Research Article

Reconstruction and development of Azerbaijani traditional instruments: an applied study on the Çahar Tar, Kaşkar Rubab, Kaman, Shaman Defi, Çağanaq, and Müğenni

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Article Info	Abstract
	This study examines the organological and structural characteristics of six traditional Azerbaijani musical instruments—Çahar Tar, Kaman, Kaşkar Rubab, Shaman Frame Drum, Çağanaq, and Müğənni—and documents their reconstruction through an applied, practice-based methodology. Drawing on historical sources, contemporary organology literature, and technical measurements, the research analyzes each instrument's body structure, string arrangement, material composition, and acoustic behavior. Findings demonstrate that the successful restoration of these instruments requires not only historical accuracy but also engineering precision and acoustical coherence. The reconstruction outcomes parallel Zeller's (2019) methodological approach, which emphasizes the need to reinterpret historical drawings through geometric logic, material science, and performance practice. This is particularly evident in the reconstruction of the Müğənni, where Abdullayeva's alternative structural model proved acoustically superior to earlier linear-bridge schemata. Similar engineering-acoustic adjustments were required in the rebuilding of the Kaşkar Rubab and Çağanaq, where string–bridge relations and resonance properties were recalibrated to achieve functional performance quality. Overall, this study integrates historical documentation with applied reconstruction data, contributing a systematic and culturally grounded model for the restoration of traditional Azerbaijani instruments. The findings offer a methodological framework that may support future organological research and instrument-making practices.

Introduction

Organology is a fundamental field of study that examines the origins, classification, structural characteristics, and historical development of musical instruments. The preservation and reconstruction of traditional instruments are among the most important research topics within this field. The restoration of historical instruments is considered not only a process of physical reconstruction but also a scientific activity that ensures the preservation of cultural memory (Kartomi, 1990; Montagu, 2007). Particularly in Eastern musical culture, the tradition of instrument making based on master craftsmanship holds strategic importance in safeguarding both tangible and intangible heritage.

Azerbaijan has historically been recognized as a cultural center with a rich diversity of musical instruments and has played a pioneering role in the formal and acoustic development of string, wind, and percussion instruments. Studies on Azerbaijani instruments in the literature provide comprehensive information on their structural typology, historical

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transformation, contexts of use, and technical characteristics (Abdullayeva, 2002, 2016; Kerimov, 2003; Nəcəfzadə, 2004). In light of these studies, instruments such as the Çahar Tar, Kaman, Kaşkar Rubab, Shaman Defi, Çağanaq, and Müğenni hold an important place not only in traditional musical practice but also in the formation of Azerbaijan's cultural identity.

Each of these instruments possesses distinct structural and acoustic characteristics: the multi-stringed and fretted structure of the Çahar Tar; the idiophonic character and rhythmic function of the Kaman; the horn-shaped body form of the Kaşkar Rubab; the symbolic ritual use of the Shaman Defi; the bowed timbral character of the Çağanaq; and the complex multi-string system of the Müğenni all require specialized organological examination (Abdullayeva, 2002; Kerimov, 2003). The methods applied in the preservation and reconstruction of these instruments demand high precision in terms of material knowledge, construction techniques, measurement systems, and acoustic balance. In particular, factors such as the selection of body materials, bridge placement, string thickness, resonance chamber, and tension system directly affect the success of the restoration process (Azerbaycanın Musiqi Alətləri Xəzinəsi, 2025; Mammadova, 2025).

In this context, the main problem of the study is to examine the restoration principles of six traditional Azerbaijani musical instruments (Çahar Tar, Kaman, Kaşkar Rubab, Shaman Defi, Çağanaq, and Müğenni) from an organological perspective and to present the applied reconstruction process of these instruments in detail. The study constitutes both an analysis based on historical sources and an applied research including the experimental and technical stages of the reconstruction process.

