

## THE STRUCTURE OF GEOMETRICAL ORNAMENTS IN DECORATIVE AND APPLIED ART

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**Abstract-** Azerbaijan is one of the ancient rich historical parts of the world. The artistic sphere of influence of masterpieces created by Azerbaijan skillful architects and painters had been very wide and strong. Many of these decorations had mythical meaning and symbolic essence. The motives worked out on art monuments first of all are expression means of art and they are directed to increase the aesthetical quality of things which they decorated.

**Keywords:** Geometric, Decoration, Architecture, Ornaments.

### I. INTRODUCTION

During thousands years the best patterns of architectural, description and decoration art works created in Azerbaijan was included in the gold fund of worldwide art. It played an important role in the development of art creation of eastern people. Many of Azerbaijani well-known architects, painters and other masters had showed a wide creative activity in the East countries, especially from Turkey to the far India. They took an active part in creating and decorating rare art works which were far-famed in the feudal palaces. The scientific in Azerbaijan ornament field show that some geometrical ornamental forms had developed from ancient time and took traditional picture. These ornaments didn't lose its main essence till nowadays and it uses in the art works more than once until recently.

The ornaments had been unsupported part of Azerbaijan from the beginning of ancient period and at the same time it gifted a highly artistic qualities to the constructive significant of monuments [1]. The creation of decorations is the portentous part of the period and surroundings and complicated separate stages of development of customs, life conditions, religious ceremony and artistic taste in itself. The investigations show that, from the ancient time the art decoration on monuments had never worked out freely and in disorder case, but it always carried out according to the custom rules. These rules characterized the definite description style of culture and performed brightly expression role on artistic aesthetic views of the period. Besides, the main ideological forms of the period as religious, mythology, folklore, poetry, were also influenced to description style.

### II. DECORATIONS

The information of travelers about religious ceremony, art brand and etc. dealing with mastership which take place in Shamakha (Azerbaijan), Tabriz, Ardabil (Iran) are very interesting too. We meet different views about the ornament motives of the art samples, its artistic peculiarities and contents in many works of East painters and art critics. There were given a wide explanation about ornament art, its structure and contents in Iskandar Munshine's "Tarikhi-alam-araye-Abbasi" work, Gazi Ahmad's "About painting and calligraphy" booklet, in the Sadig bey Afshar's "Ganun us - savar".

The investigations show that, though the decoration meet by change on the art monuments are different and we may divide them into six large groups.

1. Geometrical ornaments.
2. Botanical ornaments.
3. Zoomorphic and legendary- mythic images.
4. Topical and narrative description.
5. Decorations made up from different from of calligraphy.
6. Emblems and symbolic essence decoration.

We must note that all these decorations on the art monuments are not met simultaneously. Some of them are decorated by geometrical ornaments and some by botanical ornaments but the others are decorated by mixed ornaments and pictures.

It must be noted that, the most of these ornaments recently having decorated character had a special meaning in the far past and they reflected real, lifeless images which are met in the life and daily round.

### III. GEOMETRICAL ORNAMENTS

Some geometrical ornaments had been the first writing and explanation from among the primitive human in the far past too. From the ancient time geometrical ornaments which were used in schematic and conditional style rose to high development stage in Azerbaijan in the middle age. The high development of geometrical ornaments in the middle ages first of all deals with general development of geometry and algebra, mathematics and other exact sciences. In this period the scientific notions as symmetry, proportionality, harmony, scale passes to the front plan in all fields of artistic

culture. We met by chance an original compound sample of geometrical ornaments on the architectural monuments in the Middle Ages. "Mermina Khatun" and Kuzeyir's son Jusif tombs which were built by Abubakr's son Ajamy may be a nice example for it and they were keepsake of XII century [2].

The geometrical ornaments come cross more than once on the art samples are comparatively callous, static and although in most cases they were in connection with other decoration types. According to their original and artistic image they have been inseparable part of our culture and decorative art. According to their appearance the geometrical ornaments are divided into two groups: simple and compound.

We can include straight, fragmentary, wavy lines, the pictures of reflecting the description of sun, moon and stars into simple geometrical ornaments. Among ornament motives the primary and simple one are the fragmentary lines. We happen upon these on the earthen wares plates found in Khanlar, Gazakh, Nakhchevan territories (Azerbaijan) created in 4-5 thousand years before. The investigations show that, on the base of simple ornaments as straight, fragmentary, wavy lines gradually created the new, relatively compound decorative motives.

This decoration motive happen upon the earthen wares plates created in the far past, afterwards they began to use on the art monuments made from stone, metal and wood. The carried out scientific investigations show that, this decoration motive represented water in the past. As an example to this we can display the red clayey jug founded (in XIII-XVII centuries B.C.) in Shamakha village of Nakhchivan Autonomous Republic (Azerbaijan). The description of duck given between the straight lines on the frame of jug is the point to their swimming on the water.

It is interesting that, even such type of decoration motives given today by the people's masters named water on the border of the carpet and on fine-needle works. Among the simple geometrical ornaments there were "paxlava" like ornaments too. Afterward this decoration kind gradually became compound and it was called "katiba" and it overturned to unsupported part of the decorative applied art type: carpet, fabric fancy work stone engravings and etc. [3].

