NATURAL HERITAGE, GEODIVERSITY, GEOCONSERVATION

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Foreword

CHALLENGES AND TRENDS IN ENVIRONMENTAL REGULATIONS APPLICABLE IN E&P ROMANIA

Gheorghe Brănoiu, Dumitru Frunzescu

Universitatea Petrol-Gaze din Ploieşti, Facultatea Ingineria Petrolului şi Gazelor,
B-dul Bucureşti 39, 100680 Ploieşti
gbranoiu@yahoo.com

Key words: environmental protection, conservation, biodiversity, oil industry

The main laws regulating the exploration and production (E&P) activity in Romania are: (1) Petroleum Law 238/2004, as further amended (implements Directive 94/22/EC); (2) Gas Law 351/2004, as further amended; (3) Energy and Gas Law 160/2012 (repeal Gas Law 351/2004, as amended and supplemented). Typically the concession agreements make reference to the Emergency Governmental Ordinance (EGO) 195/2005 on environmental protection and risk management, and EGO 68/2007 on environmental liability with regard to the prevention and repair of environmental damage. Also EGO 34/2013 on organization, administration and operation of permanent grassland, as amended and supplemented Law Land 18/1991. Still there are other relevant national and European HSE (Human, Safety and Environment) regulation with impact in the oil industry (Radu, 2012).

Figure 1. Natura 2000 sites in Romania (red areas) (after Frunzescu, 2018).

In order to comply with Convention on Biological Diversity (Rio 1992), the Directive 92/43/EEC on the Conservation of natural habitats of wild fauna and flora, was adopted and

it complemented by the Directive 2009/147/EC on the conservation of wild birds. Natura 2000 is a network of designated areas within the EU in which vulnerable species and habitats are preserved in the Europe. Currently the Natura 2000 network has more than 26,100 sites, covering more than 750,000 km^2 inland and 198,000 km^2 offshore. EU has elaborated guidance documents and best practice guides with regard to management of the sites. It was transposed into national legislation by EGO 57/2007 on the status of natural protected areas, conservation of natural habitats, flora and fauna. Network Natura 2000 consists in Special Conservation Areas (SCAs) and Special Protection Areas for Birds (SPAs). Sites of Special Protection Areas included in the Natura 2000 network covers approx. 17% of Romanian territory (Fig. 1). In the most cases the impact of investments on those species for the area which was designated as Natura 2000 site can be minimized or substantially reduced by careful selection and proper implementation of mitigation methods of impact (Radu, 2012; Petrescu-Mag, 2013; Frunzescu, 2018).

During the exploration operations in the perimeters granted by National Agency for Mineral Resources (NAMR) there are problems related to getting of the notices of entry into protected areas (Natura 2000, archaeological sites, etc.). The need to comply with the environmental standards specific to the concession area requires prior information from public data and compliance. The exploration operations can also be carried out in Natura 2000 areas, as they run in short time, do not change land configuration, require no tree cuts, do not affect habitats and species protected of the plants and animals and only caused minor damages to crops or pastures, which are immediately recovered and compensated. Usually, there are not approved drilling operations, especially the production type which involve large affected areas, long term execution and production, construction of access roads, installation of equipment, noxious, noise, etc.

In the exploration and especially production phases there may be some restrictions on several types of areas: (1) cities and villages areas, including villages hearth (there are no works in the village hearth or at distances less than 500 meters of houses); (2) areas of protection of archaeological sites, historical monuments, art works, various types of buildings (industrial, military, religious), landmarks, or areas of land with protected vegetation, which may be affected by the effects of the exploration and especially production operations, are set by environmental agencies. Their list can be consulted at specialized environmental agencies where it is possible to customize the involvement of activities for each situation, and it is possible to get approvals under specific conditions.

Accommodating to “new environment” for a responsible E&P activity involve supplementary efforts from oil companies and contractors. Thus, oil companies in partnership with contractors and authorities can undertake: (1) Informational campaigns and constant communication with locals, opinion leaders, media and authorities; (2) Monitoring of field activity and coverage on related topics; (3) Prevention of potential crisis situations through an open dialogue with all stakeholders; (4) Lobbying for a clearer definition of oil and gas legislation; (5) Presentation of a full safety case and associated HSE documentation for each operation; (6) Mandatory planning for emergencies before beginning exploration or production, companies will have to prepare a report of serious danger to the facilities, which should include a risk assessment and plan of intervention in cases of emergency; (7) Liability and indemnities: oil and gas companies will be fully

responsible for environmental damages caused by the protected marine species and habitats. (Radu, 2012; Schulz, 2014; Frunzescu, 2018).

The oil and gas industry has to face the environmental challenges as it is among the industries with a high risk of pollution. They need to look for, find and implement innovative solutions to create a competitive edge, but also to meet environmental and resource protection standards. The management of oil companies should ensure full compliance with HSE laws and regulations and, to maintain a responsible and sustainable business while protecting habitats and biodiversity. Whilst the company management is responsible for the implementation of the HSE policy, company employees and contractors are required to accept their responsibilities and participate with the company management in achieving the goal of continuously improving of the company's HSE performance.