The international literature on the reconstruction of historical instruments also supports the theoretical framework of this study. In particular, Zeller's (2019) analysis of the reconstruction of lost instruments through Praetorius's *Syntagma musicum* demonstrates how critical the combined reading of historical documents and technical drawings is in re-establishing sound production mechanisms. As emphasized by Zeller, reviving the historical form of an instrument requires not only copying its physical features but also holistically evaluating the performance practices, material technologies, and acoustic preferences of the period. This approach is equally important in the restoration of Azerbaijan's traditional instruments and necessitates reconsideration of structure, measurements, timbre, and performance ergonomics. Therefore, the applied reconstruction process of this study is also consistent with the methodological framework proposed by Zeller.

Method

The methodological basis of the research relies on the combined use of the descriptive analysis approach commonly employed in organology (Kartomi, 1990) and the applied reconstruction method. This approach enables the identification of instruments through historical literature, museum specimens, drawings, and technical documents, followed by the remodeling of the instrument-making process according to engineering principles and acoustic requirements. In this way, both historical accuracy is preserved and technical data related to the production process are systematically documented.

Findings

Restored Çahar Tar

The Çahar Tar is one of the ancient musical instruments of Azerbaijan. This instrument has four strings and four bridges. It basically consists of the pegbox, neck, and body. The frets of the Çahar Tar are made of nylon, and the number of frets is 19. A visual of the instrument is presented (Photo 1).

Photo 1. Çahar Tar

The head of the Çahar Tar is carved together with the neck and is made of walnut wood. The body (çanaq) is made of mulberry wood and assembled in a ribbed manner. The bridge on the upper part of the body is made of walnut wood. The top soundboard surface of the body is made of mulberry wood. The nut on the neck is made of bone. The strings are made of steel.

The parts of the instrument are shown in Figure 1.

1. Pegbox
2. Neck
3. Body
4. Bridges
5. Frets (19 pieces)
6. Body bridge
7. Strings (4 pieces)
8. Simgir (hook)
9. Nut

The sound range of the Çahar Tar is 2.5 octaves, extending from the "do" note of the small octave to the "sol" note of the second octave.

The measurements of the musical instrument are given in Scheme 1: body length 285 mm; body width 177 mm; body height 100 mm; neck length 410 mm; pegbox length 120 mm; width of the neck at the body joint 36 mm and height 33 mm; width of the neck at the pegbox section 30 mm and height 27 mm. The instrument can also be performed on the knee. The instrument was restored for the first time by me.
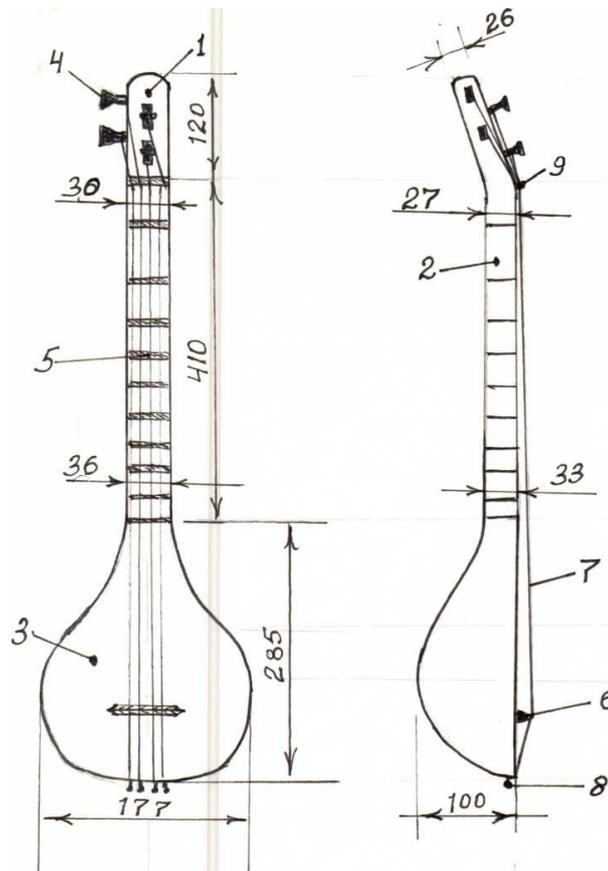
Figure 1. Çahar Tar

Kaman is an idiophonic instrument, that is, a self-sounding instrument that produces sound through vibration. Classical poets such as Afzaleddin Khagani, Nizami Ganjavi (12th century), Imadeddin Nesimi (14th century), and Mehmed Fuzuli (16th century) mentioned the kaman in their works. This indicates that the kaman was widely used in Azerbaijan between the 12th and 16th centuries.

