



## Viewpoint

## Geological heritage in archaeological sites: case examples from Italy and Russia

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## ABSTRACT

Archaeological and geological information may coincide in the same objects (sites, collection specimens, etc.). Understanding this is important in making correct judgments about geological heritage, geoconservation, geotourism planning, and in defining geodiversity in wide sense. Five different archaeological sites from Italy and Russia, namely La Pietra and Pietralba (Tuscany), Cala Bianca (Campania), and Guzeripl' and the Mezmajskaja Cave (Western Caucasus), indicate the presence of several geological features (stratigraphical, geomorphological, etc.). For instance, the ancient quarrying site of La Pietra and the megalithic construction of Guzeripl' may serve as proof of the geological activity of past populations. Geological heritage can be associated with archaeological sites and/or archaeological material. For example, in the case of La Pietra, the landform is a local geomorphosite (a geomorphological site with a scientific, cultural/historical, aesthetic and/or social/economic value), and the archaeological material collected in the Mezmajskaja Cave is itself of geological (palaeontological) importance. Geological features of archaeological sites may be of heritage value. However, some sites exhibit only "ordinary" geological features that cannot be assigned as having heritage value. It appears that the co-occurrence of archaeological and geological heritage may be treated, with some caution, within the context of geodiversity. Recognition of the geological heritage value of archaeological sites facilitates their use for the purposes of geotourism.

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## 1. Introduction

The richness of the world's geological heritage is unlimited (Wimbledon et al., 1998; Prosser et al., 2006, 2011; Gray, 2008, 2013; Ruban, 2010; Wimbledon and Smith-Meyer, 2012; Erikstad, 2013; Prosser, 2013; Bradbury, 2014; Bruno et al., 2014; Farsani et al., 2014a), and significant efforts are necessary in order to comprehend it fully. It is known already that not only "purely" geological, but many other features and objects may be interpreted as belonging to geological heritage (Wetzel, 2002; Schmidt-Rutsch, 2010; Erikstad, 2013; Gray, 2013; Lubova et al., 2013; Bruno et al., 2014). This is especially the case with archaeological sites that are closely linked to the geological environment. Although much has

been said about the co-occurrence of archaeological and geological heritage (e.g., Gray, 2013; Last et al., 2013; Bruno et al., 2014), their relationship in a given site is an issue yet to be clarified. Moreover, it is necessary to distinguish "ordinary" archaeological and geological features visible at sites from features with heritage value. A better understanding of the relationship between these features is important in order to support correct assessments of geological heritage value, geoconservation and geotourism planning, and even in defining geodiversity in its widest sense.

This paper explores the relationship between archaeology and geology based on the authors' own experience. Three Italian archaeological sites (two from Tuscany and one Campania) and two Russian archaeological sites (from the Western Caucasus) are considered as case examples for this purpose (Fig. 1). They are all exceptional from an archaeological point of view, and all represent the archaeological heritage. However, these sites are essentially different with regard to geology. La Pietra is managed as a part of the regional geological heritage. Cala Bianca and the Mezmajskaja Cave are "typical" archaeological sites that cannot be understood without geological context and retain close links to the local

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Fig. 1. Geographical location of the considered archaeological sites.

geological environment. Pietralba and Guzeripl' exhibit cultural objects with apparently unclear geological value; the authors tend to share the view that the meaning of the geological heritage may be extended to include “purely” cultural objects (see also Hose, 2000; Panizza and Piacente, 2009; Gray, 2013; Necheş and Erdeli, 2014).

Examination of the above-mentioned sites sheds light on how geological features in archaeological sites may differ by their essence, correspondence to archaeological features, and heritage value. The difference based on essence results from the wide spectrum of geological heritage types (stratigraphical, palaeontological, palaeogeographical, etc.) (Ruban, 2010; Ruban and Kuo, 2010). The difference in correspondence to archaeological features is determined by the diversity of the latter. Particularly, geological information can be deduced from the archaeological objects (artefacts, ancient constructions, etc.) or sites where these objects are located. Finally, in terms of heritage value, some geological features may be of heritage value and some may be not of any value. Valuing heritage is a highly subjective procedure, although rarity and importance for understanding the geological phenomena should be noted among the main criteria. As for the archaeological heritage value, all sites used as case examples in the present paper have been assessed as possessing a high archaeological heritage value.