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ROMANIAN HERITAGE STONE. WHAT TO BE DONE FOR INTERNATIONAL DESIGNATION AND SCIENTIFIC RECOGNITION

Valentina Cetean

Geological Institute of Romania, Dept. of Geo-Resources, 1 Caransebeş St., 012271 Bucharest, valentina.cetean@yahoo.com

Key words: dimension stone, ornamental stone, Măgura Călanului limestone, Ruşchiţa marble

Under the name of *heritage stone* are included those *natural stones that have special significance for the human culture*, as the stones that have been used for centuries to build the architectonic heritage of world sites, some of them recognized by UNESCO as World Heritage sites. Some of these stones are no longer extracted or even their extraction was stopped for millennia. Other stones continue to be commercially important, but their heritage uses have not been well documented in widely available sources for the interested parties.

The public details about the "Global Heritage Stone Resource" (GHSR) designation were first time provided in August 2008 at the 33rd International Geological Congress in Oslo, when it was also agreed to advance the GHSR proposal under the auspices of "Commission C-10 Building Stones and Ornamental Rocks" of the International Association for Engineering Geology and the Environment (IAEG). The requirements and reasons for nominating a Heritage Stone Resource have been outlined by Cooper et al. (2013), in the report of the establishment of the Heritage Stone Task Group (HSTG). In February 2012, in San Sebastian, Spain, the International Union of Geological Sciences introduced in their "Terms of Reference" the defining characteristics of a Global Heritage Stone Resource:

- Special significance or recognition of the nominated stone in human culture, potentially association with national identity or a significant individual contribution to architecture;
- Historic use of the proposed stone for a period of at least 50 years;
- Wide-ranging geographic application;
- Utilisation in significant works, in public or industrial projects (buildings, sculpture or utilitarian applications);
- Ongoing availability of material for quarrying (at least for restoration purposes);
- Scientific, cultural, architectural, environmental and commercial benefits arising from designation as Global Heritage Stone Resource (GHSR).

As they declared, the aim of a GHSR recognition is "to spread awareness of the cultural heritage aspects of these stones, to help to encourage continued supply for maintenance and repair of important monuments and the preservation of historically important quarries". The recognition of those stones that have had internationally significant

architectural and ornamental uses neither promote nor limit the contemporary quarrying for commercial purposes; many times the ongoing availability is beneficial and might ensure future supplies for conservation or restoration purposes.

Up to know, eight stones were designated as GHSR at European level: Portland limestone, Larvikite monzonite, Petit Granit, Hallandia gneiss, Podpêc limestone, Carrara Marble, Estremoz marble and Villamayor sandstone.

To be nominated as Global Heritage Stone Resource, a stone with significant heritage value has to be well documented from scientific and technical point of view. The follow categories of information are required:

- History of excavation;
- Area of occurrence;
- Principal location of quarry or quarries;
- Geological age and geological setting;
- Petrographic name;
- Primary colour(s), aesthetics of stone and natural variability;
- Composition (optional);
- Technical properties: compression strength, compression strength after freezing, bending strength, real density, water absorption at N.P. conditions, apparent porosity, thermal linear expansion coefficient, abrasion test, impact test: minimum fall height;
- Geochemistry and mineralogy;
- Suitability;
- Durability issues;
- Vulnerability and maintenance of supply;
- Historic use and geographic area of utilisation;
- Dimension stone characteristics;
- Buildings and related heritage issues.

Thus, the designation of a GHSR offers a mechanism to promote the safeguarding of stone resources, as well the formal definition of stone types within sufficiently tight parameters that it can facilitate the protection of its name.

Romanian stones that meet the designation conditions as Global Heritage Stone Resources

Taking into account the previous researches conducted on this subject by the author of this paper, there are *two Romanian stones that meet the designation conditions as Global Heritage Stone Resources: Măgura Călanului limestone and Ruşchiţa marble*. Both stones are undergoing research and technical investigations, to fulfil the requirements for specific documentation according to the international approved criteria for GHSR recognition (see www.globalheritage stone.org).

The **Măgura Călanului limestone** quarry is the most important preserved ancient quarry on the Romanian territory. It is considered to be the main source of stone for blocks used on the monumental structures of Sarmizegetusa Regia, the capital of the Dacian Kingdom (Fig.1), and to the ensemble of fortresses and fortifications around it. These fortresses were

located in a mountainous area, over 1000 m altitude, on a geological bedrock (schist or limestone) that cannot be cut to size for building purposes. For this reason, the Dacians used the oolithic limestone from Măgura Călanului, located 30-50 km away from the fortresses, with good workability as dimension (squared) stone. Fortunately, the quarry was only exploited during the ancient period and is well preserved, being probably one of the most spectacular ancient monuments of its kind outside of the Greek-Roman world. But while the mentioned fortresses are today part of the UNESCO World Heritage, the quarry have never been systematically studied, protected or valued. The only research it benefited from were some mineralogical-petrographic analyses conducted in the '90s of the 20th century, followed after 2011 by independent research (prospecting campaigns and more than 30 microscopic mineralogical analysis) carried out within the projects of the Study Centre of Dacica Foundation.

