

# INTEGRATION OF ORNAMENTS: ARTISTIC AND MATHEMATICAL ASPECTS

**H**aving undergone a centuries-old path of development, the ornament has shaped up as a complex pictorial composition with a profound meaning, and its semantic content is comprised of both clear and vague points. Ornaments are very diverse in terms of their shape, color and content. The experience of an artistic and mathematical interpretation of ornamental plots that adorn the buildings attributed to the Shirvan architectural school of Azerbaijan is described below.

The Shirvan school of architecture formed in the 8th and 9th centuries and flourished in the period between the 11th and 15th centuries. The works of this school reflect the architectural style, which mainly developed in the territory of the medieval state of the Shirvanshahs. The characteristic features of the Shirvan school of architecture include gradual facilitation and tune-up of the heavy forms that were inherent to ancient fortifications, and laying chipped stones was a widespread technique used. **The minaret of the Sinigh-Gala mosque, the Palace of the Shirvanshahs, the Maiden Tower, the Sabael Castle in Baku**, as well as the **Diri Baba Tomb in the Maraza settlement** of the Shamakhi district are among the well-known creations of the Shirvan school of architecture. Of these, the magnificent ensemble of the Palace of the Shirvanshahs is the peak of the Shirvan-Absheron school of architecture, and the distinct features of this style were clearly reflected in the architectural structure and carved ornaments, as well as the inscriptions on the rocks of this remarkable monument.

The ornament has been of tremendous importance as a means of expression for architects and layout designers of the Muslim East. They conveyed to others their thoughts, emotions and tribulations through styl-



