

GEOLOGICAL AND MINING HERITAGE OF TWO HISTORICAL MINING LOCALITIES (ROMANIA)

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- The aim of this work is to underline the importance of the geological and mining heritage of two localities (Roşia Montană and Brad) situated in the South Apuseni Mountains (Western Romania) (Fig. 1). The region is worldwide known for the numerous ore deposits of Neogene age — Au-Ag-(Te) or Pb-Zn-Cu-(Au, Ag) epithermal and porphyry Cu-(Au-Mo) deposits — forming the richest metallogenic region of Romania (Ianovici et al., 1976; Borcoş et al., 1998). It is also famous for the minerals discovered here for the first time in the world (<http://cnmnc.units.it>).
- According to the archaeological and historical data, the oldest mining activities (mainly for alluvial gold) in this region date back to Late Neolithic. During the Roman Dacia (from 106 to 271 A.D.), but also in the Medieval period and in the 18th–20th centuries, it was one of the most important gold mining regions of Europe. The region was so rich in gold and other precious metals, that, at the beginning of the 20th century, the name of *Golden Quadrilateral* started to be used for the area containing all these deposits (Ghiţulescu and Socolescu, 1941).
- **Roşia Montană** (known as *Alburnus Maior* in Roman times) is a village in the Alba County in which, starting with the Roman Dacia period, the ore mining was well-developed. Roşia Montană is renowned as a high-grade gold-silver deposit of epithermal type. It is also the type locality for the mineral alburnite. Within the protected zone of the historic centre of the village, there is the "Cătălina Monuleşti" Mining Gallery, a national historical heritage (Roman, Medieval and Modern periods) (INP). Opened in 1981, the Gold Mining Museum itself is on the list of national heritage (historical monument). The open-air part of the museum exposes archaeological vestiges, equipment for mining and ore processing etc. (Fig. 2).



Figure 2. Gold Mining Museum in Roşia Montană Village (Alba County). Image from the open-air part of the museum.

In the underground part of the museum, the visitors can see Roman galleries and learn about the mining technics used at that time (Fig. 3). Two natural monuments of geological interest (ANANP), namely Piatra Corbului and Piatra Despicată, are located not very far away from the village centre (Fig. 1).

Since 2021, the Roşia Montană Mining Landscape is both on the World Heritage Site List of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and on the UNESCO's List of World Heritage in Danger (<https://whc.unesco.org/en/list/1552/>).