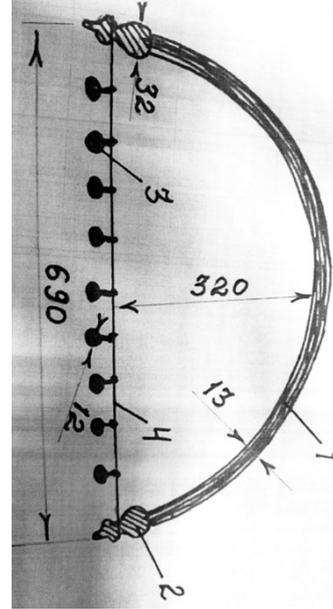
Figure 2. Kaman (bow)

Figure 3. Bow measurements

The name Kaman is derived from a weapon of the same name that was formerly used in hunting and warfare. Our performers also made use of the kaman as a musical instrument. The instrument is crescent-shaped and made of wood. Its ends are tied with a rope and tensioned. Iron jingles are attached to the rope at intervals of every 5–6 cm.

The instrument is generally used by the *yallıbaşı* in yallı dance groups. The *yallıbaşı* is regarded as the lead dancer and the main guide of the dance. While dancing, the *yallıbaşı* holds the kaman in the right hand and produces sound by shaking it in accordance with the rhythm of the dance. For this reason, the kaman plays an important role in the development and formation of yallı dances.

To prepare the kaman, four wooden rods are taken and each is placed into a pre-prepared mold. The rods, positioned in a bent state within the mold, are exposed to high heat using a heat gun so that they take the shape of the mold. Bending the rods without applying heat is not recommended, as they may break (see Figure 2).

After the rods are bent with heat, they are glued to each other. After being left in the mold for one day, the bow is removed, and excess parts are carved to obtain a smooth form. Bridge-like wooden pieces are prepared to tie the rope and are attached to the ends of the bow. Then the rope is tensioned between the bow ends, and the jingles are fixed onto the rope at intervals of every 5–6 centimeters.

Parts of the instrument
1. Kaman (bow)
2. Bridge piece for tying the rope
3. Jingles
4. Rope

The measurements of the instrument are given in Figure 3.

Kaşkar Rubab

The Kaşkar Rubab has a distinctive form and is played with a plectrum. This type of the Kaşkar Rubab is believed to have been invented in the first millennium BCE. When examining the writings of Nizami Ganjavi and A. Khagani (12th century), information is found indicating that the K. Rubai type of this instrument was used in Azerbaijan. As the rubab was used by different peoples, various forms emerged over time. According to some sources, the instrument was named

"Kaşkar Rubab" because Uyghurs lived around a river called Kaşkar in China (Abbasgulu Necefzade, *Our Musical Instruments*, pp. 76–77, 2004). Later, when the Uyghurs migrated to Uzbekistan, this instrument became more widespread there.

In Azerbaijan, there is also a mountain called Kaşkar and a river of the same name within the borders of the Dashkesen district. It is most likely that the instrument was called "Kaşkar Rubab" because it was widely used in these regions. In Arabic, the name of this instrument means "horned wood."

Photo 2. Kaşkar Rubab

There is a horn-like protrusion between the body and the neck of the instrument. Such protrusions are unique to the Kaşkar Rubab. The Kaşkar Rubab is considered the oldest type among rubab instruments. The sound range of the instrument is three octaves, extending from the "do" note of the small octave to the "re-flat" note of the third octave. In Azerbaijan, the Kaşkar Rubab is tuned to the note "si."

This musical instrument has 5 strings, 27 frets, and 5 bridges. In the past, the plectrum of the instrument was made from the horn of large cattle. The membrane on the body is made of fish skin. The correct form of the instrument was reconstructed for the first time at the Scientific Research Laboratory of the Azerbaijan National Conservatory by PhD Memmedeli Memmedov.