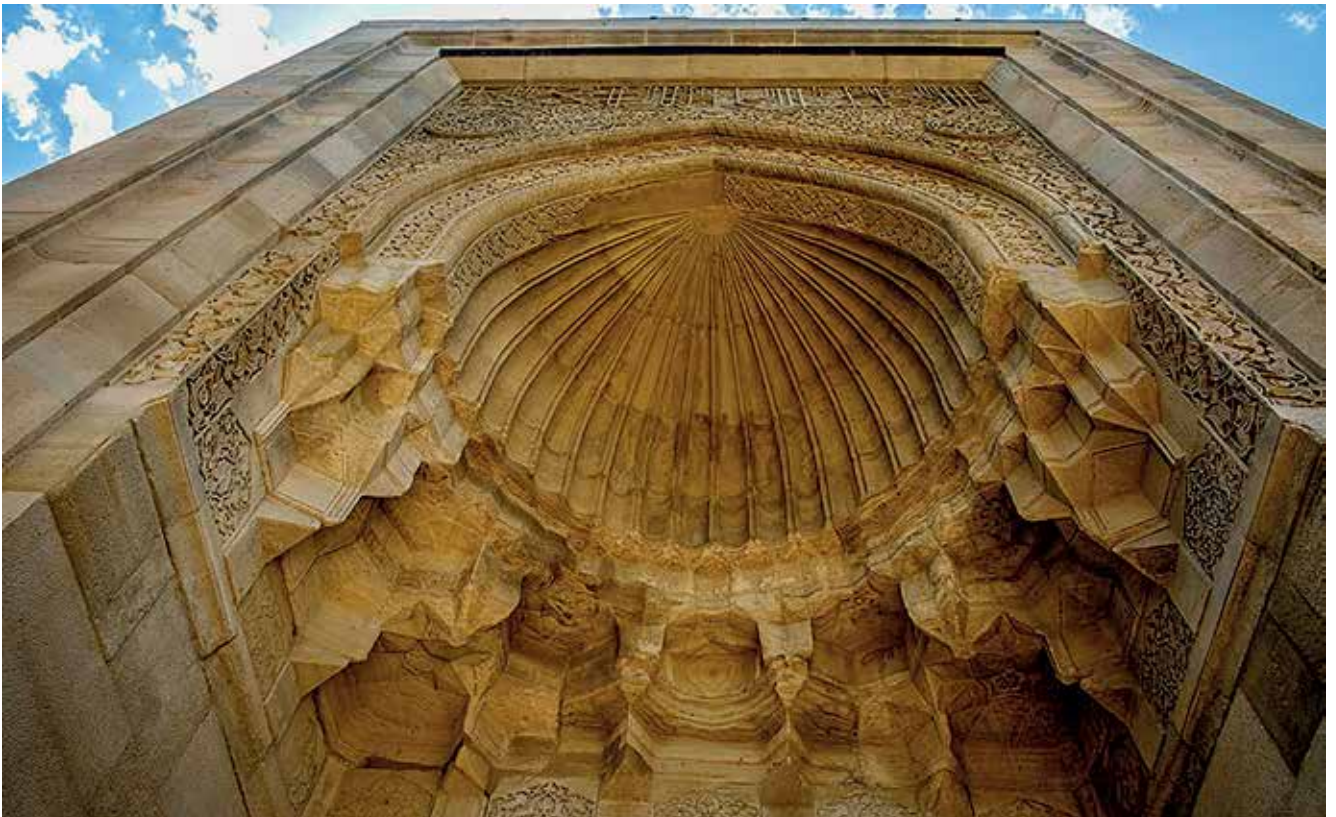
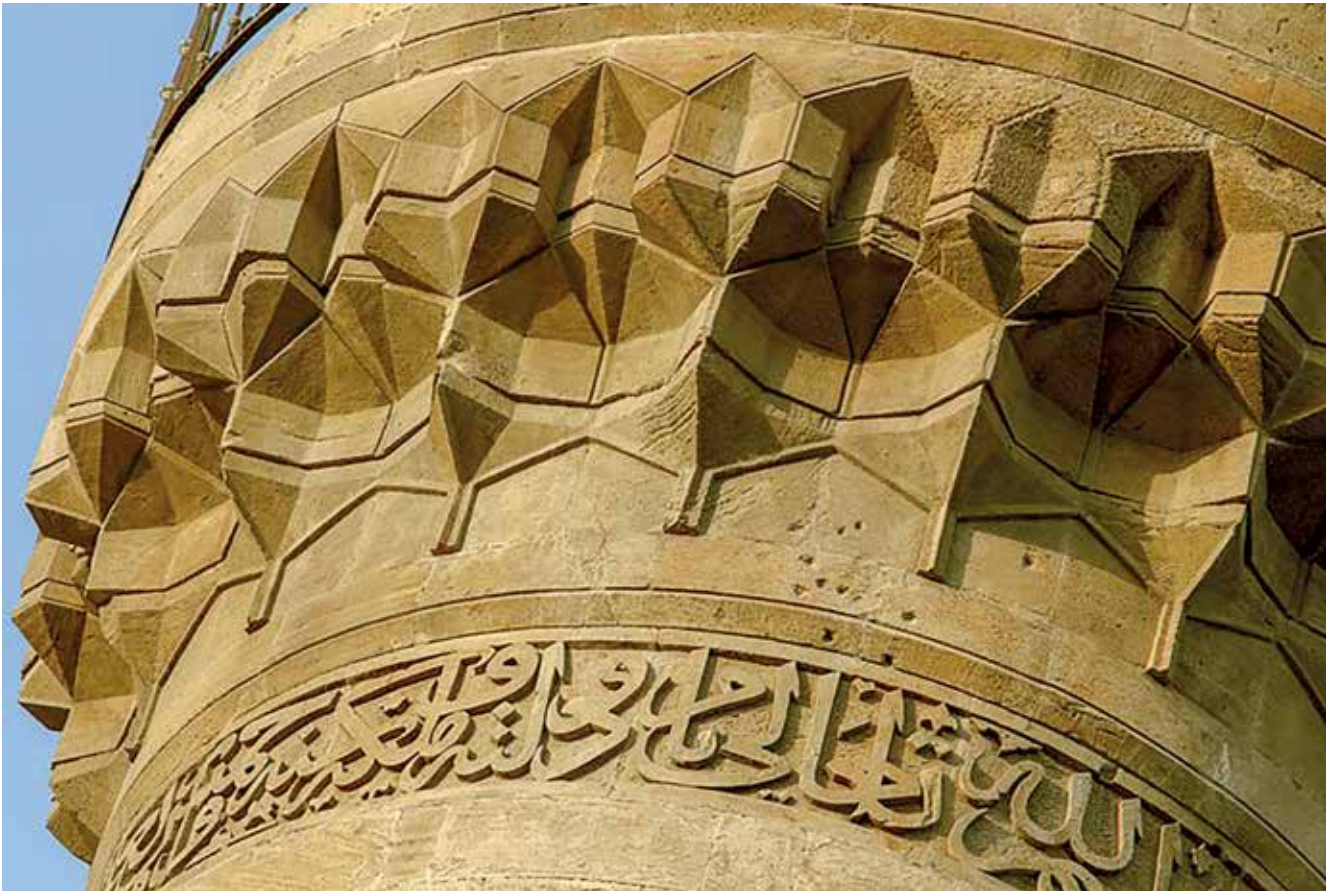
*Rock mausoleum of Diri-Baba near Shamakhi. 15<sup>th</sup> century*

