

## **Romanian ancient gold objects provenance studies using microbeam methods**

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The study of trace-elements and inclusions in archaeological metallic objects can provide important clues about the metal provenance and manufacturing procedures. Several fragments of ancient gold objects coming from an Eneolithic treasure (fragments of small gold idols) and from Pietroasa hoard (IV Century), and two Transylvanian native gold nuggets were analyzed using micro-PIXE technique at the Rossendorf TANDETRON and at the Legnaro AN2000 Van de Graaff microbeam facilities and using micro-XRF technique at ANKA-Karlsruhe synchrotron radiation facility. In Pietroasa case, the origin of the objects must be heterogeneous, because three styles are evident: Germanic, Roman and Persian-Sassanide. The purpose of the study was to clarify the metal provenance, establishing if the hypothesis of local gold holds. Trace elements (Cu, Te, Sn, Pb, Hg, As, Zr, Sb) and PGE (Platinum Group Elements) concentrations were determined for samples from three idols, two fibulae and the patera, and two natural gold nuggets. We found some Si, Ca, Fe inclusions on two Eneolithic samples, some Ta, Nb and Cr ones on two Pietroasa samples (fibulae), and a Ir one on the Roman style patera. The measurements suggest an alluvial origin for the for the Eneolithic gold (Si presence) and gave indications for possible gold sources of Pietroasa treasure – Ural Mountains (where Ta, Cr, Au but also Pt are largely found as common minerals – e.g. "samarskite", a type of columbite – Ta, Nb mineral) for the fibulae and Mediterranean gold (probably re-melted) for the patera. As concerning the Neolithic idols, their composition (more than 90% gold, around 5% silver and less than 1% copper) is similar to Varna treasure composition and to other Greek Neolithic gold idols. As concerning the Romanian gold nuggets, their high silver content (10-25%) and Te, Pb and Hg impurities made them completely different from the gold composition of the archaeological objects.