The compound geometrical ornaments are met mainly on the artistic arrangement of architectural monuments. According to the history most of them belong to the middle age. We see the beautiful and compound samples of these ornaments which are used for decoration main parts of architectural monuments crated in XII-XIV centuries. A lot of these geometrical ornaments were contracted on the base of nets and is formed from the repetition of definite figures and lines on stone, wood, brick and glasses. We met the most beautiful samples of such kind of compound geometrical ornaments like net in "Gulustan", tomb near Julfa (Nakhchivan, Azerbaijan) and in architectural monuments in Baku (Azerbaijan) and in its suburbs. The ornaments come across on "Sinning Gala geometrical" [3].

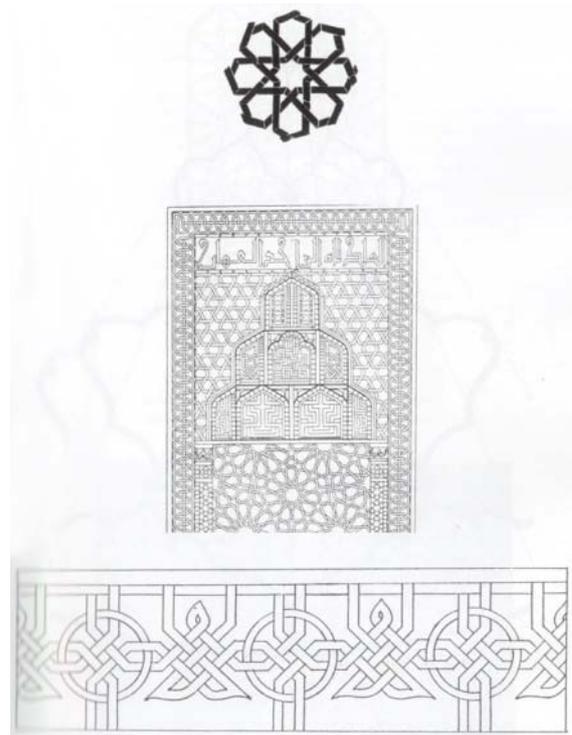


Figure 1. Geometric decors of the mausoleum of "Momina Khatun", 1186, Nakhchivan, Azerbaijan



Figure 2. Metal bars with geometric decor, XIX century, Shusha, Azerbaijan

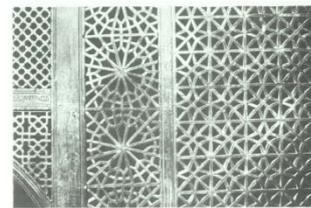


Figure 3. Shebeka of geometric motif in Juma mosque, XVII century, Ganja, Azerbaijan

Others examples include the broken fortress and minaret (1078 year) and on "Seyid Yahya Bakuvi" tomb and in court-house in Shirvanshah's complex in Azerbaijan (XV century).

We must note that, in forming such kind net the like geometrical ornaments which are known in geometry and in other field such as rectangle, rhombic, triangle, parallelogram and hexagon ornaments are used continually. The compound geometrical net like ornaments covered and decorated not only plain surface but in many cases circle surface of Azerbaijan

architectural monuments. We can show as an example the cupolas mosques religious school of musclemen. In this cases net like ornament called "Bandy rummy" are carried out by spreading it from the centre to the sides. There used pair and sometimes single axes for this purpose.

In the middle ages in Azerbaijan the masters creating geometrical ornaments were applied complicating ornaments by color method. In the nature as well as in the society there are met straight, curved and mixed surfaces. Pictures imprinted on these surfaces always aroused interest. Therefore, these ornaments studied in the course of enjoyment if they are reproduced on the basis of exact mathematical calculation and perspective construction [4].

#### **IV. ORNAMENTS**

The main idea of the presented article is dedicated to the study of working out of ornaments in the field of architecture, carving on stone, carpet-weaving on the basis of molecular construction and revealing of their perspective on different surfaces.

The similar modular organization of space found in crystal cells of natural minerals (Zeolite etc.) and polyhedral molecules (diamond, fullerene) witnesses the unity of principles of designing the stable systems, the ergonomically and economically advantageous the stability in a cosmology.

The visual structure of molecules having conceptual value finds its sufficiently bright expression in the spatial DNA (published by Dzh. Witson and F. Krik predicting comprehension of a human heredity and nature of genetic diseases), establishment of correlative dependence between a fine structure and physical-chemical, biological properties, finding of topological indexes for ecologically dangerous dioxins, for the stereochemical theory of an olfaction, for an octane number of oil hydrocarbon, etc. At this stage the most important role falls on the computer generation of molecule designs and development of topological stereochemistry which predict the dependence of molecular properties upon their conformation and configuration structure. In this method they enlarged the measure of the spans (inch). Aforesaid process is fulfilled as mentioned below. At first they take relatively a little span, but the color is repeated passing some spans [5].

