GeoJournal of Tourism and Geosites
Year I, no. 1, vol. 1, 2008, pag. 7-12

SOME THEORETICAL ASPECTS REGARDING THE GENESIS OF GEOSITES[1]

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Abstract: *Some Theoretical Aspects Regarding the Genesis of Geosites*. The elements of the natural heritage along with the cultural and individual ones or all intermingled render specificity to the territorial systems, characterized by self-organization, having the capacity to sustain its own evolution, once formed it becoming an active factor of morphodynamics and generating new landforms. Geosites are landforms whose identity is strong and unique, which cannot be understood in the absence of the mass it is composed of and the specific process that have an influence on them and on the connections between them. The geosite is the common result of several factors, agents and internal processes (endogenous) and external ones (exogenous) whose action can manifest itself actively or passively. The processes of relief formation and evolution include, beside relations of an antagonistic type, those of co-work or co-operation. Since a landform is the result of continuous processes, in time it will have its own evolution. Thus a landform has the features of the structure, depending on specific ways of incorporation, which being accumulated progressively, gives it a historical nature. This explains the historical nature of some geomorphological sites, some of them being formed at present, others being degraded or disappearing.

Key words: geosites, earth heritage, cultural heritage, landform, factors, agents, process

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The elements of the natural heritage along with the cultural and individual ones or all intermingled render specificity to the territorial systems; geomorphological sites are landforms or/and geomorphological processes that represent a scientific, cultural or social-human asset due to human perception and/or its use (Reynard, E., Quranta, G., 1993, Panizza, M., Piacente, Sandra, 2003). „A form of the landscape with peculiar and significant geomorphological attributes, which qualifies it as a component of the cultural patrimony (general sense) of a territory" (Panizza and Piacente, 1993, 2003, 2005). The geo(morphological) patrimony is part of the cultural landscape in a general sense, or even

[1] This contribution presents results from research projects: PN-II-ID-PCE-2007-1, financed by CNCSIS, code ID_751. The authors acknowledge to anonymous reviewer for their thoughtful suggestions and comments.

of the architectural type etc; it is what Panizza M., Piacente, Sandra, (2003) call „integrated cultural landscape", the definition being privileged in a „tourist" interpretation of the landscape promotion. We cannot speak about a standard dimension of the geosites, some being punctual (eg. the erratic blocks), others more expended (eg. the fields of dunes, the glacial valleys etc), some of the latter being confused with „geomorphological landscapes", „parts of the terrestrial landscape, seen, perceived and often exploited by the human beings. (....)" (Reynard, 2004).

The landform represents, as regards the physiognomic feature, a relatively stable configuration, determined by lines (rectilinear or geometrical variable bends) and dots which circumscribe a variable number of surfaces, differing in geometry, extension, genesis, and sizing and which incorporates a certain load of substance, energy and information (defined by informational parameters (Josan, N., Petrea, D., Petrea, Rodica, 1996); is not only a deformation of the Earth's crust, but it also implies the composition and the structure of the mass in which it was shaped, as well as the process that have generated it. In other words, a landform, a geosite, cannot be understood in the absence of the mass it is composed of and the specific process that have an influence on them and on the connections between them. The morphogenetical agents can be represented by material bodies (solid, liquid and gaseous) and energies which through their mass, density, gradient and dynamic put a certain pressure from their inside or from the Earth's exterior upon the Earth's crust, modifying its phisical and chemical status (Mac, I., 1986). The agents and the process induce substance, energy and information in the geomorphic system. There is a specific reversibility between landforms and morphogenetical processes: the process alter the shape and the substratum, and these in their turn, due to resulting alterations, generate changes in the nature and the intensity of the process (Petrea, 2005).

Genetically speaking, a landform is the answer of the Earth's crust that reacts through deformation, to the force imposed by the use, transfer or accumulation of substance, energy and information from the Earth's inside and outside. The landform, as any other system, is characterized by self-organization, having the capacity to sustain its own evolution, once formed it becoming an active factor of morphodynamics and generating new landforms.

Geomorphic sites, as any other landforms, are the result of several factors, agents and internal processes (endogenous) and external (exogenous) whose action can manifest itself actively or passively.

The morphogenetical factors can be active inside the Earth (internal or endogenetical factors) or outside the Earth's crust (external or exogenetical factors). The ratio between these two large groups of factors is constantly antagonistic.

The internal factors are the global tectonics and gravity. The global tectonics through its specific agent – the melted matter from the asthenosphere - and the processes and phenomena generated by it. The factors that can produce subsidences of the Earth's crust – positive or/and negative. The main ways of its occurrence are the orogenic process, the vulcanic process, earthquakes, disjunctive and epirogenetic movements. Through these process, the internal factor inserts substance (e.g. orogenic process and volcanism) and energy into the Earth's crust (earthquakes, disjunctive movements, epirogenetic movements). The gravity indirectly inserts energy into the geomorphic system, being the cause of some specific morphogenetic (eg mass shifting on the versants).

The external factors – maintained by solar energy – are: climatic, hydric and biotic. They are active in the external geospheres and tend to level the irregularities produced by the external factor.

„The interaction between the internal and external factors, considered active factors of the morphogenesis is a close illustration of dialectics and the fight of the contrasts" (Josan, N., Petrea, D., Petrea, Rodica, 1996).

The process of relief formation and evolution include, beside relations of an antagonistic type, those of co-work or co-operation**.** The relations of co-work imply various aspects of maintenance (unilateral or reciprocal), of competition, of integration ao. The relations of co-operation are specific to all landforms, and the main elements through which they form are the relative altitude (in relation to local main level), the slopes and the phisical and chemical characteristics of the sublayer (Josan, N., Petrea, D., Petrea, Rodica, 1996).