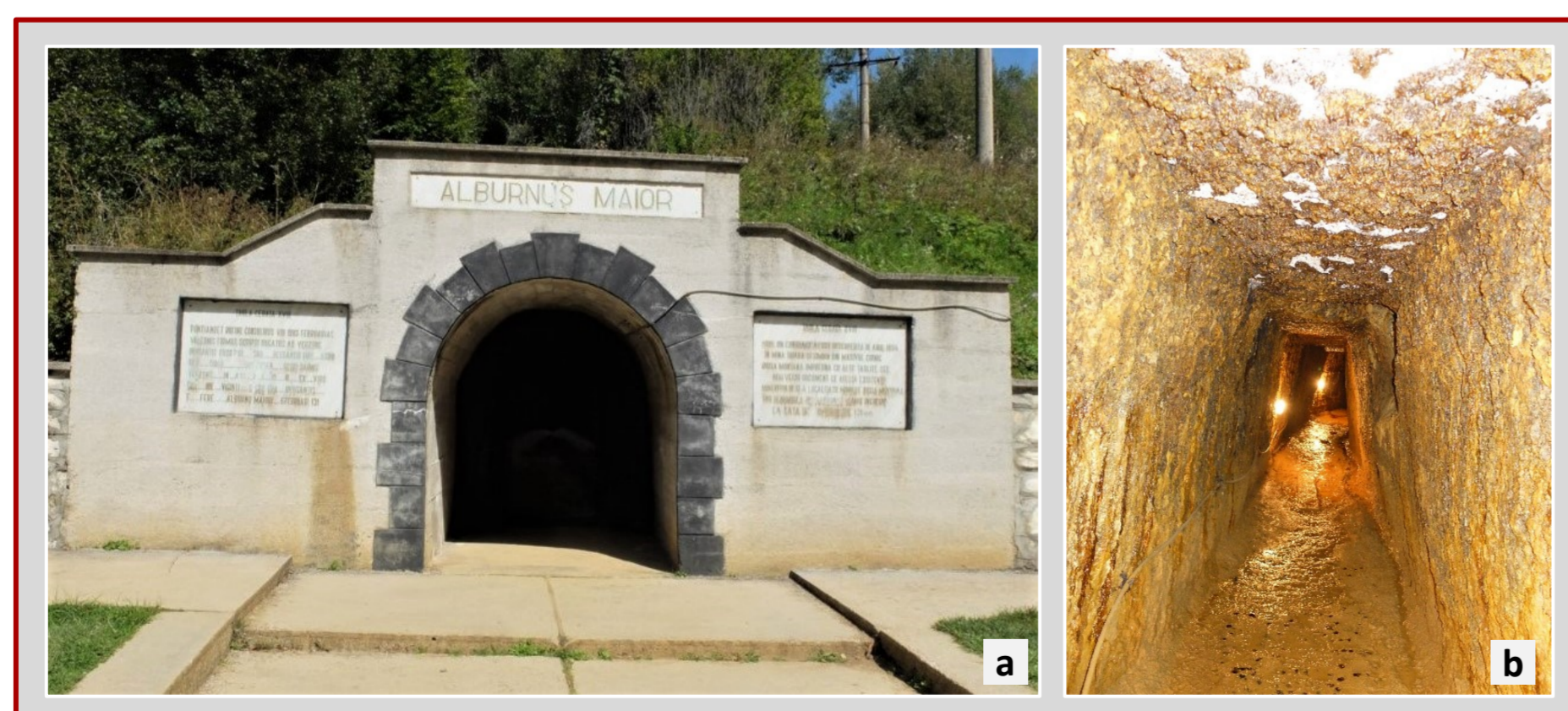


Figure 3. Gold Mining Museum in Roşia Montană Village (Alba County). (a) the entrance in the underground part of the museum; (b) image showing a Roman gallery.

- Taking into account the mining and geological heritage of the two localities (Roşia Montană and Brad), both of them could have a major contribution in promotion not only of geological and mining heritage but, also, of archaeological and historical heritage of the Golden Quadrilateral.



Figure 1. Location of the Roşia Montană Village and the Brad Town in the South Apuseni Mountains (Romania). The location of the Piatra Despicată (1) and Piatra Corbului (2) natural monuments, and the "Roman Stairs" Mine Gallery (3) are also indicated. The dashed orange line shows the limit of the "Golden Quadrilateral" (adapted from Milu, 2021).

- **Brad** (Hunedoara County) is a historical mining locality too. In the middle of the town, there is the Gold Museum. Founded in 1912, nowadays the museum collections contain around 2000 pieces; hundreds of them are of native gold or gold-bearing samples (Fig. 4).