Figure1. Sarmizegetusa Regia Dacian fortress (UNESCO site) mainly made of Măgura Călanului limestones.

Figure 2. Ruşchiţa marble, the most famous Romanian ornamental stone (stepped side of Rușchița Old Quarry and some decorative pieces).

The **Rușchița marble** is the most famous and widely used Romanian ornamental stone. The old quarry (Fig. 2) is being operative since 1883 and developed by step-by-step expansion, reaching a depth of 130 m. Nowadays, the marble is extracted in other four quarries, allowing the owners to introduce on market important volumes of this very beautiful marble, which shows unique ornamental characteristics: high crystallinity and medium size crystals, good translucence and colours from white and grey to pink, usually with grey veins. The Rușchița marble presents good physical-mechanical properties and can be easily cut to size or processed for both indoor and outdoor applications: cladding, flooring, wall and ceiling finishes, stairs, solid masonry units or a very large range of architectural elements. In the last half of the 20th century, it was the main stone in Romania for cladding, flooring and architectural elements for a number of administrative, public or private buildings that cannot be quantified, from City Halls, diplomatic institutions, schools, hotels, shopping centres, airports, cathedrals to underground stations, People's House, National Library, National Bank, Telephone Palace or Museum of Contemporary Art from Bucharest. Abroad, the marble was used for Parliament buildings from Vienna (Austria) and Budapest (Hungary), BBC centre from Manheim (Germany), or the bathrooms from the sultan's palace in Brunei and many other private buildings in the Asia. All necessary scientific and technical information are available in official documentations or that of quarry owners, but even if it

is commercially so important, the heritage uses of the Ruşchița limestone have not been well documented in widely available sources.
Certainly there are other types of heritage stone in Romania (as Moneasa, Vaşcău or Podeni limestones, Bologa dacite, Moigrad microdiorite, Măcin granite, Pietroasa andesite, Geoagiu travertine etc.), some of these having outstanding national and international significance. But this involves the knowledge of their places of application or consistent details related to historical buildings or monuments with special significance in human culture, unfortunately almost unavailable (or non-existent) information due to different reasons: inappropriate archiving of construction documents, dismantling of some institutions or companies (as the quarries owners), no research has been done, so on.

But the approach to the subject must continue at least with the elaboration of a distribution map of the Romanian stones with national and global heritage value and quarries of national interest. This has be done in November 2018 by the Geo-Resources Division from Geological Institute of Romania, by drawing up a project proposal in the national research program, called RoQ – Romanian stone for construction – qualitative characteristics, cultural heritage value, scientific designation. In the same project proposal, one of the task is to continue the investigation of limestones from Măgura Călanului, to obtain the necessary information for drawing up the documentation for this stone to be nominalized as Global Heritage Stone Resources.

Technical investigations are encouraged for these type of stones, as well as the ongoing use of the GHSR stone, where appropriate. Further details about the development of the GHSR designation can also be found at the Global Heritage Stone website, www.globalheritage stone.org.

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OUR NEED FOR GEOLOGICAL EDUCATION

Ioan Denuț[1,2], Réka Kovács[1,3]

[1] Muzeul Județean de Mineralogie *Victor Gorduza* Baia Mare
[2] Universitatea Tehnică din Cluj-Napoca, Centrul Universitar Nord din Baia Mare
[3] Universitatea *Babeș-Bolyai* Cluj-Napoca

Key words: school curricula, pre-university education, geological textbooks, Earth Science Olympics

The objective of this approach is to introduce Geology into the subjects of the secondary and high school curricula, with the intention to present geological processes and their effects and products in order to broaden the knowledge in the field of geology and to emphasize the importance of the lithospheres resources to the development of human society.

