versions. Only one mismatch can be seen here: in the case of the 7th heirmos. Probably the most important downside of the oral transmission of music is the risk of losing information. No one should be surprised if the melody type corresponding to C_M did not reach us. On the other hand, despite this problem in oral transmission and the 10 century-long time gap, the fact that the types of the final cadences of eight heirmoi out of nine are matched like this, is astounding.

Now one may draw some conclusions. First of all, let us assume that at some point in the history of Georgia (say in the 16th-17th centuries) the connection to the old musical tradition was interrupted, old melodies were lost, no one could read mediaeval neumes and the recreation of sacred hymns became necessary. Then the melodies of the nine heirmoi would have been created independently of the mediaeval tradition. If so, how is it that one can see a strong relationship between the oldest and the latest melodic types revealed in Table 14? Are we dealing with some randomness here? It must be admitted that the possibility of pure chance cannot be completely rejected. One may then question directly: what is the probability of the match of the melody types observed in Table 14 occurring accidentally? It is not so difficult to obtain the value of this probability: it equals 0.0078125.¹⁶ What does that mean? It means that there is less than a 0.8% chance of the relationship witnessed in Table 14 occurring due to pure chance.

¹⁶ To obtain the probability I am looking for, it would be convenient to formulate and solve the probability theory problem, equivalent to the one I am dealing with. Suppose we have 16 coloured balls, 8 of them white and 8 of them black. Let us assume that there are two participants in the experiment: P1 and P2. P1 is asked to name at most 8 integers between 1 and 8 (e. g. one could name the numbers 2, 4, 6 and 7; or 1, 3 and 8). P2, not being aware about the numbers named by P1, is asked to choose any combination of 8 balls from the set of 16 balls and to place them side by side in a row from left to right. One can say that the

Nine heirmoi have been considered, then, in this study. All of them belong to the first mode. The last clauses of them have been investigated in the most important mediaeval source S-425 and 19th-century musical manuscripts. I focused on the final cadences of the hymns and found three types of the most characteristic neume symbol arrangements (see Table 11). The investigation of the parallel musical scores revealed two types of melodies applied to those final cadences (see Table 12 and Table 13). After gathering these results in the single table (see Table 14), it became evident that there is a strong relationship between the distributions of melodic types in the earliest and the latest musical manuscripts. Moreover, I obtained the exact value of the probability of this kind of relationship occurring accidentally. The figure proved to be very small. This means that it is very unlikely that the relationship revealed in Table 14 has been established randomly. With more than 99% confidence, one can claim, instead, that the correspondence one sees is the result of non-interrupted musical tradition. Despite the faults of oral transmission, melodies from the distant middle ages have more or less safely reached the 19th century. The connection between these two sources is seen in Table 14. No doubt that during their 10-century-long journey melodies changed their shape to some extent, although this is a subject for future studies. For now, we have a reasonably well-grounded clue as to where to search for the meanings of mediaeval Georgian musical signs and how to decipher the neumes.

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leftmost ball is at position 1, the next one at position 2, etc., and the rightmost is at position 8. What is the probability of the following event occurring: all the balls at positions named by P1 are identical in colour and all the rest are another colour? There are 256 ($=2^8$) different possibilities that two colours (black or white) might appear at 8 positions. And there are only two cases supporting the occurrence of the event: a) when all of the balls at positions named by P1 are white and all of the rest are black, or b) when all of the balls at positions named by P1 are black and all of the rest are white. Therefore the value of the probability we are looking for is equal to $2/256=0.0078125$.

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