

Eka Chabashvili  
Composer, Doctor of Musical Art  
Assoc. Professor of V. Sarajishvili Tbilisi State Conservatoire

## Georgian Medieval Church Bell

“Georgian church bell is a prayer cast in metal”

Nodar Mamisashvili

The bell is one of the main attributes of the Orthodox Church and, of course, it is also an important part of the liturgical procession in the Georgian Church. Bells in Georgia were not only related to the religion, they had many other informative functions for the society, such as warning about epidemics or invasions of the enemy, calling for public fests, etc. They were often used even as treatment tools in therapy rituals (for example, in one of the ancient healing rituals in Guria - western Georgia, a young man wearing colourful female clothes was moving in the room of a patient with small bells in hand and he rang them, while other visitors were singing the treatment song "**Batonebo**" in parallel).

Below is a presented link to the song without action of ritual.

<https://www.youtube.com/watch?v=gYC4T4A8XHw>

Bells of different sizes and functions have been made in Georgia since ancient times; During archaeological excavations were found **small ritual** as well as jewelry bells that existed before Christianity. The oldest bells found in Georgia date back to the 7th century BC.



Bells preserved in various museums of Georgia

**Poles of hanging bells** are still preserved in the mountain regions of Georgia such as Svaneti, Adjara, etc.



(Ushguli, Svaneti - region in Georgia)

We believe that perfect metallurgical knowledge of ancient Georgian people also would be spread on the bell casting and there was a tradition of making rather big bells which were lost for centuries. Most of the old Georgian church bells were lost in medieval Georgia, during the period of wars (for example, it is known that the army of Shah Tamaz removed the bell from the **Vardzia** bell tower and took it away; Georgian metal was always a treasure for the manufacture of combat weapons).



Vardzia, 12<sup>th</sup> century cave city and monastery in southern Georgia; The Church of the Dormition, dating back to the 1180s - the golden age of King Tamar and Poet Rustaveli.

Many of the bells were destroyed in the a) 19th century - during the occupation of Georgia by the Russian Empire the unique frescoes on the walls of the churches were covered with white paint, and the bells were removed. Instead of Georgian bells Russian bells were hung, which had a completely different shape and sound. It was a period, when Russia tried to remove culture and identity of Georgian people; and b) 20th century during the and anti-religious campaign of the 1920s. In total, two dozen Georgian bells have survived to this day, especially in mountainous regions, the oldest of which dates back to the 15th century; the first **bell tower** in Georgia dates back to the 13th century.



Gudarehki, region of Kartli.

Some bells are carved with the inscription "**Asomtavruli**" or "**Mkhedruli**" (Georgian alphabets) of the donor or master names. One of the inscriptions of the 16th-century bell preserved the name of the Georgian master (bottler) Dzedan Titadze.



Mkhedruli



Asomtavruli

The aim of the paper is to present the Georgian medieval church bell made in the 20th century, which was reconstructed by contemporary Georgian composer and scientist **Nodar Mamisashvili**, on the basis of survived parts of the broken bells and the folk legends about bell casting rituals. Mamisashvili studied the habits of medieval Georgian people, the type of their thinking covered in folk traditions and Georgian chants; According to this knowledge, he recovered the tradition of Georgian church bell casting through the prism of the contemporary imagination. Nodar Mamisashvili's personality was unique in its versatility and systemic thinking. He is the author of dozens of scientific papers and publications.





Nodar Mamisashvili (1930-2022), composer and scientist

In Tbilisi, on the bell tower of the **Holy Trinity Cathedral** 9 bells hang, the biggest of which - “Dedo Zari” - weighs 8200kg (Mamisashvili called it “Golden Weigh” because of the proportions he discovered). They were compiled and created according to Mamisashvili's calculations.