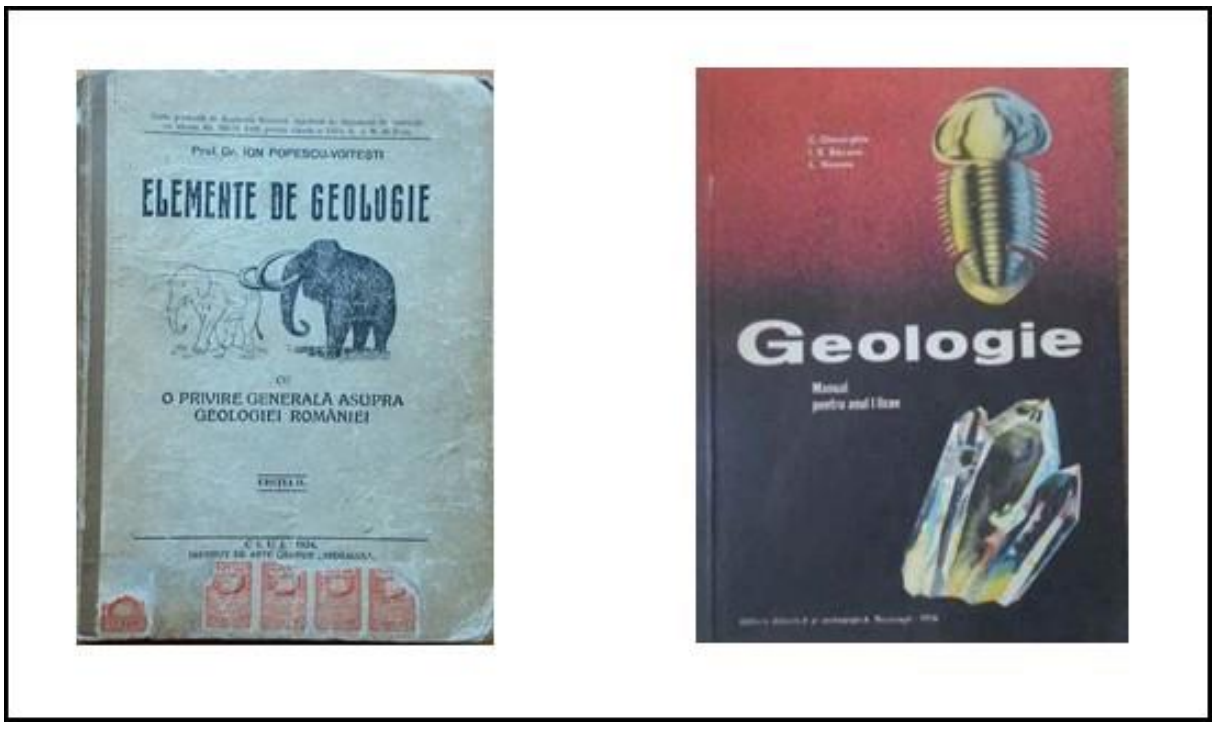

Figure 1. Past geological textbooks in Romania. Left, *Elements of Geology*, the book of Ion Popescu Voiteşti from 1924. Right, Geology, text book for secondary schools by C. Gheorghiu, I.S. Băcanu and L. Neamu, 1976.

This paper follows the idea initiated by Denuţ and Sîngeorzan (2016), which highlights the categories of disciplines and the distribution of curricular areas, respectively the

representation of natural sciences in the pre-university education plans. This research continues the above-mentioned study and aims to achieve the stated objective by addressing the following categories of arguments:

- the classification of the sciences in general and Earth sciences in particular;
- representation of natural sciences in the curricula for pre-university education cycles;
- emphasizing the importance of mineral resources among natural resources;
- national experience – regarding past periods in which geological disciplines were taught, as well as the organization of the National Interdisciplinary Olympics of Earth Sciences;
- international experience – exemplifying educational plans that contain geological disciplines in other countries and the International Earth Science Olympics (IESO).

This paper also presents the history of the geological textbooks from the pre-university education, starting with 1921 (Fig. 1), respectively the presentation of the Earth Sciences Olympics both in Romania and abroad.

The paper aims to be an invitation addressed to all stakeholders, to make their own contribution and to engage in the implementation of this goal, to reconsider the geological sciences at a national level and to reintroduce geology into the educational programs for secondary schools.

NATURAL HERITAGE VERSUS CULTURAL HERITAGE

Ioan Denuț, Alexandra Sîngeorzan

[1]Muzeul Județean de Mineralogie „Victor Gorduza" Baia Mare
[2]Universitatea tehnică din Cluj-Napoca, Centru Universitar Nord din Baia Mare

Key words: mobile and immobile heritage, national legislation on heritage

The starting point for this paper was represented by the current national legislation in the field of heritage protection, especially the way in which some of the assets that are part of the natural heritage are transformed in cultural assets when they become part of a museum's collection.

As presented in the following images one can observe the inconsistent way of fitting the patrimonial assets into the two categories, namely the cultural heritage and the natural heritage.

Immobile CULTURAL heritage mobile CULTURAL heritage

Figure 1. Left, Sarmizegetusa Regia. Law nr. 422/2001 regarding the protection of historical monuments (Photo Bogdan Brylynskei, source: Administration of Sarmizegetusa Regia). Right, Dacian gold bangles from Sarmizegetusa (the collection of the National Museum of History of Romania, photo Ioan Beres), governed by law 182/2000 regarding the protection of mobile national cultural heritage, republished in 2008.

In the case of the assets listed as cultural patrimony as shown in Figure 1, the in-situ cultural property (the ruins of Ulpia Traiana Sarmisegetusa) is classified as property of the cultural heritage and is subject to Law no. 422 of 18 July 2001 on the protection of historical monuments. The cultural asset from such a historical monument (the Dacian gold bangles), which are currently in a museum, becomes a cultural asset of the mobile cultural heritage and is subject to the Law no. 182/2000 on the protection of the mobile national cultural heritage, republished in 2008.