The body is made of mulberry wood, while the neck and pegbox are made of walnut wood. The diameter of the body is 170 mm, the body height is 120 mm, the neck length is 585 mm, and the pegbox length is 85 mm. The upper neck nut is made of ebonite, and the bridge on the body is made of hazelnut wood.

Shaman Defi

The Shaman Defi is a percussion instrument. This instrument is a sacred percussion instrument used by various indigenous peoples around the world. It holds an important place in religious rituals, meditation practices, and spiritual healing practices. Shamans use this drum to enter trance states through rhythmic sounds, communicate with spirits, and direct energy.

The instrument can be produced in different forms. The Shaman Defi that we prepared at the Scientific Research Laboratory of the Azerbaijan National Conservatory has an octagonal shape.

Photo 3. Shaman frame drum

There is a type of frame drum similar to the bendir in Türkiye and the Middle East, but it is mainly played with the fingers. The def (in Iran and Central Asia) is a skin-covered percussion instrument. These instruments are used in modern music and festival culture.

The dimensions of the instrument we prepared, called the Shaman frame drum, are as follows: The distance between each corner is 26.8 mm, the diagonal is 690 mm, the distance between two sides is 490 mm, and

the height of the frame drum is 8 mm. Tıbır (male goat) skin is stretched over the Shaman frame drum. On the back surface of the drum, a human figure seen on the Gobustan rocks is engraved; this figure was made to hold the drum with one hand. The instrument was reconstructed by us for the first time at the Scientific Research Laboratory of the Azerbaijan National Conservatory.

Developed Çağanaq

Çağanaq is a bowed string instrument played with a bow (similar to a violin bow). This name appears in the manuscript titled *Ozan-Karaxaelli* by the researcher Alihuseyin Daglı. The Çağanaq is preserved in the musical instrument collection of the J. Jabbarlı State Theatre Museum (Figure 3).

The word "Çağanaq" most likely derives from the word "çağanak/çanak." Çağanaq is a term used for round frames such as drum hoops, sieves, and similar objects. This musical instrument was used by performers in the past.

Frankly speaking, the old form of the instrument did not satisfy me; neither its scale length, nor string thicknesses and structure, nor its sound timbre and playing comfort were suitable. For this reason, the instrument was completely reconstructed from scratch, development work was carried out, and a musical instrument suitable for performance was produced.

The materials used in the construction of the Çağanaq were determined as follows: The measurements of the instrument are given in Scheme 5.The body of the instrument is made of mulberry wood, while the neck and bridge parts are made of walnut wood.

Parts of the instrument
1. Bowl
2. Simgir (kırmak)
3. Knee support
4. Bridge (on the body)
5. Neck
6. String
7. Bridge (on the neck)
8. Bridges
9. Pegbox
10. Tar body

The sound range of the Çağanaq is 2.5 octaves. It extends from the "do" note of the small octave to the "la" note of the first octave.
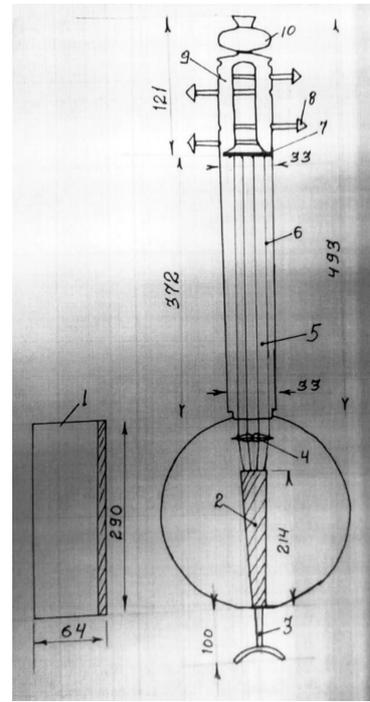
Photo 4. Çağanaq

Figure 4. Çağanaq dimensions

Reconstruction of the Müğənni (Muğni) Instrument

The Müğənni musical instrument is one of our forgotten instruments. Müğənni is a plucked musical instrument played with a plectrum and consists of a total of 39 strings. The strings are stretched over a wide neck. On the left (upper) side of the neck there are 6 bridges, while on the right (lower) side there are 3 bridges.

