

EARTH SCIENCES AND CULTURE: NATURAL AND CULTURAL HERITAGE IN THE INTERNATIONAL YEAR OF PLANET EARTH

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ABSTRACT. The heritage of mankind should be regarded as an indivisible whole: natural heritage (geological heritage, mineral diversity, biodiversity and the variety of different environments) and cultural heritage in which archaeology, art and folklore heritage are only different facets. Geoarchaeology and archaeomineralogy are important interdisciplinary sciences that help to restore the cultural balance of art and sciences, and to achieve a new harmony between nature and mankind. They have a considerable potential for studying the history of material culture.

International Year of Planet Earth (IYPE) – A Renaissance of Earth sciences

The importance of Earth sciences for society has been systematically underestimated during almost half a century. However, vital problems related to climate changes, water supply shortages, exhaustion of energy and some types of mineral resources, increased natural risks have unequivocally demonstrated that Earth sciences are vital for understanding nature and for finding an adequate response to new challenges for humankind.

Following this line of thinking, and after a considerable preliminary work performed by the International Union of Geosciences – IUGS (under the past presidency of Ed de Mulder) and UNESCO, the General Assembly of the United Nations Organization unanimously adopted in December 2005 a resolution proclaiming the year 2008 as International Year of Planet Earth. IUGS and UNESCO decided to extend the IYPE activities over a three-year period as a Triennium of Geosciences (2007-2009). The need of such international activities follows from the necessity to demonstrate the great potential of the geosciences in building a safer, healthier and wealthier society, and from the challenge to encourage society to use this potential more efficiently. A *Scientific Programme* has been developed over a few main principles directed towards building the main features as: to be based on the geosciences; to have a global approach; to be complex, holistic and multidisciplinary, and to possess an integral impact on humanity and a potential for developing countries; to have a potential for efficient outreach; its approach to consist of refining the components towards building the whole ("bottom-up"). The carefully elaborated scientific programme is centered over ten topics, and namely: 1. Groundwater – towards sustainable use; 2. Geologic hazards – minimize risk, increase awareness; 3. Earth and Health – to build a healthier and safer environment; 4. Climate – the stone record; 5. Resources – towards sustainable use; 6. Megacities – going deeper, building safer!; 7. Deep Earth – from crust to core; 8. Ocean –

abyss of time; 9. Soils – the living skin of the Earth; 10. Earth and Life – origins of diversity. The importance of these topics for geosciences and society is obvious, and does not need any additional explanation. It is also visible that all principal topics are closely related to boundary areas of different geosciences or with sciences of different groups as medicine, chemical and physical sciences, engineering sciences, etc.

Another important aspect of IYPE is the *Outreach Programme*. This programme has to answer the necessity for popularization of the Earth sciences in times when they are not included in the school curricula, and remain a *white spot* for representatives of the business, policy makers, and the widest circles of society. It is not necessary to enumerate all varied activities undertaken all over the world during IYPE. It is important to mention that the world IYPE premiere occurred on February 12-13 in Paris as an IYPE Global Event, and that a *Paris Declaration* has been proclaimed. One important point of the Declaration regards "Promoting awareness about the structure, evolution, **beauty** and **diversity** of the Earth System and its **human cultures** inscribed in landscapes, through the establishment of Geoparks, Biosphere Reserves and World Heritage Sites as a public tool for conservation and development...". The key words here relate the human culture with the Earth's beauty and diversity, – the most important feature of the *Man – Earth relationship* forgotten for a long time by pragmatic human societies. Moreover, and in the most general sense, scientific knowledge (and Earth sciences in particular) is the most important element of human culture, and sciences situated at the boundaries of Earth sciences and humanitarian sciences as archaeology and history are of paramount importance for the society of XXI century.

Earth sciences and human culture

Basic and applied knowledge about the rocks and processes acting on the planet Earth has been an important element of the perception of the Universe by humankind. Indeed, the very existence and survival of every human individual, of the tribe,

and of the species *Homo sapiens* (as well as of other species of the genus *Homo*) has been always dependent on knowledge about Nature, the application of that knowledge to the utilization of natural products (and further on, on their processing and making of new products) and in avoiding or/and minimizing the natural risks.

Ever since the first manifestations of abstract thinking, humans began building different elements of culture. The definition of culture itself has changed dramatically during the last fifty years. The modern socio-anthropological ideas (e.g., Bodley, 1994; 2001) consider that culture “generally refers to patterns of human activity and the symbolic structures that give such activities significance and importance”. Different definitions refer to historical, behavioral, and other aspects of culture. One of the most comprehensive definitions belongs to Tylor (1871): "Culture or civilization, taken in its wide ethnographic sense, is that complex whole which includes **knowledge**, belief, **art**, morals, law, custom, and any other capabilities and habits acquired by man as a member of society." More recently, the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2002) described culture as follows: "... culture should be regarded as the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs."

It is clear from these definitions that culture and civilization cover a vast domain of human life, and mostly, science, arts, social structure and traditions (including lifestyles, morals and religions). Culture is the distinctive feature of human society when compared to animal societies.

