Symmetrological review of the ornamental patterns of the Chiprovtsi hand-woven carpets

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Abstract. Especially suitable for the study of 2-dimensional symmetry, antisymmetry and colored symmetry is the large number of geometric patterns executed in textile. The tradition of carpet-making in Chiprovtsi, NW Bulgaria is selected for inscription on the Representative List of the Intangible Cultural Heritage of humanity in 2014 by UNESCO. The town of Chiprovtsi is rich in history and was also famous all over the Balkan Peninsula for its goldsmiths. The earliest information about Chiprovtsi carpets dates back from the 17th century. The hand-woven technique,preserving the ancient way of weaving, is used to produce two-sided flat carpets and nowadays. The present investigation arose from a desire to clarify contradictory statements regarding the decorative ornaments which are to be found on the carpeting from different regions in Bulgaria and in the Chiprovtsi carpets particularly.

It is well known that there are 17 classes of symmetry groups of planar ornaments which repeat in at least two nonparallel directions; these are known as crystallographic plane groups. When each set is denoted by a color, the geometrical pattern becomes a color pattern (Senechal, 1975). In this respect, preliminary analysis can be made on symmetry patterns (Shubnikov and Koptsik, 2004).

Characteristic for the composition of the oldest carpets is a rim orbiting a square or rectangular field consisting of one or more strips. The traditional carpet ornamentations of the Chiprovtsi region are symmetrically organized with highly stylizing geometric forms. The first ornamental shape which is determined by the technique of weaving is a triangle (Stankov, 1964). In different models were documented several typical ornaments with specific names as "kanatitsa", "makaz", "kamulka", "karakachka", etc.

According to the symmetry elements and operations in different ornaments are recognized *p1*, *pm*, *cm, pmm, p4, p4mm* and other plane groups arrangements. From each uncolored group of symmetry several colored groups can be derived if different choices of color-changing symmetry operators are made. In such manner some late models, from ornamental period, have received and formed an exceptionally rich decorated style.

Twinning phenomenon, as in crystalline nature, was not failed to be recognized from the Chiprovtsi masters and the beauty of the principle was used in the model composing. It applied in majority with an ornamental match of two or several patterns. Adding of black-and-white (anti-) symmetry to the *p4mm* plane group led to the design expressivity of the oldest carpet example, exposed nowadays in the museum of Chiprovtsi town.

The Arabic geometrical art with its preponderance of hexagonal or trigonal patterns stands unique in the history of ornamental art, while the two-dimensional geometrical patterns of antique Greece and Rome in the great majority were based on orthogonal axial systems(Makovicky and Makovicky, 1977). The rhombohedric-like motifs in Chiprovtsi models known from older carpets apparently borrowed itsdecorative form from the Orient. It is obvious also from semantic point of view that some of the ornaments have foreign origin, such as "makaz" from Arabic and others.

The most distinctive feature of the Chiprovtsi carpets can be mentioned as use of the simplified triangular forms and the stylized models. In addition, the most popular motif "kanatitsa" is regularly used in internal and external architectural decoration of different parts of local public and private buildings

Introduction

The man-made two-dimensional periodical patterns executed in textile are especially suitable for the study of plane groups. The geometric patterns diversity can be described by the symmetry classification of the two-dimensional symmetry, antisymmetry and colored symmetry.The clarity of symmetrological definitions is advantageous when compared to many otherfields of analysis of visual art (Makovicky, 1986).

The characteristic texture and artistic merit of Oriental carpets and rugs are known and widespread in the ancient world from Egypt to Caucasus. Recently the tradition of carpet-making in Chiprovtsi, NW Bulgaria is selected for inscription on the UNESCO Representative List of the Intangible Cultural Heritageof humanity (UNESCO Representative List, 2014). The "intangible cultural heritage" means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity (UNESCO Convention, 2003).

The town of Chiprovtsi is rich in history and was also famous all over the Balkan Peninsulafor its goldsmiths.