The Müğənni musical instrument was first constructed in the 13th century by the renowned Azerbaijani music theorist S. Urmevi. Information about the Müğənni is found in the work titled *Kitab al-Adhār*. In addition, detailed information about this instrument was provided by E. Maragali in the 14th century.

In order to reconstruct the Müğənni, I first examined historical sources; at the same time, I benefited from the studies of the contemporary researcher Saadet Abdullayeva, as well as from the writings and drawings prepared by Abbasgulu Necefzade.
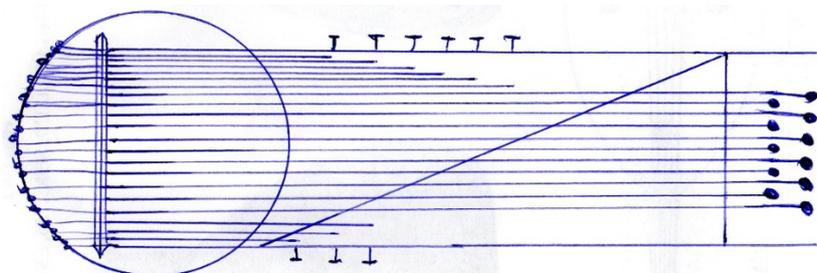

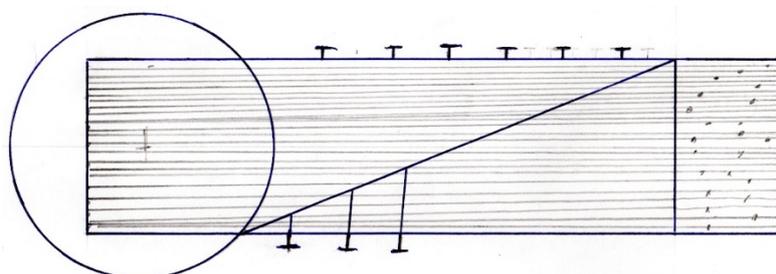**Figure 5.** From Saadet Abdullayeva's research – Müğənni musical instrument

Figure 6. From Abbasgulu Necefzade's research – Müğənni musical instrument

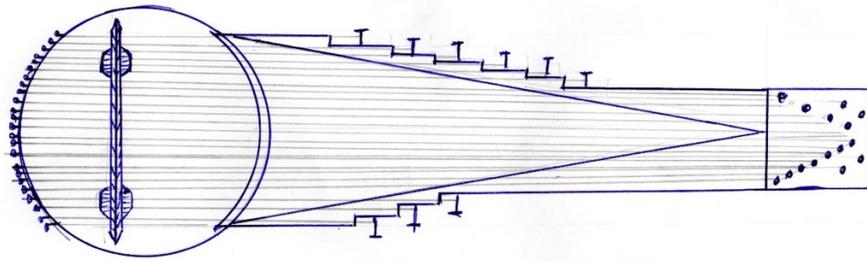After getting acquainted, I prepared my own sketch.

Figure 7. Diagram of the Müğənni musical instrument prepared by Memmedeli Memmedov

I would like to state that the diagram that satisfied me was the one in Figure 5, prepared by Saadet Abdullayeva. In this diagram, by applying my engineering approach, Figure 6 emerged in the final stage, and the musical instrument was made according to this diagram.

For the Müğənni musical instrument we prepared, the appropriate spacing has been maintained on both the right and left sides of the bridges (aşıklar) to ensure the strings that exit remain free and independent of each other. The distance between the strings is 7–8 mm, and this equality applies to all the strings.

The sound range of the Müğənni musical instrument we made is 2 octaves. It extends from the "do" note of the small octave to the "si" note of the first octave. The strings are made of kapron (jilka) material. All the bridges in the instrument are placed in such a way that each string exits its own bridge and does not touch the other bridges.

The total length of the musical instrument is 850 mm, the body diameter is 240 mm, and the body thickness is 55 mm. The bridges used are qanun (instrument) bridges.