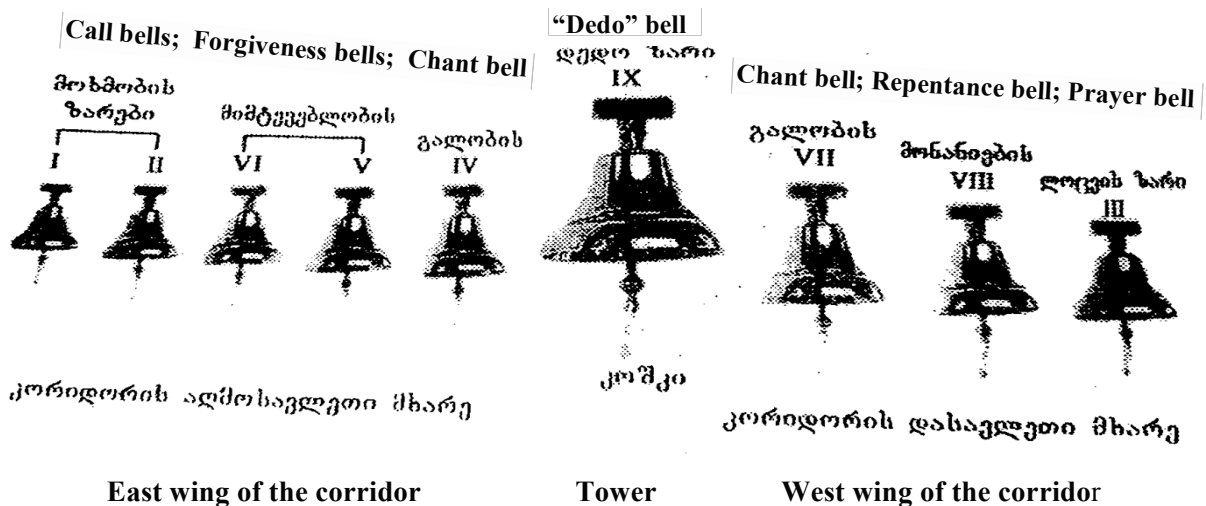


Holy Trinity Cathedral in Tbilisi

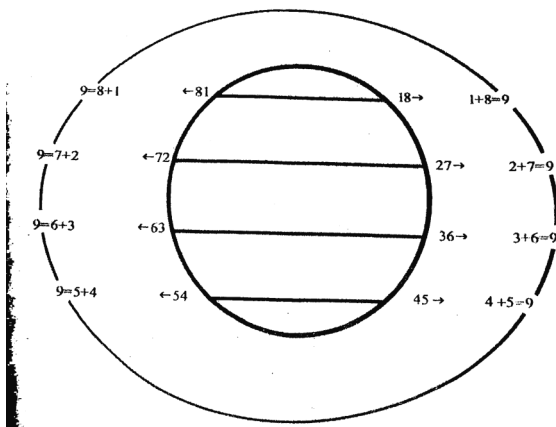
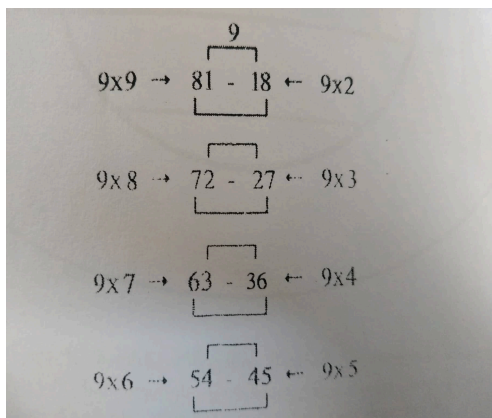
He was the first in the world to create an acoustic scheme for the resonant distribution of **9 church bells**, according to which the bells were distributed in the bell tower of the Holy Trinity Cathedral. He separated the main root-tones from the Georgian hymnal harmony and transferred them to the sound of 9 bells; He also differentiated the bells according to their functions: 2 call bells, 2 forgiveness bells, 2 chant bells, 1 repentance bell, 1 prayer bell, 1 bell of glory.

### Distribution of the Bells in the Holly Trinity Church Tower

ზარების განლაგება წმიდა სამების საბრველოში



When we asked him why he decided to create a nine-bell resonant scheme, he explained that the unique features of the proportion of symmetry can be calculated from the number 9; and then he added that the ancient Georgians possessed a secret knowledge which was reflected in the musical system of Georgian medieval chants.



