GEMMOLOGICAL SIGNIFICANCE OF THE PREHISTORIC BALKAN "NEPHRITE CULTURE" (CASES FROM BULGARIA)

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ABSTRACT. According to recent mineralogical determinations of prehistoric (Neolithic and Eneolithic) artefacts from Bulgarian museums a lot of nephrite objects have been identified (mainly represented by small axes and chisels, ritual scepter and zoomorphic amulets as well as some decorations). Their distribution on the territory of Bulgaria has been traced, together with data on some neighboring countries on the Balkans and in other European regions. A description has been made of the colour varieties, microscopic features and the possible methods of working of some of the nephrite artefacts. The lack of up to now known nephrite occurrences on the Balkans puts the question about the origin of nephrite and the more detailed study of places with ultrabasic rocks. Because of the large number of nephrite objects found, which have been aged since the Early Neolithic, as well as of their significance in the history of human civilization, a *Balkan "nephrite culture"* has been introduced, which is considered earlier in time (VII-VI mill. BC) in respect to the well known Neolithic "nephrite cultures" in China (Hemudu, Hongshan, Liangzhu, Longshan) and the Russian Federation (Kitoi, Glaskovo).

ГЕМОЛОГИЧНО ЗНАЧЕНИЕ НА ПРАИСТОРИЧЕСКАТА БАЛКАНСКА "НЕФРИТОВА КУЛТУРА" (ПРИМЕРИ ОТ БЪЛГАРИЯ)

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РЕЗЮМЕ. Въз основа на проведени минералогични описания на праисторически (неолитни и халколитни) артефакти от български музеи е установено наличие на голям брой изделия, изработени от нефрит (предимно представени от малки тесли и длета, ритуални предмети като скиптър и зооморфни амулети, а също и украшения). Проследено е тяхното разпространение на територията на България, като са дадени данни и за някои съседни страни на Балканите, както и в други европейски региони. Описани са цветовите разновидноси, микроскопските характеристики и възможните начини на обработка на някои от нефритовите артефакти. Липсата на досега известни нефритови проявления на Балканите поставя въпроса за произхода на нефрита и за подетайлното изучаване на районите със ултрабазични скали. Поради големия брой намерени нефритови изделия, датирани още от ранния неолит, както и поради тяхното значение в историята на човешката цивилизация, се предлата въвеждането на понятието *Балканска "нефритова култура*", която изпреварва назад във времето (VII-VI хил. пр.Хр.) известните неолитни "нефритови култури" в Китай (Хемуду, Хонгшан, Лянгжу, Лонгшан) и Руската Федерация (Китой, Глазково).

Introduction

Recent observations, redeterminations and publications mainly on prehistoric rock and mineral artefacts from Bulgarian museums have revealed a lot of nephrite samples which have been mislabeled or unidentified from a mineralogical point of view (Kostov, 2004a; 2004b; 2005; Kostov, Bakamska, 2004; Kostov, Genadieva, 2004; Kostov et al., 2003).

According to archaeological data the nephrite objects are spread throughout the Neolithic and Eneolithic period (~7000-4000 BC in Bulgaria). Some of them are masterpieces of art and as stage of perfection, thus pointing to the Balkans as a cradle of prehistoric gemmology.

Nephrite □Ca₂(Fe,Mg)₅Si₈O₂₂(OH)₂ is a Fe-Mg-bearing Casilicate mineral with a double-chain structure, which is classified in the group of amphiboles (clino-amphibole). It is a massive variety with a composition in the tremoliteferroactinolite series. It is known mainly with a pale green or dark green colour, but can also be coloured in white, yellowish, red-brownish or even black. Its genesis is attributed mainly to metasomatic processes in ultrabasic (serpentinites) host rocks. The main genetic types deposits of this gemmological material are related to the contacts of gabbroids or methamorphic rocks with ultrabasic rocks or to their contacts with dolomitic marbles (Suturin, Zamaletdinov, 1984; Harlow, Sorensen, 2001; Kostov, 2003).

Nephrite and jadeite (NaAlSi₂O₆, another usually similar in colour pale greenish mineral, but a member of the group of pyroxenes) are frequently mistaken in general archaeological or historical articles, as the unified term 'jade' has been introduced a long time ago up till modern times, when no precise mineralogical determination has been used (the word comes from the Spanish 'piedra de ijada' – stone of the loin, a name given to the green decorative mineral brought back to Europe from Central and South America by the 16th century Spanish conquistadors). Jadeite has hardness on the Moss scale 7-6.5, and nephrite – 6-5.5 (for an early historical review on both minerals see Fischer, 1881; Bauer, 1914).