Figure 5. Müğənni (Muğni) Musical Instrument

The technical comparison of the existing forms during the reconstruction process of the Müğənni instrument shows that the form number 4, prepared by Saadet Abdullayeva, provides a more suitable reference in terms of structural integrity. In this arrangement, the bridge saddles are positioned in such a way that they rise from the right and left axes of the instrument and converge at the center of the neck's head section. This arrangement also clarifies the functional separation of the strings: a balanced and performance-friendly distribution has been provided, with 12 thick strings on the left side of the central line and 12 thin strings on the right.

When examining the forms proposed by previous researchers, it is understood that there are various structural inconsistencies in the model presented by Necefzade. In this particular arrangement, placing the bridges on a single linear axis eliminates both physical and practical functionality. The arrangement consisting of six bridges on the left side and three on the right side prevents the independent exit of the strings and does not align with the fundamental operational principles of the instrument.

In order to resolve these issues, the research of Saadet Abdullayeva, known for her meticulous work in the field of instrument making and organology (Azerbaijan Musical Instruments Are Enchanting the World, 2016), has been used as a basis. Abdullayeva's proposed approach presents a more consistent system in terms of both geometric arrangement and acoustic performance, thus expanding the performer's movement area and optimizing the instrument's sound production capacity.

The final model prepared in line with this method is shown in Figure 6 in its completed form. Additionally, the comparative evaluation of Figures 4 and 5 reveals that Abdullayeva does not share the same view as Necefzade in terms of the suggested design; instead, she has developed an alternative arrangement that is clearer, more consistent, and in accordance with physical and geometric principles.

This study examines the organological and structural features of six traditional Azerbaijani instruments—Çahar Tar, Kaman, Kaşkar Rubabı, Şaman Defi, Çağanaq, and Müğənni—by investigating their reconstruction processes in a practical manner. The findings show that each instrument carries its own unique structural logic in terms of body form, string system, and acoustic function, and the restoration process requires technical accuracy in alignment with this logic.

Conclusion

These results parallel Zeller's (2019) methodological approach to historical instrument reconstruction. Zeller (2019) emphasizes that copying the drawings in Praetorius' *Syntagma Musicum* verbatim is often not possible, and elements such as geometric consistency, acoustic function, and the performance practice of the period must be reinterpreted during the construction process. This view has been clearly verified in the reconstruction of the Müğənni instrument. Since placing the bridges in a single line, as given in Necefzade's diagrams, was not functional in practice, Abdullayeva's (2016) alternative arrangements provided a more accurate acoustic structure. Thus, as Zeller (2019) points out, historical forms require critical evaluation and re-engineering in the modern reconstruction process.

Additionally, Zeller (2019) specifically states that the positions of the strings, tension distribution, and the body–neck relationship should be verified not just through drawings but through physical and acoustic tests. This study has adopted a similar approach, where the string–bridge systems of instruments such as Kaşkar Rubabı, Çağanaq, and Müğənni have been reevaluated in terms of sound quality, resonance, and performance ease. In particular, the division of strings around the center line into 12 thick + 12 thin strings in the Müğənni has been decisive in achieving acoustic balance. This result directly aligns with Zeller's (2019) process of "transitioning from historical drawings to engineering logic."

A similar approach is seen in Azerbaijani organology literature. Abdullayeva's (2002, 2016) studies highlight the necessity of reassessing the historical forms of many traditional instruments in practice, emphasizing that the construction process should not only adhere to historical fidelity but also ensure acoustic consistency and performative function. Kerimov (2003) and Nəcəfzadə (2004) also point out the critical importance of material type, body-neck ratios, and resonance areas in traditional instruments, findings that align with Zeller's (2019) reconstruction methodology.

In general, the findings of Memmedov (2024) and Hüseynova (2024) demonstrate that the restoration of Azerbaijani instruments is not merely a reproduction of the past, but rather a multidisciplinary process that bridges acoustic engineering, organological research, and contemporary performance practice. This research, therefore, combines historical data with practical reconstruction results, offering a functional model compatible with Zeller's (2019) international methodological approach.