NATURAL heritage

CULTURAL heritage

Figure 2. How the law governing geological heritage changes when a sample is transferred from an outcrop to a museum collection. Left, outcrop in the Chiuzbaia fossil site, subject to Government Emergency Ordinance 57/2007 related to the regime of natural protected areas. Right, samples with leaf imprints from the Chiuzbaia fossil site exposed in a cabinet at the Mineralogy Museum in Baia Mare, subject to law 182.2000 related to the protection of the mobile national cultural heritage. Photo: Ioan Bereş.

Fig. 2 shows how assets belonging to the natural heritage (originally covered by Government Emergency Ordinance no. 57/2007 on the regime of natural protected areas), when taken from their natural environment and turned into museum pieces, not only become subject of other laws (in this case of Law no. 182), but they go to another category of heritage, becoming assets of the mobile cultural heritage, without mentioning that they originate from the natural heritage.

The paper discusses the difficulty that occurs for museums that have a natural science profile when applying the criteria for classifying assets in the legal categories of the national mobile cultural heritage.

The paper also tries to highlight the importance of introducing some changes in the legislation, modifications that would allow a proper classification of all the assets belonging to the natural heritage and which would allow natural assets to keep their natural heritage feature even when they become part of a museum collection.

TRANSECT ACROSS THE EASTERN ALPS (*Post-Ex1*-CBGA 2018) – GEOLOGICAL CONTEMPLATION ON THE GREAT MAN-NATURE HARMONY

Dorin Dordea[1], Anca Dobrescu[2]

[1]Prospecţiuni S.A., dorin_dordea@yahoo.com
[2]Geological Institute of Romania, 1 Caransebeş St., 012271 Bucharest
ancadobrescu2003@yahoo.com

Key words: CBGA, post-congress excursion, environmental protection, mineral resources

Throughout the history of the Carpathian-Balkan Geological Association – CBGA (1922-2018), only four provincial cities (Lviv – 1925, Krakow – 1963, 1985, Thessaloniki – 2010 and Salzburg – 2018) challenged themselves to organize Congresses, besides the main capitals of the associated countries (Bucharest – 1927, 1961, 1981, Prague – 1931, Kiev – 1958, 1977, Warsaw – 1963, Sofia – 1965, 1989, in project for 2022, Belgrade – 1967, 2006, Budapest – 1969, Bratislava – 1973, 2002, Athens – 1995, Vienna – 1998, Tirana – 2014). Now, as the event concluded, the XXI CBGA Congress – 2018 in Salzburg seems to have been one of the most successful, from organizational, scientific level, social policy, scientific excursions and general atmosphere perspectives.

On the exceptional scientific quality of the plenary presentations (Stefan Schmid – *Alps, Carpathians and Dinarides-Hellenides: about plates, micro-plates and delaminated crustal blocks*; Wolfgang Müller – *Why less is more – high time resolution from laser-ablation mass spectrometry in paleo-environmental research and beyond*; Sierd Cloetingh – *From the deep Earth to the surface: thermo-mechanical controls on lithosphere dynamics*) and on the studies presented during the 19 sessions (*GT1-1 Stable Isotopes in the Earth System Sciences; GT2-1 Mesozoic of the Tethys realm; GT2-2 Climate and biota of the Cretaceous and early Paleogene; GT2-6 New developments in Paratethys Research GT3 Sedimentary petrology as a tool for understanding of the geological history of the Carpatho-Balkan region; GT4 Magmatism in the Alpine-Capathian-Balkan realm; GT5-1 Tectonometamorphic processes in Alpine and pre-Alpine orogenic belts; GT6 Minerals – building blocks of rocks and man-made materials; GT7-1 Tethys-related tectonics in southern Eurasia; GT7-3 Orogenic processes in the Alpine-Balkan-Carpathian-Dinaric orogen; GT8-1 Quantifying landscape evolution during the Plio- and Pleistocene and natural hazards; GT9 Geophysics and Seismology; GT 10-1 Mineral Deposits in the ABCD Region; GT10-2 From subduction to post-collision: tectonics and ore deposit controls along the Anatolian-Caucasian-Iranian segment of the Tethys belt; GT10-4 Geochronology, whole rocks and mineral chemistry as assessment tools for magma fertility and ore formation in magmatic-hydrothermal systems; GT11-1Petroleum system and hydrocarbon exploration in the Carpathian-Balkan region;*

GT12-1Hidrogeology; GT15 Cultural Geology) many subjects will be further debated, spurring innovations and future projects.

Having attended the Post Congress excursion (*Transect across the Eastern Alps*), the authors want to share several opinions on the petrologic, tectonic, facial and economic exposures advanced by our illustrious guides – professors Franz Neubauer and Johann Genser, debating the secrets of the Alpine crust by reaching the microcosm of each visited outcrop and sample, answering tens of questions and controversies (Fig. 1). We are trying to present relevant aspects of environmental protection that authorities and citizens of the Salzburg and Carinthia lands apply all over is needed.

Figure 1. Participants in the excursion *Transect across the Eastern Alps* at Nassfeld.