Nephrite as a gem material has been treasured and revered for its colour and durability in different societies throughout the centuries and especially in Asia it became an integral part of China's history and society (Laufer, 1989). Today, nephrite as raw material for the gem industry is mined primarily in northeast China (deposits in the Kunlun Mountain, Xinjiang Uygur Autonomous Region), the Russian Federation (Eastern Sayan Mountains, Eastern Siberia, Buryatiya), Taiwan, Australia, New Zealand, the U.S.A. (Alaska, California and Wyoming) and Canada (British Columbia).

Nephrite artefacts

Small axes and chisels with a fine polish represent the dominant quantity of nephrite artefacts. About 30 such artefacts are known from the districts of Pernik (Kostov, Bakamska, 2004) and Kyustendil (Kostov, Genadieva, 2004) as well as from some other sites in Southern Bulgaria, for example from Kurdjali (see Kostov, 2004a; 2005). Among the artefacts frequently can be found ritual zoomorphic (frog-like) figurines or amulets (Todorova, Vajsov, 1993; 2001), one of them well preserved with a 4-fold rotational symmetry from the Early Neolithic site at Kurdjali (Peikov, 1986; Kostov, 2004a; 2004b; 2005). Early Neolithic frog figurines, also carved from some sort of green mineral or rock ('greenstone'), have been reported from Nea Nikomedeia in Northern Greece (Rodden. 1964) and Anza in Macedonia (see Kostov, 2004b; 2005). A unique and finely polished scepter, 36.4 cm long, found at the Early Neolithic site at Galabnic near Sofia is supposed to be of the same material (Kostov, Bakamska, 2004). Most of the nephrite artefacts are located in southwest Bulgaria - they have been found mainly in archaeological sites along the Struma valley.

A fine 12.1x0.7 cm size nephrite 'hair pin' with three holes without analogue has been found among the artefacts from the Middle Eneolithic Varna II necropolis (*The First Civilization...,* 1982; Kostov et al., 2003; Kostov, 2004a; 2005) together with some of the earliest golden beads and painted pottery. Nephrite-bearing or nephrite-like artefacts from some of the discussed and other sites must have also to be taken into consideration because of their similar greenish colour resemblance.

The nephrite carver's art has developed continuously from Neolithic times. Technically, the surfaces of the objects were gradually worn away and shaped through the patient application of some sort of hard abrasive medium (most probably fine quartz sand has served the purpose). Nephriteworking tools, which acted only as agents for carrying the abrasive medium, were necessarily simple. They included cords as well as implements in wood and/or bone. A fine stone holder (made of dark ultramafic rock) probably used in the drilling process is known from the Middle Eneolithic necropolis Varna II (Kostov et al., 2003). All main methods of cutting gems have been known since the Early Neolithic - sawing (usually for beads), grinding (giving the object a rough shape on stone plates with abrasive material) and polishing (the polishing agents are under discussion). In certain cases (for amulets and other prestigious objects) carving and engraving hava been applied. Later on, during the Late Eneolithic, some complex faceted chalcedony (carnelian and agate) beads (usually with 2x16=32 facets) have been described from the Varna and Durankulak necropoli (Kostov et al., 2004).

Mineralogy of the nephrite

The nephrite artefacts from different archaeological sites seem to be from at least two different deposits (regions). They are mainly two types of nephrite structure and colour variety – monochromic (pale yellow-green; dark green; pale gray-green) and green spotted with black inclusions (oxide ore mineral). Among the spotted nephrite samples are the 4-fold symmetry zoomorphic amulet from the Early Neolithic site Kurdjali (not properly identified in earlier works as jasper; Peikov, 1986) and the nephrite pin from the Middle Eneolithic necropolis Varna II (not properly identified in earlier works as green marble; *The First Civilization...*, 1982).

Two samples (pale green and dark green nephrite) from fragments of small axes from the Neolithic site at Galabnic have been studied under the microscope (Fig. 1 and 2). They have been identified previously by X-ray analysis (Kostov, Bakamska, 2004).



Fig. 1. Long fibers of nephrite under crossed polars; size of photo – 1 mm width (sample of pale green nephrite from the Early Neolithic site Galabnic)



Fig. 2. Short fibers of nephrite under crossed polars (black spots – opaque ore mineral); size of photo – 1 mm width (sample of dark green nephrite from the Early Neolithic site Galabnic)

The pale yellow-green sample displays non-orientated long fibers of tremolite-ferroactinolite, and relict amphibole crystals can be observed together with some ore mineral of the chrome-spinelid family. The dark green variety of nephrite is composed of non-orientated short fibers of tremoliteferroactinolite and also of minor inclusions of the opaque chrome-spinelid mineral. In plane polarized light in both cases the fibers are colourless and not greenish, thus the tremolite part and nature of the series has to be taken into account.