The earliest information about hand-woven carpets in the region dates back from the 17th century. The western traveller Ami Boué, who visited Chiprovtsi in 1836–1838, reported that "mainly young girls, under shelters or in corridors,

engage in carpet weaving" (Minkin, 1989). The people of Chiprovtsi have preserved their old-fashioned vertical hand looms and using interlacing method produce flat, two-sided tapestries for floor covering. During the centuries the carpet weaving is deeply integrated in the social and cultural life of the population of the region.

Ornamentation and motifs

The carpets have specific composition, motifs and color. Characteristic for the composition is a rim orbiting a square or rectangular field consisting of one or more strips (Fig. 1a).Their original color schemes often represent either dichroic or multicolored plane groups.

The traditional carpet ornamentations of the Chiprovtsi region are highly stylizing geometric forms which are symmetrically organized. The first ornamental shape which is determined by the technique of weaving is a triangle (Stankov, 1964). The motifs are closely interlocked, and although recognizable as various figures, they function simply as motifs in the pattern, in some cases structured by complex two-dimensional symmetries.

Fig. 1. Chiprovtsi carpets: a) one of the oldest models "karakachka"; b) the "tree of life" composition with geometric floral and birds figures; c) a detail of the model "kufarite" with complex composition, known from the ornamental period.

Names such as "karakachka", "makaz", "kanatitsa" is terminology that weavers use among themselves to indicate which motif should be used. Often displayed in Chiprovtsi carpets are some compositions like "bakam", "esennaloza", "saksykite","kufarite", "tree of life", etc. The "tree of life", which appears in many cultures is a motif frequently used also on Anatolian carpets (kilims, Unal, 2009). Some authors believe that it symbolizes the uniqueness of the god, paradise and immortality. It is generally depicted with birds on it (Fig. 1b).

Three carpet production periods are recognized: constructive, decorative and ornamental (Stankov, 1960).The constructive period covers the earliest models made in the end of the 18th and 19th centuries. The second, decorative period starts from the 19th century. In this period the reddish colors began to dominate in more recent models as well. The last ornamental period is marked by expanding the color variety and ornamental motifs of the models like "kufarite" (Fig. 1c), "saksyite" and others. Chiprovtsi carpets from that times were recognized on the well-known international fairs (London, Brussels, Antwerp, Plovdiv), as well as on other fairs and markets in the region.

Symmetrological aspects

It is well known that there are 17 classes of symmetry groups of planar ornaments which repeat in at least two nonparallel directions; these are known as crystallographic plane groups. When each set is denoted by a color, the geometrical pattern becomes a color pattern. This color pattern illustrates a group which is a subgroup of the pattern group; this subgroup determines, or is determined by, the ways in which the colors are permuted by geometrical symmetry operations (Senechal, 1975). In this respect, preliminary analysis can be made on symmetry of the ornaments and motifs used in the textile (Shubnikov and Koptsik, 2004).

According to the symmetry elements and operations in different ornaments of the Chiprovtsi carpets recognized are:*p1*, *pm*, *cm*, *pmm*, *p4*, *p4mm* plane groupsand some other arrangements. From each uncolored group of symmetry several colored groups can be derived if different choices of color-changing symmetry operators are made. In such

manner some late models, from the ornamental period, have received and formed an exceptionally rich decorated style (Fig. 1c).

Twinning phenomenon, as in crystalline nature, was not failed to be recognized from the Chiprovtsi masters and the beauty of the principle was used in the model composing. It applied in majority with an ornamental match of two or several patterns. Characteristic with such arrangements is the model "kufarite", typical for the ornamental period (Fig. 1c).

Adding of black-and-white (anti-) symmetry to the *p4mm* plane group led to the design expressivity of the oldest carpet example, exposed nowadays in the museum of Chiprovtsi town.

Discussion and conclusions

In general it has been observed that most designs produced by cultures throughout the world are symmetric, and the designs in any given culture are organized by just a few symmetries rather than by all classes of the plane pattern symmetries. We do not yet understand why there is preferred use of several symmetries, nor how these preferences relate to other activities in culture (Washburn, 1986).