Our Austrian colleagues work to protect representative areas of geological value and their means of informing visitors are quite impressive. Similarly, the technical land solutions for protection against soil erosion as well as the effects of avalanches, blocks flowing and floods triggered by snow melting noticed on the trip route have been identified as successful solutions to be implemented wherever are needed.

The trip route followed the NS transect of the eastern ridge of the Alps, starting from the idyllic city of Salzburg (Mozart's birthplace) to the joint border with Italy and Slovenia. At the onset we observed mineral resources that gave Salzburg's name and prosperity (Salt Castle), although the site of extraction is far from the burg, being located on the Permian-Triassic carbonate conglomerate molded between two slopes carved by Salzach River.

Quarries where blocks have been extracted for more than four centuries, the resistance and the ornamental aspects of the city's brand-name buildings are proof of skillful use of a cheap, durable and decorative mineral resource (Fig. 2).

Figure 2. Koschach quarry art gallery.

Registration (selection, sampling, comparison, etc.) of the 38 observation points, the study results, comments and controversies were interrupted only by three night stops (at Mauterndorf, Faak am See and Ribitsch) in three wonderful locations. The explanations and intense discussions on diagnosis, petrology, ages, structures and tectonic events, geodynamic evolution, economic resources and exploitation in relation to nature and communities were focused on the miraculous environment valued by man for his own use.

OPPORTUNITIES TO AVOID RESTRICTIONS IN EXPLORATION FOR SHALE GAS IN ROMANIA

Dumitru Frunzescu, Gheorghe Brănoiu

Universitatea Petrol-Gaze din Ploieşti, Facultatea Ingineria Petrolului si Gazelor, B-dul Bucuresti 39, cod postal 100680, dfrunzescu@yahoo.com

Key words: seismic acquisition, restricted areas, South Dobrogea, unconventional resources

In the context of growing energy demand, the need to find new conventional hydrocarbon resources, the need to emancipate from the monopoly of some countries holding such resources, the opportunity to approach unconventional hydrocarbon production appears to be crucial. In this context, the Romanian state (National Agency for Mineral Resources – NAMR) conceded by petroleum agreements the perimeters of Barlad and South Dobrogea to Chevron company. The agreements ceased ahead of schedule and ended with a dispute debated at the International Arbitration Court in Paris (June 2016). Chevron company withdrew by a business decision from all Eastern European countries, without fulfilling the minimum exploration program agreed with the Romanian government (NAMR) regarding the execution of 300 km of seismic profile and 1-2 exploration wells respectively.

In the argument of the withdrawal from Romania, Chevron company invoked the difficulty of carrying out the exploration works (mainly seismic works), development, production, geological differences, geochemical parameters, infrastructure, application conditions of extraction technologies (horizontal wells, hydraulic fracturing, etc.) with the emphasis on aspects of government inconsistencies, population protests, environmental protection, and specific risks.

The counter-argument has highlighted the availability of the Romanian state in ensuring the conditions for fulfilling the commitment established by contract (the protection of the concession perimeters, the facilities in getting the approvals, the possibility of delaying the stage deadlines); were pointed wishes and parameters/complex determinations (of cores, wells logging and seismic logging) unrealized by non-completion of the minimum program assumed in the petroleum agreements; were made references to the inappropriate comparison of shale gas approach between the US / Canada and Europe (Romania) and were presented considerations related to the flexibility of seismic prospecting in the sense of bypassing the restrictions (including those of related Nature 2000 network).

The methodology used to conduct the seismic prospecting activity was a high resolution method, based on the small distance between channels and the deep depth of investigation (6 ms), as premises of an optimum interpretation. The fact that the entire designed profiles grid was not developed reduced the interpretation options (the assessment on the space

extension of the formation and the correct estimate of their thickness) with expected generation capacities. It is clear that the entire designed grid was mandatory so as to facilitate mapping of the formations both at overall and detail scales, intent clearly anticipated from the very beginning. A special and comparing processing of the seismic profiles would have led to the optimization of the follow-up of the formations, as well as the lithofacial variations both horizontal and vertical. With respect to the development of seismic alignments to the restricted areas (social sites – villages, military, industrial, civil, religious, touristic sites, natural protected areas, stubborn land owners refusing leasing the property), the data acquisition technology allows bypassing restriction and their mitigation at ease. We would like to technologically stipulate the possibility of shortening the profiles, abandonment, and deviation at the risk of obtaining a rather poor signal, with an increased effort of processing and interpreting.

Efforts could have been made from social and bureaucratic points of view to increase the price of leasing from small land owners, or more effort in securing the approvals faster. Another aspect would be, so as to have credibility and to complete the optimum data processing (especially when there is a belief that a poor signal was recorded from a deviation and not directly from the alignment), distribution of primary data would have been an option not to a single unit, but to several witness units for processing and interpretation. It is known that after the unpleasant events of Pungesti, an excess of zeal was made in order to getting the approvals (previous, in the practice of data acquisition, the prospecting company started the works and, in time, obtained the approvals).