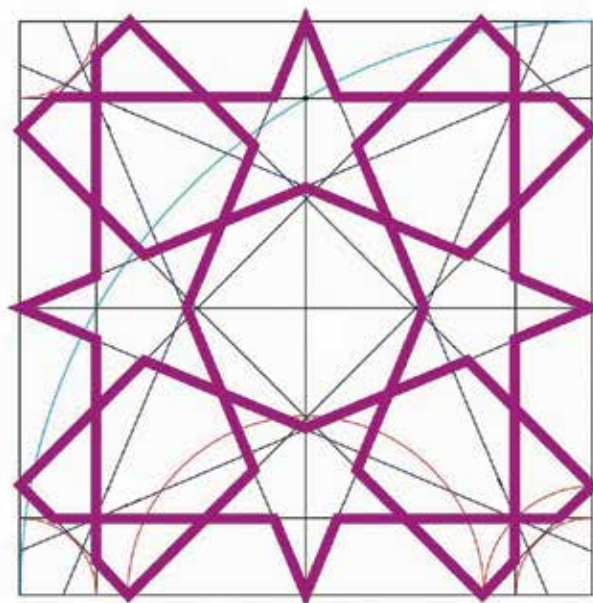
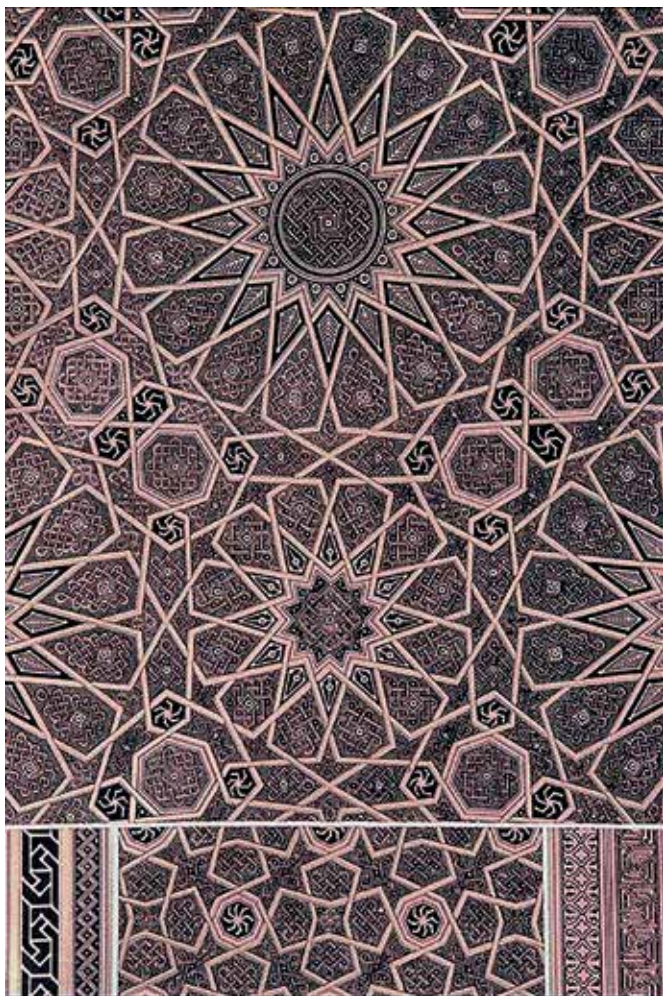
ized ornamental patterns, which became a significant factor in the development and spread of the art of ornaments in Islamic countries.