The knowledge about our home – the planet Earth, should be according to the definitions listed, the most important element of human culture and civilization. This knowledge together with related beliefs and customs became the basis for ancient mythology and religion. Hence, a new science **geomythology** has developed during the last decades (Vitaliano, 1973). Thus, geosciences (being by themselves and as a part of the natural sciences an important element of culture) begin to interlace with humanitarian sciences that have been always regarded as a basic element of culture. These interactions tend to expand in different directions:

- **geoarchaeology** develops specific methodology based on classical geological methods and techniques from the domains of stratigraphy, sedimentology, geochemistry and isotopic geology, palaeontology, palaeoseismology, Quaternary geology, speleology and other geosciences. It is an important tool for the understanding of prehistoric and ancient societies and their relations to the changes of the environment.
- **archaeomineralogy** provides valuable tools for understanding of many aspects of history: from the mineralogy, geochemistry and petrography of the artefacts to their provenance and the history of mining, metallurgy, crafts and trade. It helps to restore everyday life, religion and rites, to find craft centers and trading routes in the most remote times. The knowledge of the composition and provenance of building materials used in construction and ornamentation is the most important element in conservation and restoration of ancient buildings and sculptural elements.



Fig. 1. Basalt sheet over terrace sediments of the Euphrates fluvial system, Turkey (terrace sediments contain Neolithic artefacts); geoarchaeology studies this remarkable geosite with methods of sedimentology, petrology, isotopic geochemistry and radiogeochronology, Quaternary geology and geomorphology

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Natural and cultural heritage

The last fifty years witnessed a real revolution in the attitude of western societies to their natural and cultural heritage. During the years of the technical revolution in the XVIII and XIX centuries, states and human societies followed in a most barbaric way the proud slogan “We should not expect merci from nature, we should take ourselves our due”. This resulted even during the XX century in a most aggressive and greedy exploitation of the natural resources and devastation and annihilation of precious natural and cultural monuments.

The new attitude towards nature and culture considers the natural diversity of minerals, rocks, landforms and landscapes, plant and animal taxa, etc. as a common heritage of mankind, a wealth that has to be transferred from generation to generation with the possible minimum of harm and interference. These concepts are a part of the idea for sustainable development on national and on world scale. The material and spiritual elements of human culture should be preserved in harmony with nature and natural monuments, and during conservation have to be restored to the possible maximum to their original state including such elements as the materials used, the natural and architectural environment, etc.

The geological heritage of a region or country consists (s. e.g. Zagorchev, 1996) in the broadest sense of the word, of its whole geological wealth. A pragmatic classification based upon the value of geotopes (geosites) for the experts and for the general public distinguishes between several major groups: (i) geological sites of economic, commercial or utilitarian value; (ii) geosites of special scientific importance; (iii) geotopes of aesthetic value. These three big groups of geoscientific features are usually being exposed and preserved *in situ*. Although each geosite is in some respect a unique natural feature, elements of similarity may be found between a number of geosites thus requiring to choose and select the most typical

examples to be preserved for posterity. Geoarchaeological studies on archaeological (and even, on more modern architectural) sites have to establish their geological position and setting, and to establish the natural links between the archaeological and the geological heritage.

Another large group of geological features is represented by objects extracted from their natural environment. They are usually exhibited *ex situ*, in museums and collections. In some cases here is the meeting point of several geosciences and historical sciences: mineralogy, petrology, sedimentology, archaeology, hence, archaeomineralogy in its broadest sense. Archaeomineralogical research not only determines the composition and structure of the stone material used by prehistoric or historic craftsmen but finds the provenance of the natural material (stone, mineral) and helps to find the craftsmen's workshops and the trade ways of the past.

The last group of geoscientific heritage consists of the remains of geoscientific and mining activities. The *in situ* preserved features include old quarries and mines. The geoscientific documentation of past research, exploration and mining together with all sort of artefacts related to these activities (utensils, etc.) is preserved and exhibited in museums and archives.

Knowledge (science) about Nature, being an integral part of culture and civilization, as well as science, religion, art and ways of life, have been in harmony in prehistoric and ancient times, and humankind developed in a sustainable manner. Architecture developed in a way that usually inscribed the human constructions within the landscape, and the main building material was always the local stone, sand or clay. In some cases, as, e.g. Petra in Jordan, buildings and statues were carved into the natural rock and cliffs, thus, continuing the tradition of cave dwellers. Imposing monuments of the eastern culture are carved directly in the rocks, and an example unique in Europe is the Madara Rider of the Proto-Bulgarians near their first Balkan capital Pliska. The very difficult, time- and money-consuming transportation of building materials occurred usually in cases of special circumstances and needs. In Chalcolithic times, artefacts prepared from precious and semi-precious stones as jade have been subject of trade over considerable distances. Obviously, they were needed by the rulers and their families to ascertain their power and underline their wealth. The Thracians transported easily-workable tuffs for columns and reliefs in the Starosel temples, and in many cases, marbles for sculpturing stellae and effigies of their defunct relatives. Ancient Egyptians transported monolithic stones as obelisks at amazingly long distances. Whereas Romans build the walls of the ancient town at modern Hisar with brick and local porphyric Palaeozoic granite, they transported huge blocks that weight tens of tons of Upper Cretaceous syenite from Plovdiv to a distance of more than 50 km to fortify the most vulnerable northern gates and towers

against barbarian invasions. Fortresses, castles, churches and palaces are often built over natural heights (as the remarkable tradition of Perperikon in the Eastern Rhodopes), being partially carved into the stone, and the constructions above utilizing the local stone, too (Fig. 2).



Fig. 2. Perperikon – remnants of the Thracian temple complex partly carved into the Palaeogene tuffs

All these and many other examples point at the close relations of human edifices with the geological heritage, hence, the necessity of complex restoration and conservation. Conservation should follow the originals, and use only petrographic varieties already utilized by the first builders.

The impressive constructions and the modest dwellings of our ancestors have been built in harmony with their geological environment. It is our duty to restore this harmony in the modern research, conservation and exhibition of all important features of our natural and cultural heritage.

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