As to the early statements of the investor, one can see an inconsistency recorded in time, as the desire for communication and follow-up on works dropped. As a reason for postponing the start of the prospecting, it can be concluded on the difficult approach to getting the approvals. Examining the report of the amount of seismic works over time, it can be emphasized that the efforts of Prospecţiuni SA Bucharest, company contracted by Chevron, were maximum in the given conditions.

Any interpretation and assessment of the petroleum potential (both conventional and unconventional) are not feasible due to the lack of the entire seismic grid that was proposed and designed during preliminary phase, pursuant to the minimal works program, and due to the lack of exploration wells. We need to emphasize the need to drilling of the wells both for securing core data and wells geophysical data, but also for the calibration opportunities of the extrapolation data secured from geophysical methods. Meeting the proposals included in the minimum exploration program, as provided in the agreement, appears to be a mandatory duty for Romanian government as related to the minimal information of the explored areas, with a view on the presence or absence of a potential for mineral resources and their conditions (both geologic and economic), as known from several papers (Crânganu, 2013; Anastasiu et al., 2015).

The need to observe environmental standards typical for the leased area requires prior information from public sources and observance of such standards. In developing the explorations within South Dobrogea area (fig. 1), there were several issues related to securing permits to enter protected areas (Natura 2000, archaeological sites). The prospecting works may be developed within Natura 2000 sites, due to the fact they are developed within a short period of time, do not alter the configuration of the terrain, do not need wood clearings, do not impact habitats and protected species of plants and animal and

produce only minor damages to crops and pastures, which are immediately recovered and for which damages are paid for. Usually, there are not approved drilling operations, especially the production type which involve large affected areas, long term execution and production, construction of access roads, installation of equipment, noxious, noise, etc.

There are situations where a land owner does not allow land access to perform seismic works or drilling (although the Petroleum Law 238/2004 stipulates the obligation to grant access, imposed by local authorities, but which in reality does not apply). Remedying the situation can be solved by suing the owner by deciding to change the location of the works or by increasing the amount of compensation. It is questionable the measure to which increased compensation has been made.

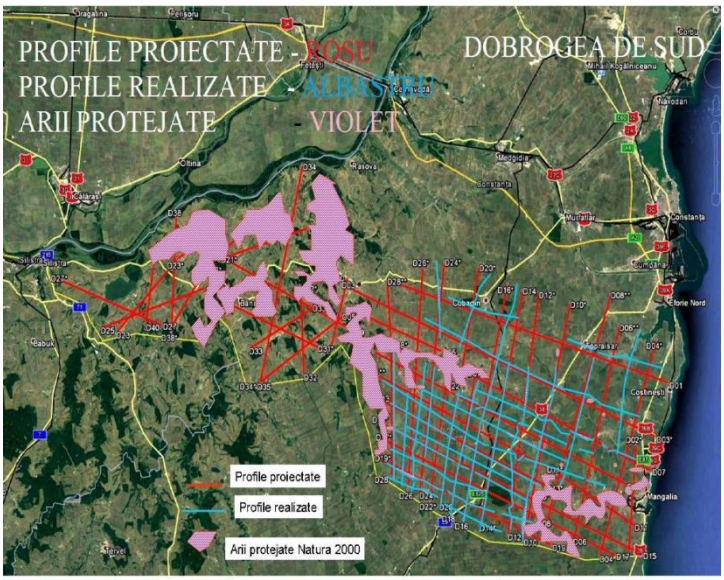

Figure 1. Satellite image of South Dobrogea, with protected areas in purple, projected seismic profiles (red lines) and performed seismic profiles (blue lines)(after Frunzescu, 2018).

The situations presented above and other particular ones are normal for a populated area, with economic activities and cannot be invoked as a pretext for not realizing the exploration program. In cases of restriction, the work of the programs are adapted to existing conditions and are planned the works so as to optimally cover land areas for optimal investigation of the geological objectives.

The list of nature reserves in South Dobrogea includes the protected areas of national interest (natural reservations), located on the administrative territory of Constanta County, and declared by Law 5/2000 (on the approval of the National Territory Arranging Plan – Section III – Protected Areas). Natura 2000 is a European ecological network which mainly aims to maintain favorable conservation status for certain species and natural habitats types appropriate to the European directives. The Natura 2000 Network includes Special Conservation Areas (SCAs) – established according to Habitats Directive (Directive 92/43/EEC on the Conservation of natural habitats of wild fauna and flora) and Special Protection Areas for Birds (SPAs) – established according to Birds Directive (Directive 2009/147/EC on the conservation of wild birds).

Biodiversity in South Dobrogea refers to many types of habitats and ecosystems with a multitude of species of flora and fauna, which can be classified in aquatic habitats (freshwaters, brackish, marine, coastal); terrestrial habitats (forests, steppe grasslands, shrubbery, forest-steppe, marshes and peatlands) and as underground habitats (cavernals or caves) (Doniţă et al., 2005).