Two main styles, namely, the geometric one («girikh») and the vegetative one («islimi») stand out in the ornamental art of the Muslim East. The former is characterized by **complex compositions consisting of rectangular and polygonal figures and is widely used in the design of the outer walls of mosques, tombs and the covers of voluminous books**. The latter is manifested in single or paired leaf-shaped ornamental elements, which also form intricate compositions. The floral ornament is widely used in carpet-making to decorate gaps and in the design of fringes and curbs (1). The integration of ornaments is a structural fusion symbolizing the unity and indivisibility of the universe and the integrity of their maker's worldview.

There are several levels of integration in the pres-

*Decoration fragments of buildings of the Palace of Shirvanshahs in Baku. 16<sup>th</sup> century.  
Above – minaret frieze, below – portal of the central entrance*





ent-day educational process: intra-subject, inter-disciplinary and trans-subject integration. Intra-subject integration, i.e. synthesis of the knowledge and skills pertaining to any particular discipline, may be expressed in horizontal and vertical integration. Inter-disciplinary integration is focused on the use of laws, theories and rules applied in one subject when teaching another one. Moreover, similar topics from different disciplines are studied within a single academic process. From this point of view, **the application of inter-disciplinary integration is of particular importance for the effectiveness of the educational process.** The trans-subject or super-subject integration dwells upon the synthesis of the main and additional components of the teaching content, i.e. the actual subject studied along with outside topics.

It appears that considering ornaments as a means of architectural design from the viewpoint of the methods (levels) of the educational process integration opens up interesting opportunities (2). Therefore, the author has developed a number of models of the inter-disciplinary

integration of ornaments based on major elements of exterior decoration of the architectural monuments of Azerbaijan and Turkey.

Works of decorative and applied art show that **dots, circles, triangles, quadrangles and polygons lie at the core of the geometric ornament** and are used to make multi-pointed stars. Let us take a brief look at the main elements that make up a geometric ornament. The simplest but fundamental one is the **dot**, which signifies the outset of everything, symbolizing the starting point of the universe. As is known, according to the generally accepted Big Bang theory, the universe emerged due to the expansion of space and time, which were previously concentrated in a single point. According to Azerbaijani researcher, Prof. S. Dunyamaliyeva, the dot as an element of the ornament plays a dually important role both as an independent decor element and as the fundamental basis of all other elements (3).

**A straight line** is the shortest line connecting two points and it symbolizes the only proper, direct path of a person to the outlined goal, and in the wider context, living a decent and honest life. In addition, an indefinitely large number of curved lines may be drawn between two points, and in ornamentalism they symbolize devious ways in life and wrongdoing.

**An ellipse** is a curve connecting the vertices of an arbitrarily selected triangle. In ornamentalism, it symbolizes eternity, the afterlife in paradise.