Colour in nephrite has been related by optical absorption and Mössbauer spectroscopy to one or more of the following main cases: crystal field spectra of Fe^{2+} and Cr^{3+} , charge transfer $Fe^{2+}-Fe^{3+}$ or O²— Fe^{3+} (Platonov et al., 1975). Darker samples in general are considered with a higher total iron content, but in some cases even cream or white unweathered nephrite samples can contain high iron concentrations (Wilkins et al., 2003).

In search for nephrite deposits

The nephrite occurrences in prehistoric times on the Balkans raise a lot of questions. No nephrite deposits are known cited in publications in this region despite of the favorable geological setting with a lot of ultrabasic exposures (Montenegro, Serbia, Albania, Macedonia, Southern Bulgaria and Northern Greece). Nephrite has been probably observed only microscopically in some Eastrhodopian ultrabasic outcrops (Kozhukharova, 1990). The well known European nephrite deposits in Poland (Traube, 1885; 1887), Switzerland (Dietrich, de Quervain, 1968; Stalder et al., 1993) and Italy (Kalkowsky, 1906) have been 'discovered' in the late XIX and early XX centuries, and do not provide information or can not be related to trade routes on the Balkans in prehistoric times. Another alternative is that the nephrite deposit or deposits on the Balkans have been exhausted or disappeared due to some geological (earthquake; volcano; landslide) or other natural process (soil; active vegetation).

Nephrite artefacts are known from prehistoric sites in Bulgaria since the Early Neolithic and they 'disappear' after the Eneolithic period. The use of this precious material can be attributed to a population with its specific mythological system in the discussed region. It is a surprise for gemmologists the precision and symmetry of the objects as well as the perfection in their final polishing.

On the Balkans nephrite artefacts have been reported from several Neolithic to Early Eneolithic sites in Croatia, mainly along the Adriatic coast and they have been properly distinguished from the similar in colour jadeite artefacts (Petrić, 1995; Burić, 2000), which are widely spread in prehistoric Western Europe (see Campbell Smith, 1965; D'Amico et al., 1995). Other nephrite artefacts are known in Greece (for example from the Neolithic site Sesklo in Thessaly – on display at the Athens National Museum; thanks to Mr. P. Zidarov for his kind information), and probably in Montenegro, Albania and Macedonia (see Kostov, 2005).

In the rest of Europe a few small prehistoric polished stone axes with a nephrite composition have been reported rom Poland (Foltyn et al., 2000; Gunia, 2000), Switzerland (Stalder et al., 1993) the islands of Sardinia (Bertolino et al., 2002) and Sicily (Leighton, 1989) and under question from a mineralogical point of view in some other places – all related to possible local or near-by resources (for discussion see Geschwendt, 1977; Kostov, 2005).

As the Early Neolithic on the Balkans is dated about the VII-VI mill. BC, thus the observed nephrite objects as part of the Balkan prehistoric area are considered as representatives of one of the earliest 'nephrite culture', long time before the well known famous 'nephrite cultures' (Hemudu; Hongshan; Liangzhu; Longshan) in Neolithic China (Wen, Jing, 1992) or the Neolithic cultures (Kitoi; Glaskovo) in the Angara-Baikal region of the Russian Federation (Okladnikov, 1950; 1955; Suturin, 1986). In this respect it is interesting to have a precise age of the Neolithic Xinglongwa site in China, from where a few nephrite objects have been reported as the 'earliest refined 'jade" (Jing, Wen, 1996; Yang, Liu, 1998).

Conclusion

A high number of nephrite prehistoric artefacts have been found on the territory mainly of southwestern Bulgaria and adjacent northern Greece. The question about the in situ nephrite deposits in Europe and some possible clues for finding such deposits from a geological point of view on the Balkans has to be discussed. Suitable geological conditions for nephrite formation are serpentinitized ultrabasic rocks and ophiolithic belts, which are known in the geological setting of different countries in the Western Balkans, including Bulgarian territory. The observed nephrite artefacts are considered among the earliest in history according to their variability, perfection and style. The symbolism of the zoomorphic (froglike) figurines (amulets) has to be explained in terms of prehistoric mythology and colour impact. The uniqueness of the green gemmological material (or similar substitutes) has to be studied with joint mineralogical and archaeological efforts. The Balkan 'nephrite culture' in prehistoric Europe has to be declared as one of the earliest in human civilization not only on the continent. but worldwide.

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