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GREEN BONE PIN FROM PIETRELE: POSSIBLE EVIDENCE FOR INTENTIONAL COLOURATION OF BONE ARTEFACTS DURING THE COPPER AGE IN THE BALKANS

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ABSTRACT. The paper introduces a newly found green stained bone pin from the Copper Age tell settlement Măgura Gorgana, near Pietrele in Romania, and discusses the possible mechanisms for its colouration. The argumentation makes parallel to medieval recipes for colouring bone, the ingredients of which could have been available already at the site in this period.

Archaeological excavations in 2007 at the late Copper Age site Măgura Gorgana near Pietrele in Romania yielded a bone pin conspicuously stained green. While decorative colouration of bone objects was common in Antiquity and Mediaeval times (MacGregor, 1985, 67-70; Stancheva, 2002, 107-111), the find in question is unparalleled among contemporary assemblages in the region. Hence, the purpose of this paper is to consider the possibilities for circumstantial and intentional character of its colouration, as well as to attract the attention of colleagues working in the region to look for further evidence.

The find, Museum N-P07B513-376, is a distal fragment of a common type of bone pin (Fig. 1). It has a smooth and polished surface, rounded cross-section and a slender shaft with roughly parallel lateral edges ending in a blunt tip. The proximal end is broken and missing. Judging by contemporary finds from Romania and Bulgaria, it could have ended as simply and evenly cut, or with a flat rounded, spatulate, rhomboid or heart-shaped head (Todorova, Vajsov, 2001, Taf. 10-11). The preserved part of the shaft measures 39 mm in length and 4 mm in diameter. Unlike its counterparts from Pietrele and the contemporary sites in the region, this pin is distinguished by intensive green colouration, distributed regularly along the total length of the artefact, as well as across its entire volume as observable at the breaks.

Fig. 1. Green stained bone pin from Pietrele

Such pins are usually made of splinters extracted from the compact tissue from the diaphysis of long bones of large ungulates. Unfinished objects found in Pietrele, bear evidence that the most likely raw material for this purpose would be cut out from red deer metapodials, shaped by scraping, and finished by grinding on whetstones bearing characteristic grooves.

The compact bone tissue has a porous structure and is easily permeable to tainting solutions. Sometimes in anthropogenic deposits, where bone and copper objects were buried in intermediate proximity, ions from the copper objects seem to have migrated in wet and slightly acidic conditions onto the bone surface and into the structure of nearby bone objects causing partial green staining. This could be illustrated with another find from Pietrele – a 114 mm long flat bone figurine, having a copper earring fixed to a hole on its head and copper wire on its legs (Fig. 2; Museum N-P05B168-626; cf. also Hansen et al. 2006, 41, Abb. 85). The colour of this artefact is white to pale brown for most of its surface, except for the areas adjacent to the copper pieces, which gained characteristic green colouration. Still, it should be pointed out that this pigmentation is limited to an area extending for less than a centimetre around the points of contact and gradually faints away. Contrastingly, the colouration of the green pin is regularly distributed over a length of more than 40 mm, and across its entire volume. Given the scarcity of massive copper objects among the hundreds of copper finds from Pietrele, it seems rather unlikely that the reviewed bone pin was in direct contact to a copper object so big that would have such profound effect on it, and would yet dissolve completely prior to excavation. Therefore, it seems plausible that the pin was coloured before entering the sediment.

In the historical records, two main sources for green pigments suitable for colouring bone are listed: one of organic, the other – of mineral origin. According to one anonymous manuscript, *Mappae Clavicula* (ca. 850-900 AD), one of the

Fig. 2. Green stained bone figurine from Pietrele

basic substances for achieving green colour is *lulax* or the dye derived from the leaves of woad (Sharenkov, 1988, 236-237).

There are several suggested procedures that will enhance the dying process: "*240. Dyeing bones, horns, and woods green -- First scrape whichever of these you want and put them into Asian alum: treat bones with alum for 12 days; horn, however, for 9 days; and wood for 4 days. Then cook well some weld, and while it is simmering, put whichever of these materials you want into it: and when it has cooled, mix some lulax, and put them into it, and leave for 5 days. Afterwards take them out and wash them*" (Smith, Hawthorne, 1974). Lulax or woad (*Isatis tinctoria L.*) was widely used as the primary source of blue dye throughout the Medieval period in Europe since indigo proper was a rare commodity until the discovery of the sea route to India in the late fifteenth century. Scholars disagree as to the place of origin of woad, some favouring Western Asia, others – South-Eastern Europe (Barber, 1991, 233). So far, there is just a single evidence for its possible use in prehistory. It is documented on a bone tool wrapped in bast fibers which were reportedly partly coloured in blue and found in late Neolithic levels, excavated in the cave Adaouste, Bouche du Rhône in France (Barber, 1991, 234).

Considerably more popular in the historical records is the use of *verdigris* or cupric acetate, derived from dissolving the greenish patina developing on copper objects in acidic solution such as vinegar. In anonymous manuscript *Segreti per colori* from 15 c. AD, is given a simple recipe for colouring bones green that could have been available as soon as the production of the first copper objects took place: "*371. To dye bones green. -- Mix finely powdered verdigris with the very strong vinegar, and put white bones into a vase closely covered, warm them a little, and they will become green*." Another recipe from the same manuscript suggests: "*377. To dye bones green. -- Put bones well cleaned into a vase full of ley, with goat's milk and verdigris very finely powdered; cover the vase closely, and bury it in dung for the space of 10 days, and the bones will become green inside and outside*" (Merrifield 1849). Elsewhere while discussing textile dying, the same source mentions that for similar purpose, one could use urine instead of vinegar. It is well known that urine helps developing the green patina on copper, which has not only decorative but also protective function against corrosion. Hypothetically, it could be envisaged that copper objects, and especially ornaments such as pins, could have been dipped in urine for achieving greenish coating and durability. The latter idea could have been even borrowed by association from tanning procedures, where soaking hides in urine makes them resistant to decay. It is not impossible that under certain conditions, a bone pin dipped next to a patina-coated copper object in a vessel full of vinegar or urine could become green.

A chemical analysis could reveal the source of pigmentation of the pin from Pietrele. Although, we may never be sure, whether its colouration happened deliberately or not, it cannot be ruled out that in a period and region, marked by series of important inventions, someone could figure out the recipe to colour the bone green. A good reason to do so would be to replicate other green coloured pins fashionable at the time, such as those made from nephrite (Kostov, 2007, 13-14), and possibly even copper ones, given they were used coated with green patina.

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