We must appendix that, while creating geometrical ornaments the masters did not used complex tools such as ruler, plummet. The strengthening knowledge, measure feeling, the handicraft of masters give them opportunity to create especially simple ornaments approximately (by eye). The examples of traces which are on stone engravings shows it clearly. Thin lines drowned in the preparation stage had stayed between the rest monuments geometrical engraving of Baku (Azerbaijan) and its suburbs. It shows that the masters didn't draw the nets on the paper, but they draw then strictly on the stone with thin pointed metal pen and then they formed an ornament from this.

The expression of substances and their conversion by means of model conceptions on the level of micro-sphere

is the peculiarity of chemical thinking. One obvious methods of such expression is a demonstration of a series of properties of a molecule in the form of its graphic image. These graphics are forms which create plane and volumetric conceptions reminding geometrical figures. Such forms promote the representation of architectural models and designs having a molecular structure with scientific elucidations.

All perfect architectural edifices as all living forms of the nature have their own law of creation of the form and their structural form. Stone annals of all architectural forms reflecting nowadays the whole scientific portrayal of the epoch since the antiquity are obvious examples of that the professions of an engineer and an architect were created on the basis of the scientific of all scientific spheres and are the places of blending of scientific accomplishments as well .

#### **V. ARCHITECTURAL CREATIONS**

As the human being is a part of the nature, the fruit of his mind should reflect the universe, material reality. In this case the result of intellectual work of the man finds its material manifestation of creative thinking is the repetition of the nature. But creative thinking also reveals new peculiarities, qualities and all of it is natural according to inner laws.

From this point of view the notion of chemical structure should unite in itself the principle of resemblance in various spheres and geometrical structure. In this case geometrical structure creates the opportunity of searching the unity in the sphere of architectural creation and stereochemical structure [6].

We come across term "stereochemistry" in the special section of chemistry, the term "stereometre" in a special section of geometry. The word "stereo" in the structure of both words shows their likeness and indicates the volumetric object in the space.

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Modern stereo chemical synthesis is developing in a very complicated and original way. Of course, the investigation of spatial structure of organic substances, the creation of new structures as well as the study and the synthesis of rotaxan and nodulous molecules which don't have chemical ties and exist both in animate and in inanimate world are main problems in modern chemistry.

Some of them are connected with investigations of natural models (oil, living organism etc.) and others with the creation of new models. The latter demands the synthesis of stereochemical structures according to the known "project", that's to say "gathering" of new molecules with any spatial structure. For example, as in building at first calculation is carried out, then to draw up a draft and at last to bring them together. From this point view the synthesis polyhedrons reminding geometrical figures are of great interest.

As long ago as, the German scientist Albert Ladenburg (1869) affirmed that molecules of Benzene have a structure of prism. But then six-term monocyclic structure with the length of sides in 1,42 Å was accepted for Benzene.

Later in 1964 Belgian scientists pointed out the possibility of the synthesis of organic combination preserving the structure of a prism and called it prisman according to Ladenburg's statements. The American chemists Ayton and Cory synthesized the new substance - Cuban, having the structure of a cube (Figure 4).

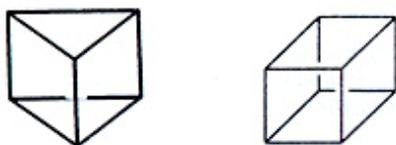


Figure 4. Prism and cubic structures

It should be noted that at present, the chemists continue synthesizing more original models and molecules from the point of view of stereochemical architecture. Adamantine, twisting, congressing, cubing, prism, aster, furler and other polyhedrons are the result of the last achievements in the sphere stereochemical synthesis. They are hydro-carbonal compounds which have the volumetric polyhedral structure reminding geometrical figures [8].

## VI. CONCLUSIONS

All fragments of instructions in the direction of the sides of hexagon are equal. The diameter of the same thickness is with unique type and frame.

1. One of the best features of art culture works of Azerbaijan masters is their artistic merit and worth-wile.
2. It is really so, because there may be found few monuments without ornaments which were created by Azerbaijan architects and masters.
3. For centuries at the result of gained experiences and knowledge Azerbaijan masters could create descriptive ornamental methods, classical compositions, and deep meaning images which have highly artistic peculiarities.

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## BIOGRAPHY



**Nardane (Israfil qizi) Yusifova** was born in Tovuz region of Azerbaijan Republic in October 3, 1959. In 1983, she graduated in the B.S. degree from Azerbaijan State Oil Academy, Baku, Azerbaijan. In 1995, she defended her M.S. dissertation called "The problem of restoration of the artistic images of the monuments on the surface of cylindrical surface". She published more than 150 scientific articles and 2 textbooks including "Spatial Thinking". She is a doctorate in art field and completed her doctoral thesis called "Azerbaijan decorative application of geometric ornaments of art and their spatial structure". Her field of interests are molecular ornaments of geometry and their nomenclature, and difficult subjects in the arts by providing a kind of emphasizes. At present, she is working in Azerbaijan National Museum of History (Baku, Azerbaijan). She is a scientific worker of department of "Scientific and organization of exhibitions" and a member of the Azerbaijan Union of Architects and Creative Teachers.