



Defining geotopes as educational tools in Earth Sciences: their use, valuation and protection

Guillermo Meléndez (1), Georgia Fermeli (2), Julia Escorihuela (3), and Amelia Calonge (4)

(1) Dpto. Ciencias de la Tierra (Paleontología), Universidad de Zaragoza; c./ Pedro Cerbuna 12, E-50009 Zaragoza, Spain (gmelende@unizar.es) , (2) Dpt. Historical Geology and Paleontology. National Kapodistrian Univ. Athens, Greece. gfermeli@geol.uoa.gr. , (3) Parque Geológico de Aliaga. C./ Polígono El Quiñón 6. E-44150 Aliaga (Teruel, Spain). jumidosiv@gmail.com. , (4) Dpto. Geología, Univ. Alcalá de Henares, N-II, Km. 33.6. 28871 Alcalá de Henares, Madrid (Spain) a.calonge@uah.es

Geotopes are local, usually small sites, characterized by their special geological features, making them particularly relevant as educational resources. Their definition and systematization have become crucial activities in Geodidactics. Due to their high educational potential, geotopes should display some features to clearly evidence a particular geological problem. They can also be a part of a higher geological feature, e.g. an exomuseum, a geopark (or a cultural park), or a geosite, but a geotope is a separate geological heritage feature, holding a different category and status. Educational geotopes should fulfil some selection criteria, such as covering a variety of geological subjects, and being located in different environments (urban, suburban, rural).

Urban geotopes

Urban geotopes are grouped in three main categories. (1) Impressive geological features or rock formations constituting the main attraction, or a stratigraphic sequence forming the base of buildings, as in the village of Albarracín, (Iberian Range). (2) The appearance of geological natural features is limited, but it exists anyway, as it is the case of the important salt works at the small town of Armallá, (natural park of river Tagus). These both features, ("typical geotopes") show in some way the relationships between the geological natural resource and the historical, social and cultural development of the city. (3) In the so-called "non-typical geotopes", the original geological features are not generally at sight, but they "are created" generally around building stone, statues, monuments, cemeteries, streets (pedestrian zones) pavements and other urban features emanating from geological natural resources. These "non typical geotopes" offer a great challenge to discover the local geological history and the geological provenance of building materials and rocks.

Some "non-typical geotopes" in Athens are the Iridanos River in the Underground Station Monastiraki and the white marble from the quarries of Penteli mountains wherefrom the building stone of the Parthenon temple was extracted. In the Iberian Range, Spain, many geotope examples of these three types are presented from the Jurassic "stratigraphic sequence" forming the basement of the houses in the village of Albarracín to the classical Middle Jurassic black micritic limestone from Calatorao (Zaragoza) widely used as building stone, as well as the fossiliferous (foraminifera) limestone used as building stone in the medieval walls of Tarragona and in the cathedral of Girona.

Rural geotopes

Suburban and rural geotopes hold special educational value as clean-cut geological features. Some typical cases in Greece are the volcanic rocks and landforms around the Soussaki volcano, the fault planes along the Athens-Corinth highway and the normal faults affecting the Plio-Pleistocene sequence along the Corinth channel. Also worth noting are the molasse conglomerate deposits of Meteora, etc. In Spain (Iberian Range), some relevant rural geotopes are the erosion landforms on Triassic (Buntsandstein) red sandstones at the Natural Park of river Tagus; the folds of Cretaceous limestones showing interference of tectonic directions and the high concentration of toucasid (reef Bivalves) fossils at the geopark of Aliaga, the Middle-Upper Jurassic discontinuity around the village of Ricla (Zaragoza), the normal faults affecting the Jurassic sequence at the margin of Ebro basin and the erosion landforms ("Mallos") in thick conglomerate deposits along the margin of the pyrenean range.

In Spain, geoconservation actions to protect such important sites, including a wide array of protective legal features (natural Park, Cultural park, natural monument, paleontological zone...) have not always proved effective to prevent their destruction by public works, quarrying, building construction or others. The recent project of LIG

(site of geological interest) definition opens a potentially promising framework towards an effective protection of geotopes.