Several Georgian rituals with certain symbols were taken into account during the casting of bells in Germany; According to Nodar Mamisashvili:

“A bell is not a usual instrument and it is neither the part of metallurgical achievement. It gives amazing sounds. In them is unified the harmony of spirituality and existence. The rule of casting the bell reached up to us in the form of myths. In different countries there are different rituals of casting the bell. For example, Italians perform special songs and prayers during casting the bell. According to the Byzantine belief, the strong sounding of round-dance stipulated the strong sonority of the bell. Very interesting is Georgian ritual: in the pit for casting the bell they used to throw wheat or barley in order the grace of cereals to be passed to the pit. Then they used to spread “salt” on the boiling metal, for what they used three soul-calming minerals, which had cosmological meaning. These minerals were; arsenopyrite (symbolizing the moon light and its energy), realgar (symbolizing cosmic light and dawn), and auripigment (symbol of golden sun light). Additionally, one more action was added to all this: they used to uproot a small evergreen pine tree together with its roots and stir with it the boiling metal. These symbols were based on human psychics and deep knowledge.” (1:350)

Mamisashvili declared that the different rituals were dedicated to the process of the glory and blessing to nature to get mystic information of the cosmic energy; for example, one of the famous round-dances "Lileo" in Svaneti expresses a ritual of greeting sunrise. Nodar Mamisashvili thought that Georgian bell makers had been collecting and including information about the harmonization of the energy of the Moon with the energy of Sun in the bell as a symbol of Eternity.

Svanetian song “Lileo”:

<https://www.youtube.com/watch?v=tAtgawjkrqM&list=RDtAtgawjkrqM&index=1>

Mamisashvili believed that the color of the aforementioned minerals is also associated with the process of rituals symbolizing the period from midnight to sunrise:



Arsenopyrite is grey, it has silver colour as moon;



Realgar is red, as the rose-pink light of dawn;



Auripigment yellow, it has golden colour as Sun.

Consequently, he included in tuning system of 9 bells associative connection of colors and its nanometers along with acoustic frequencies.

To achieve the desired timbre, Nodar Mamisashvili calculated the spectral combination of each bell; he believed that the timbre of bells and their combination can influence the listeners' mood; He also calculated intervals between pitches of bells to reflect the sound of the different birds chirping. The smallest bell is called Tone Bell, and the biggest one – "Dedo" Bell. The "Dedo" Bell weight ratio is based on Golden Ratio. Between the "Dedo" and another bell the distance in terms of acoustics is 900 cents and among other bells – from 500 to 100 cents. Only Georgian bells have such a ratio and it is based on a harmonious system of chanting tones.

It is important to mention that except of Call bells, he connected each of other 7 bells with prayer time during a day. He explained that the time is also connected with the mood of the human. He believed that different periods of the day also condition and enhance person's mood: for example, in the morning a person prays and is grateful, he is more forgiving at dinner, and he regrets in the evening, in the night he should calm down and hopefully wait for the next day, etc.

#### Classification of the Holy Trinity church's bells:

	Bell	Tone (pitch) and Hertz	Nanometer and color	Time of prayer
1	Call	b <sup>1</sup> - 485 Hz	450Nm-380Nm - violet	
2	Call	a <sup>1</sup> - 430 Hz	460Nm-470Nm - dark blue	
3	Prayer	c <sup>1</sup> - 256 Hz	640Nm-700Nm - red	6 am
4	Chant - Tone	c <sup>#1</sup> - 274 Hz	640Nm-620Nm - red	9 am
5	Chant	d <sup>1</sup> - 288 Hz	600Nm-580Nm - orange	12 pm
6	Forgiveness	e <sup>1</sup> - 320 Hz	580Nm-585Nm - yellow	3 pm
7	Chant	e - 160 Hz	590Nm-570Nm - golden	6 pm
8	repentance	a - 220 Hz	460Nm-480Nm - dark blue	9 pm
9	Dedo	G - 96 Hz	500Nm - blue	12 am

A bell is a notable exception among musical instruments, as the harmonic named the fundamental is not its lowest frequency, but it can produce the sound of a lot of partial tones, which defines the colourfulness and richness of the timbre.