The Arabic geometrical art with its preponderance of hexagonal or trigonal patterns stands unique in the history of ornamental art, while the two-dimensional geometrical patterns of antique Greece and Rome in the great majority were based on orthogonal axial systems(Makovicky and Makovicky, 1977).

The rhombohedric-like motifs in Chiprovtsi models known from older carpets apparently borrowed its decorative form from the Orient. It is obvious also from etymological and semantic points of view that some of the ornaments have foreign origin, e.g. "makaz" from Arabic and others. Nevertheless Chiprovtsi motifs are based on orthogonal system and most of them have tetragonal symmetry (*p4*, *p4mm*). The triangular form, typical for most of the carpets, is recognized as part of a square and do not originate from a rhombohedra (Fig. 2).
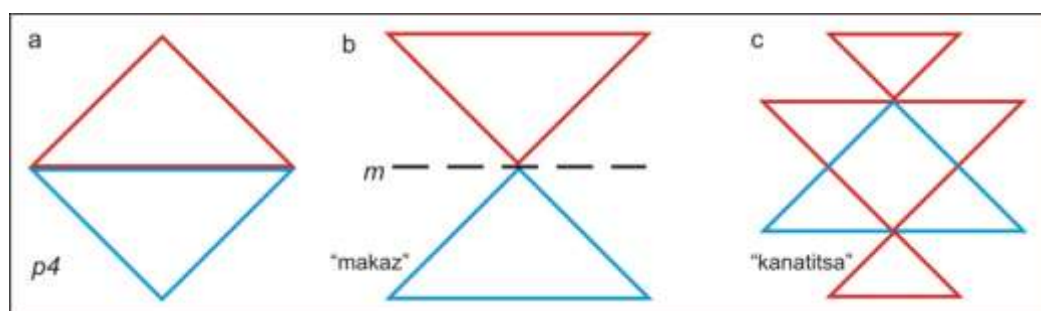

Fig. 2. Schematic representation of motifs "makaz" and "kanatitsa" and their symmetry

The most distinctive feature of the Chiprovtsi carpets can be mentioned as use of the simplified forms and the stylized modelsstructured by complextwo-dimensional symmetries. In addition, the most popular motif "kanatitsa" (Fig. 2c) is regularly used in internal and external architectural decoration of different parts of local public and private buildings.

References

Minkin, A. 1989. The Chiprovtsi carpet and the international exhibitions. Chiprovtsi 1688-1988. Sofia, 168-215.

Makovicky, E. 1986. Symmetrology of art: Coloured and generalized symmetries. *Computers and Mathematics with Applications,* 12B, 3-4, 949-980.

Makovicky, E., Makovicky, M. 1977. Arabic geometrical patterns – a treasury for crystallographic teaching. *Neus Jahrbuch fur Mineralogie Monatshefte*, 58-68.

Senechal, M. 1975. Point groups and color symmetry. *Zeitschrift fur Kristallographie*, Bd. 142, 1-23.

Stankov, D. 1964. Chiprovtsi Carpets, Sofia, BAS, 152 p.

Shubnikov, A.V., Koptsik, V.A. 2004. Symmetry in Science and Art. Moscow-Ijevsk: Institute of computer investigations, 560 pp. (in Russian)

Unal, S. 2009. Symbolic meanings and characteristics of Anatolian kilim motifs. XXV European Crystallographic Meeting, Program and Abstracts. Istanbul, Turkey, August 2009, 12-13.

UNESCO 2003. Convention for the Safeguarding of the Intangible Cultural Heritage, 14 pp.

UNESCO 2014. Representative List. Ninth session. Paris, France. Nomination File NO.00965 for Inscription on the Representative List of the Intangible Cultural Heritage of Humanity in 2014, 16 pp.

Washburn, D.K. 1986. Pattern symmetry and colored repetition in cultural contexts. *Computers and Mathematics with Applications,* 12B, 3-4, 767-781.