In conclusion, this study has documented the reconstruction processes of six traditional Azerbaijani instruments, combining historical literature with applied reconstruction data, establishing both a scientific and cultural foundation, and providing a systematic methodological framework for future restoration work.

Acknowledgement

Biodata of Author

Dr. **Mamedali Mirali Mamedov**, music researcher and musical instrument restorer. Since 2010, he has been working as the head of the "Improvement of National Musical Instruments" (*Milli Musiqi Alətlərinin Təkmilləşdirilməsi*) research laboratory at the Azerbaijan National Conservatory (*Azərbaycan Milli Konservatoriyası*). Over the years, 64 of Mamedali Mamedov's scientific works have been registered with the Copyright and Intellectual Property Agency (*Müəllif Hüquqları və İntellektual Mülkiyyət Agentliyi*), and dozens of scientific articles and conference materials have been published. The ensemble "In the Footsteps of Time" (*Zamanların İzində*), consisting of ancient musical instruments, was founded by Mamedali. Mamedali Mamedov has created a four-cornered drum (*dördguşəli nağara*), a square drum (*kvadrat nağara*), and a "chovgan" (*çovqan*, conductor's baton) for the National Military Band (*Milli Hərbi Orkestr*). In addition, he has developed new musical instruments that produce sounds at different registers and registered them in the database of Azerbaijani musical instruments in collaboration with the Copyright Agency. In 2018, the book "Improvement of Azerbaijani Folk Musical Instruments" (*Azərbaycan Xalq Musiqi Alətlərinin Təkmilləşdirilməsi*) was published.

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References

Abdullayeva, S. (2002). *Azerbaycan xalq calgi aletleri: Musiqisunasliq ve organoloji tedqiqat* (*Azerbaijani folk musical instruments: A musicological and organological study*). Baku: Adiloglu Yayinevi.

Abdullayeva, S. (2016). *Azerbaycan calgi aletleri dunyani valeh edir* (*Azerbaijani musical instruments fascinate the world*). Baku: Nurlar Nesriyyati.

Azerbaycanin Musiqi Aletleri Xezinesi. (2025). *Baku: Milli Azerbaycan Tarixi Muzeyi* (*The Treasury of Azerbaijani Musical Instruments*). Baku: National Museum of Azerbaijani History.

Huseynova, S. (2024). *Azerbaycan halk muzik aletlerinin morfoloji ve ergoloji gelisim ilkeleri* (*Morphological and ergological principles of Azerbaijani folk musical instruments*). *Turk Organoloji Dergisi, 1*(1), 29–38. https://doi.org/10.5281/zenodo.11193877

Kartomi, M. (1990). *On concepts and classifications of musical instruments.* Chicago: University of Chicago Press. https://doi.org/10.7208/chicago/9780226426183.001.0001

Kerimov, M. (2003). *The Azerbaijan musical instruments = Azerbaycan musiqi aletleri* (*The musical instruments of Azerbaijan*). Baku: Yeni Nesil Yayinevi.

Mammadova, G. (2025). *Azerbaycan organologiya sahesinde aparilan arasdirmalarin tarixi inkisafi ve gelecek istiqametleri* (*Historical development and future directions of organological research in Azerbaijan*). *Turk Organoloji Dergisi.*

Memmedov, M. M. (2024). *Azerbaycan Milli Konservatuvarinin bilimsel arasdirma labaratuvarinda calisilan ulusal muzik araclarinin incelenmesi* (*Examination of national musical instruments studied in the research laboratory of the Azerbaijan National Conservatory*). *Turk Organoloji Dergisi, 1*(1), 19–27. https://doi.org/10.5281/zenodo.11193759

Montagu, J. (2007). *Origins and development of musical instruments.* Lanham, MD: Scarecrow Press.

Necefzade, A. (2004). *Calgi aletlerimiz* (*Our musical instruments*). Baku: Min Bir Mahni MMC Yayinevi.

Zeller, M. (2019). *Reconstructing lost instruments: Praetorius's Syntagma musicum and the violin family c. 1619. De musica disserenda, 15*(1–2), 137–158. https://doi.org/10.3986/dmd15.1-2.07