**A rectangle**, as well as **a square** in its particular case, symbolizes the actions of a person in the past and pres-

*Decorative design of the entrance to the Palace of Shirvanshahs in Baku. 15<sup>th</sup> century*



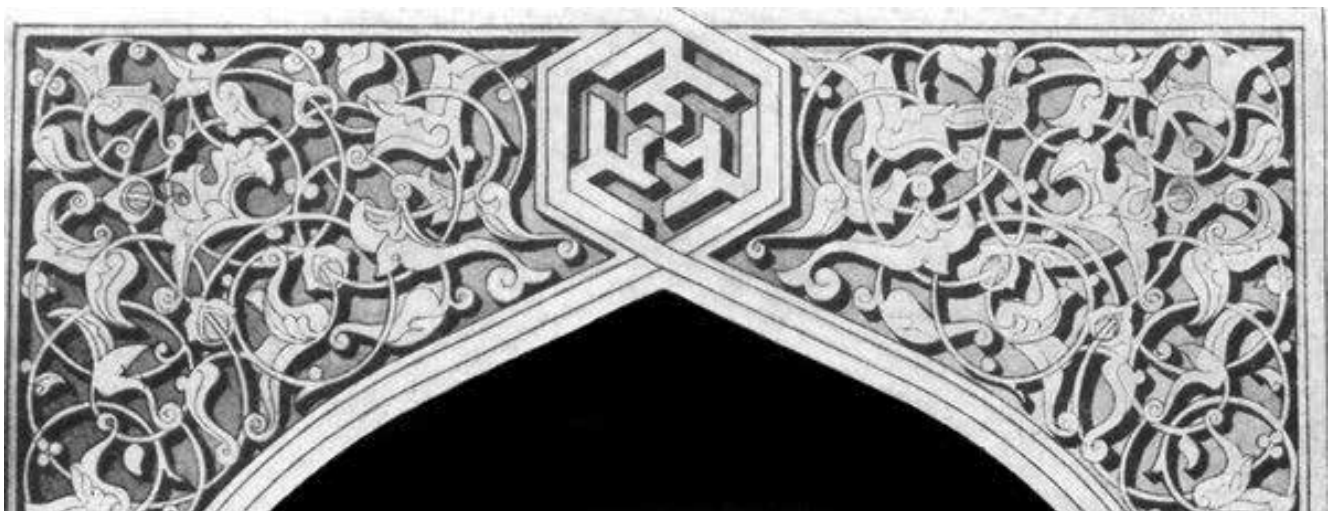
ent and the reward for these deeds that awaits him or her during the afterlife.

**A cube** is perceived as a symbol of temporal dimension, in some way, a temporal vector of everything signified by a square. By the way, the Kaaba temple in Mecca, which is the main Islamic shrine revered by Muslims as the "House of Allah", was built in the shape of a cube, illustrated by the word "Kaaba", which is translated as "cube".

It is noteworthy that a certain meaning is attached

in geometric ornamentalism not only to individual elements, but also their combinations. Thus, intersecting polygons symbolize the inter-crossing of destinies, as well as the kinship and friendly relationships among people. In addition, a successive alternation of the same pattern in the ornamentalism of the Muslim East implies a call to worshipping the Almighty God.

In a nutshell, ornaments deliver a certain message and therefore comply with a number of strict rules.



*Decoration fragments of the Momine-Khatun mausoleum in Nakhchivan. 12<sup>th</sup> century*

The profound content of ornaments stipulates their aesthetic value. **The rules regulating the creation of ornaments include consistency, proportionality, symmetry and alternation.** Obviously, these rules apply to other areas of creativity as well. All ornaments are inter-connected geometrically, mathematically and logically, not to mention in terms of the artistic aspect.

Ancient Greek philosophers asserted that humans differ from other living beings by the breadth of spatial thinking, which they deemed as some divine principle. Creative work is a way for people to express their emotions, worldview and aesthetic views. Therefore, genuine works of creative art have the power of moral influence. The integration of ornaments is an extensive topic, and this short article is merely an attempt to provide an introduction into it. The author hopes that this theme will be of interest and become a subject of systematic research. ✦



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