Timbre of each of 9 Georgian bells is different; they have own character related to their function; for example, Call bells have bright sound; Chants bells – beautiful sound that gives the tone to singers; Prayer bells sound is quiet and soft; Forgiveness bell sounds sad; “Dedo” Bell has soothing sound. ("Dedo" means Mother in Georgian; as mother's obligation is to calm the children, the sound of this bell should be soothing).

Mamisashvili calculated the proportion of the Georgian “Dedo” bell's size according to the golden ratio to achieve desired weight and timbre. For example, smallest bell's weight is 8kg, middle bell's weight is 12kg; their combination gives weight of "Dedo" bell.

$$\begin{aligned} \text{Biggest "Dedo" bell is } & 8+(8+12)=28 \text{ kg,} \\ & \text{or } 12+(8+12)=32 \text{ kg,} \\ & \text{or } (8+12)+(8+12)=40\text{kg and so on.} \end{aligned}$$

Nodar Mamisashvili declared, that vibration of bell correlated with human body parts' vibration, thus sound of bells carry the information of treatment also.

Bell's metal consists of tin, zinc, silver (lunar energy) and copper (solar energy). The clapper is made of iron. When the clapper hits the lip, the metal heats up and becomes slightly elastic, which further enhances the vibration of the metal, enriches the tones of the spectrum and increases the smoothness of the bell sound. Ringing of the bells are also carried out in different ways. For example, in the East they push the bells with logs; the Orthodox bells are rung with the clappers, and in Catholic belfries, part of the bells are rung by shaking the bell-bodies. Georgian bells' clapper was made out of iron because clapper material and place of hitting were very important for producing beautiful bell timbre.

The bell body is also interesting, as geometric figures themselves have certain energy; In different countries this issue was handled in different ways. In this respect, Georgian bell is also a distinguished one. Tbilisi Sameba (Trinity) Cathedral bell has the shape of a dome, that was taken from Georgian enamelled fresco of Golden Age (12th century).





The dome bears the noblest energy. Thus, upper parts of Georgian bells up to the bottom are domed. This sounding part creates some kind of communication with the church dome and they both make an interesting ensemble. The ancient acousticians were well aware of this. The uniqueness of the Georgian bell is conditioned by 3 reasons:

1. The domed shape of the bell is harmonized with the church dome;
2. The dome has wonderful acoustic features – it gives deep, soft, clear sound;
3. The timbre of vibration coming from the dome body is distinguished through its richness and it evokes in us positive emotions.

The sound of Holy Trinity Church's Bells:

<https://www.youtube.com/watch?v=J0W-QYQqOz0>

### Conclusion

During the casting of the Trinity Cathedral bell all kinds of Georgian metal casting rules were considered. As His Holiness and Beatitude Catholicos-Patriarch of All Georgia Ilia II says, human life does not stop in one spot; it always places different, new demands in front of a human being. So, during the bell casting several problems should have been solved; it was urgent to re-establish the tradition, a new sound should have been created, which should be related to the chanting harmony. The chanting harmony requires 9 bell compositions as Georgian chanting harmony consists of 9 tones. This is one of the secrets of Georgian bell.

Nodan Mamisashvili composed several musical score for 9 bells, for example, “Entry of the Patriarch”:

Nodar Mamisashvili declared:

“A bell has a number of secrets. First is the proportion of the bell body shape and size with its weight. The Main (Dedo) Bell would have good sounding if its weight varied between 8259 kg and 8500 kg. During casting this bell the so-called “Golden Weight” was kept – certain regulation among the body, metal and weight. It should be considered how much should weigh a bell of this or that size. One and the same sounding may be given by the bell which weigh 100, 120, 140 kg. The second secret is connected with the bell clapper: defining its size, weight, shape and the distance where it should be hung inside the bell-body. The third secret is finding the sounds in the bell sounding, which resemble the chanting. The thickness of the bell walls, composition of metal, proportion of the body width with the height, and the bell casting process are also very important. All the above-listed details have their influence on the bell sounding.” (1:351)

Historically, the function of the bell was also formed in an interesting way. It combines the profound knowledge of ritual, mystics, physics and chemistry and perfect calculation of acoustics. Fortunately, Nodar Mamisashvili was a person who considered all this knowledge during the reconstruction of the Georgian Medieval Bell.

References:

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