## 2. Case examples from Italy (Tuscany and Campania)

### 2.1. La Pietra (Tuscany)

The Prehistoric site of La Pietra is located in the Farma Valley (Municipality of Roccastrada, Province of Grosseto) on the territory of the National Park of the Grosseto Metalliferous Hills (Fig. 1). The latter joined the European network of Geoparks as the Tuscan Mining Geopark in 2010. La Pietra is the name of an isolated rock spur (almost circular in shape with diameter of ~500 m and height of ~100 m) (Fig. 2A). The red-coloured 4–10 cm-thick layers of Jurassic radiolarite outcropped there are folded and fractured (Moroni et al., in press) (Fig. 2B). La Pietra was discovered by Gambassini and Marroni (1998). It was primarily used during the Copper Age (5450–4150 cal. BP), though raw material procurement

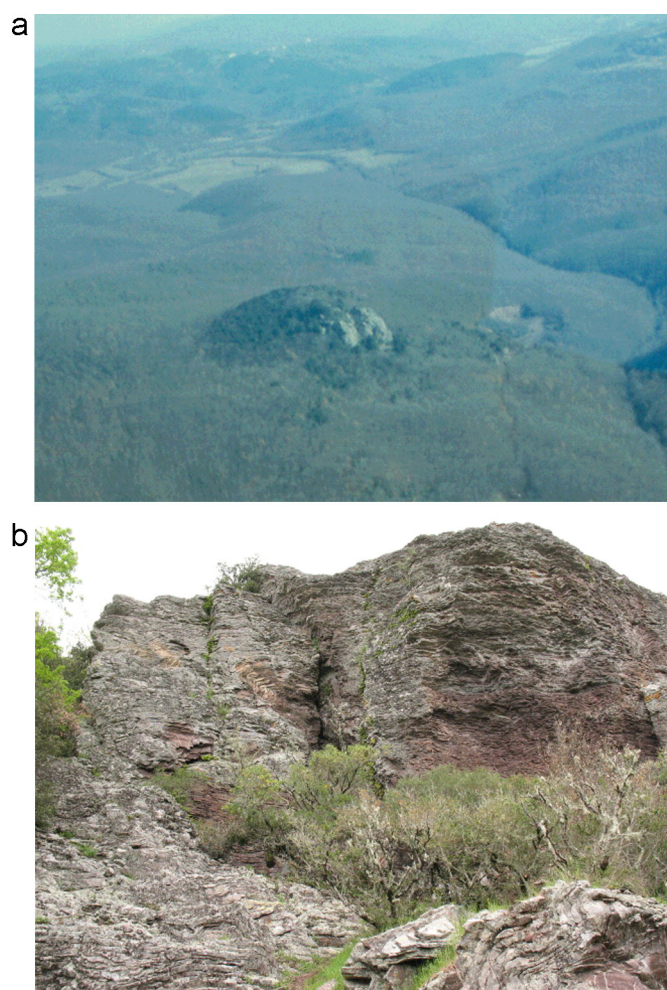


Fig. 2. Copper Age quarrying site of La Pietra: a – aerial view, b – close view. Photos by A.M.

activities date back to the Middle-Upper Palaeolithic (Moroni et al., in press). Large quantities of knapping waste attest to the exploitation of the quarry by Copper Age communities. Radiolarite blocks were removed from the rock wall. Overhanging strata were demolished in order to isolate more suitable layers, and radiolarite blocks were then detached by direct percussion with large cobbles used as hammers. Numerous concavities and removals are still visible on the rock wall. Close to the outcrop, the radiolarite wall forms a rock shelter enclosing a small area of ~20 m<sup>2</sup>. There, numerous artefacts and waste material from the excavation trench indicate the presence of a knapping area. In 2014, a date of 4226 ± 26 BP (4845–4729 – 1 sigma, 4853–4653 – 2 sigma cal. BP) was obtained from charcoal retrieved during the excavation of the shelter. By analogy with the other Italian quarries/workshops (Campana and Maggi, 2002; Ghiretti, 2003), La Pietra was devoted to production of semi-worked artefacts (preforms) for further manufacture of flat retouched bifacial items, including arrowheads, javelin points, and dagger blades. Study of the quarrying and the workshop (Moroni Lanfredini and Longo, 2011) is important for understanding the social-economic behaviour of the Copper Age communities, including the issue of the spread of stone weapons concurrent with the introduction of metallurgy.

Essentially, La Pietra is a geological object. Radiolarite is a pelagic sedimentary rock formed from siliceous oozes of biogenic origin (Boggs, 2006; Nichols, 2009). Consequently, its outcrop (Fig. 2B) demonstrates sedimentary and palaeogeographical features. If some radiolarians are present, palaeontological and

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