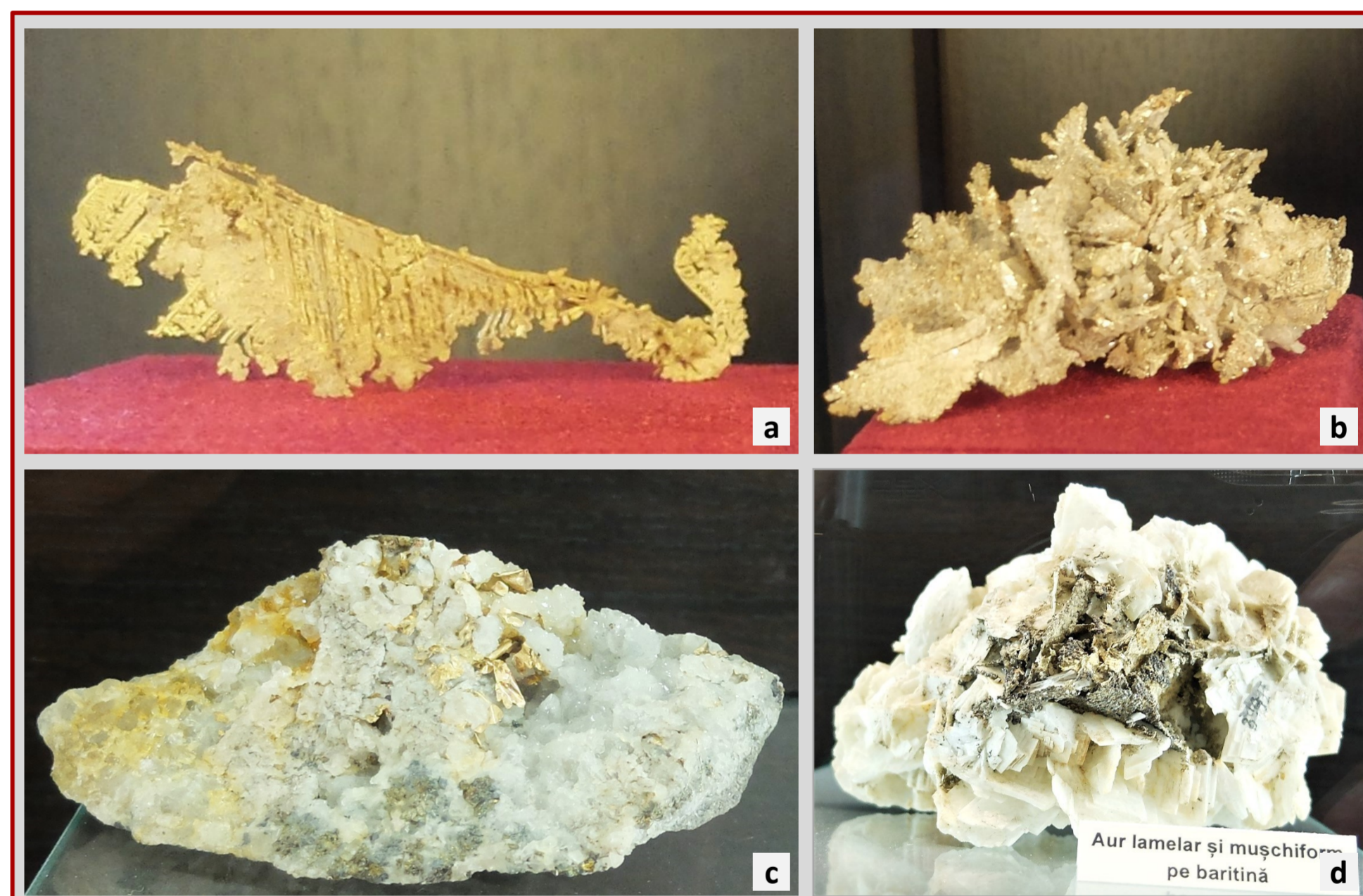


Figure 4. Gold and gold-bearing samples in the Gold Museum (Brad Town, Hunedoara County). (a) lamellar gold; (b) and (c) gold on quartz; (d) gold on barite.

The majority of samples were collected from the gold mines of Romania (most of them from the Golden Quadrilateral); there are also samples from Europe and other continents. To note that the museum detains a collection of minerals including minerals discovered for the first time in the world on the present territory of Romania. Due to the importance of collections of minerals and mineralized rocks of the museum, I consider that it is a significant *ex situ* geodiversity site (Milu, 2021). The museum collections also contain old mining tools and mining-related documents. It is to mention that in the Ruda-Brad Village (the town of Brad), the "Roman Stairs" Mine Gallery (Figs. 1 and 5), a mining heritage from the Roman Dacia, is a national historical monument (archaeological site) and cultural heritage (industrial heritage category).



Figure 5. Two images showing the entrance in the "Roman Stairs" Mine Gallery (Ruda-Brad Village, Brad Town): in the left, a painting from 1932 exhibited in the Gold Museum (Brad town); in the right, a photo taken in 2016.

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