Another feature of the landforms is their complexity, because there are numerous process involved in their occurrence, even though one of these is dominant. The complexity is given by the combination and the succession in time and space of the process and forms which thus highlights the tendency to progressive development.

The occurrence and the association of the agents and the morphogenetic processes vary in time and space. Their morphogenetic share varies, the main function being alternatively transferred from one another and the result being the selective nature of the morphogenetic process. A landform is the answer of the sublayer it develops on (lithology and structure) to the processes maintained by external factors. Differences in lithology and structure require different types of erosion. Meteorization and erosion tend to select and impose those landforms whose lithological, structural and gravitational conditioning ensure their stability. This feature of the morphogenesis – *selectivity* – explains the occurrence of the geosites which appear as a spectacular result of several factors and morphogenetic process.

The endogenous and exogenous factors lead to morphogenetic processes through the modelling agent thus resulting the identity (specificity) of a landform. This means that a landform has certain „features" which individualize and differentiate it from similar landforms. Geosites are landforms whose identity is strong and unique. The specificity of the landform lies in the specificity of the action which is the result of differentiating the factors and the processes involved in morphogenesis.

Each type of morphogenetic process has its specific action and leaves its mark upon the formed landform, as shown in the present paper.

The specificity of the action and of the landform is the result of optimal premises required by the agents and the processes which ensure the specific shaping. For instance, the glacial relief in our country was shaped during stages Riess and Wurm of Quaternary glaciation when the climate permitted the formation of the glaciers on top of the Carpathians. The modification of the optimal environment, as a result of the changing climate, led to glaciers retirement (melting), while water (rivers), snow (avalanches) and periglacial process shaped the relief.

Since a landform is the result of continuous process, it has its own evolution in time. Thus a landform has the features of the structure, depending on specific ways of incorporation, which being accumulated progresively, gives it a historical nature. This explains the historical nature of some geomorphological sites, some of them being formed at present, others being degraded or disappearing.

*Factors, agents and external morphogenetic process***.** They occur outside the Earth's crust, the main source of energy being the solar power which, together with the gravitational power, plays an important part in their activity.

The main external morphogenetic factors are: climatic, hydric and biotic. They are active through specific agents and process. The main morphogenetic agents are: the rivers and the streams, glaciers, the water from seas and oceans, underground waters, wind and living organisms (plants and animals). To all these during history, the man, through voluntary or involuntary actions, has also become an important agent. Through his actions, man has created lanforms (barrages, dams, spoils, quarries etc) or amplified the rate of natural processes.

Although solar energy and gravitation are the source of all factors and

morphogenetic agents, they determine two types of process directly:

1. meteorization processes – under the influence of solar power;
2. gravitational processes which produced the shift of the mass over inclined surfaces.

The external morphogenetic agents have common processes with specific features set by the state of the mass (solid – glaciers, liquid – rivers, underground waters, water from seas and oceans, gaseous – wind) and the density and the dynamics of the glaciers.

These processes are:

- erosion – the process of sectioning the Earth's crust by a morphogenetic agent, implying the possibility of removing the resulting mass. In general, erosion is a mechanical process but it can be „helped" by chemical processes. Depending on the agent, erosion is fluviatile, glacial, marine and aeolian. The rate of erosion depends on the strength of the shaping agent and on the structure and lithology of the geographic sublayer on which it acts. It can be influenced by the climate and vegetation of the region as well as by the anthropic action;
- transport lies in the disposal of the materials appeared from erosion, usually by the same agent that generated them. Just like erosion, the transport is specific to each agent: fluviatile, glacial, marine and aeolian. A new form of transportation is the anthropic one;
- accumulation is the process of deposition of mineral particles or/and organic carried by external morphogenetic agents.

Of all these processes only erosion and accumulation to formation of new landforms (forms of erosion, respectively forms of accumulation).

J. Tricart (1956) shows that „relief shaping is due to a hierarchy of closely associated mechanisms, whose action is not co-ordinated in a system". In this hierarchy one can notice: *elementary processes and complex processes or processes previous to erosion* (they „prepare" the material to ease the escape) and *processes of erosion*.

The intensity of the action of an agent varies in time and space. In a certain place and a determined period of time the action of a certain agent and processes becomes obvious (agents and predominant process). This means that the other process are not present but their action is more reduced (agents and secondary or associated process). The sum of all agents and processes that interact in the processe of morphogenesis constitutes the system of shaping or the morphogenetic system.

Lithology and structure – represent the contents of the material mass through which a specfic landform is shaped. As a result, it is necessary to know the characteristics of the main types of rocks and their behaviour to the action of the agents and external processes differs very much, being the result of rock peculiarities and the characteristics of the predominant shaping agent. Of all the rock peculiarities which influence their behaviour we mention: cohesion, massiveness, mineralogical uniformity, permeability, solubility, plasticity. The concrete result of endogenous process and movements – with a special interest in geomorphology – is the Earth's crust. The importance of the Earth's crust to geomorphology derives from the fact that it is the source of landforms and, of course, their support. The rocks that are part of the the Earth's crust are varied depending on the conditions of formation. Although their part in the morphogenesis is positive, they form the material mass on which external agents act, through their attributes (petrographic) and location inside the Earth's crust (structure), forming or not specific geomorphic process. Selectivity of the landforms can be explained by the different answer of the material mass (of the rocks) to the action of varied morphogenetic process, the answer being determined by the lithology and the structure of the material mass.

Conclusion. The paper is an attempt to identify the factors, agents and process whose action can manifest itself actively or passively to the genesis of geosites, landforms

whose identity is strongly unique, which cannot be understood in the absence of the mass it is composed of and the specific process that have an influence on them and on the connections between them.

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