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X-RAY, SYNCHROTRON AND NEUTRON IMAGING OF METAL ARTIFACTS FROM THE BLACK GRAVE MOUND

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Synchrotron and neutron imaging are the unique tools that allow non-destructive studies of the internal structure of bulk metal objects. It's very significant for the assessing artifacts preservation, clarifying the manufacturing technology and localization of possible decorative ornaments.
A complex of imaging techniques including X-ray computed tomography, synchrotron radiography and tomography at the KISI "Kurchatov" synchrotron radiation source and neutron tomography at the neutron source Research reactor IR-8 are used at the Kurchatov Institute. These methods are complementary, since the different nature of radiation interaction with matter.
We have studied some artifacts from the most famous mound of Medieval Rus'–Chernaya Mogila (Black Grave mound, X century, Chernigov) from the collection of State Historical Museum in Moscow. The presented results of X-ray, synchrotron and neutron studies of metal artifacts showed rich ornamentation of weapons and allowed us to study on the hidden features. In particular:
- the silver decoration of Scandinavian style was detected on the object with unknown function, later it was supposed that this object was 'barbarian scepter'[1];
- a part of a mark on a blade fragments was recognized [2];
- details of a manufacturing technology were clarifying for composite construction of the helmet [2];
- some items (stirrup, spear-heads etc.) were recognized inside the sintered bulk of weapon [2].

References:

1. V. Murasheva, S. Kainov, E. Kovalenko, *et al.*, 'Barbarian Scepters'of the Viking Age from the Chernaya Mogila burial mound at Chernigov (present-day Ukraine) (in press).
2. E.S. Kovalenko, V.P. Glazkov, M.M. Murashev, *et al.*, X-ray, synchrotron and neutron imaging of metal artifacts from the Chernaya mogila (in press).

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