To conclude, the areas with restrictive access may, theoretically, produce certain discomforts for the exploration and production activities (the activities cannot be scheduled as easily as in the case of vacant areas, with no economic activity), but these are well-known and are somehow taken into account upon participating in the leasing bidding (as it is the case in most of the countries where such activities are being developed) and it does not have a major impact on the timely development of exploration activity and in the end on the extraction activity. Moreover, for a better knowledge of existing resources it is critical to complete the mandatory minimal schedule, a schedule that in this case could have been completed, the issues faced being rather normal in such cases and could have been addressed with a rather minimum effort.

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PROMOTING GEOSCIENCES IN HIGH SCHOOLS

Găvenea Gheorghe-Andrei, Vlăsceanu Mihai-Adrian

University of Bucharest, Faculty of Geology and Geophysics
andrei.gavenea89@gmail.com

Key words: resentations, Day of open doors,

This project started two years ago when we realised that there was not enough coverage on geosciences within high schools and this process would start to cripple the domain and the field of work. We started within the Geology and Geophysics Student Association – ASGG, as a team with the sole purpose in mind of informing the high school teenagers about the opportunities that lie with geology and geophysics.

Figure 1. One of the presentations in high schools.

First, we tried to see what the problems within the faculty are and made a SWOT chart with the information gathered. Then, we compiled a PowerPoint presentation with the strengths and opportunities which a student would have in our faculty. We organized teams of two or three peoples to go to their home high schools to present our brain child (Fig. 1). Some teachers were very happy to come with us and speak in addition to our presentation and engage with the teenagers. As a result, after 10 consecutive Fridays of trips to various high schools in Bucharest and other cities, twelve persons came to our faculty because of our activities. It was a small number for other faculties, but for us it was 15 percent of the total

students enrolled that year. It was a victory and we knew that we had to do better next year.

We were happy with the result from the first year of promotion, but we wanted more. The second year of our promotion was marked by a bigger involvement of our teachers in the process of developing a strategy of the student and teacher implication in the “Open Days” of the faculty. We started an idea group with some professors who wanted to help us and to tell us what they thought was the right way to get students enrolled in the faculty. We met once a week for twenty weeks to discuss our strategy and develop a new presentation for further success. They were also very keen on coming with us in Bucharest and everywhere else where they could be of help. It was very inspiring to see them so engaged in this process and they gave us a lot of energy and trust in this process.

Figure 2. Day of Open Doors at the Faculty of Geology and Geophysics (FGG). Left, students visiting the Paleontology collection of the FGG. Right, students learning about seismic data aquisition.

The “Open Days” program was a hit, we had fifty high school students who visited the faculty and we made sure they would see everything that was beautiful in it, from the paleontology and mineralogy collection to seismic data and engineering processes (Fig. 2), everything was on point and they surely left with a better opinion of geology, or even better, with an opinion. This second year, we organized a team more than twice larger than the previous year and we collaborated with the Bucharest Student Chapter. It was a more aggressive and calculated approach this time and it showed in this year’s statistics. We were responsible for 26 people enrolled in the faculty, which was again a big victory.

This year would be the third year of the continuous project of promoting the faculty and the geosciences and this time almost everyone is involved. The results speak for themselves and it means a lot to us, the students, to make such a big impact in our faculty.

Aknowledgements. Promotional materials (flyers, posters, roll-ups) were prepared by the Faculty of Geology and Geophysics and the University of Bucharest. Other costs related to these activities (transportation, meals) were covered by ASGG volunteers.

GEOECOMAR – 25 YEARS OF ACTIVITY. AN ILLUSTRATED OVERVIEW

Dan C. Jipa, Silviu Rădan

NRDI GeoEcoMar, 23-25 Dimitrie Onciul St, Sector 2, Bucharest

Key words:

This year, the National Institute of Marine Geology and Geoecology – GeoEcoMar celebrates a quarter of a century of activity. On this occasion, we present pictures illustrating the development of the institute from the Roman Center of Marine Geology and Geoecology into a successful national institute. The institute transformed a vessel belonging to the former oceanic Fishing Fleet of Romania – *Someşul*, into the most important marine reaserch vessel in Romania – R/V *Mare Nigrum*. We are presenting the history of two vessels taken over from the Ministry of National Defence, the fluvial and coastal R/V *Istros*, and that of our house boat *Halmyris*, taken over and repaired in Orsova and turned it into a modern house boat, laboratories, with rooms for researchers and a multifunctional room used for summer schools and workshops.

We also present the two buildings of the institute headquarters, one in Bucharest, the other in Constanta, which were also renovated and upgraded, offering now excellent conditions not only for research, but also for conferences, educational and promotional activities.

The authors do not intend to present an activity report of GeoEcoMar. The pictures will unoficcially illustrate moments, facts and actios.

A special attention is given to researchers, especially in areas with international implications of GeoEcoMar activities.

GEOECOMAR – 25 ANI DE ACTIVITATE. O PRIVIRE DE ANSAMBLU ILUSTRATA

Institutul National de Geologie si Geoecologie (GeoEcoMar) implineste in acest an un sfert de veac de activitate. Cu aceasta ocazie sunt prezentate imagini fotografice care sa ilustreze dezvoltarea acestui Institut, de la centrul roman de ecologie si geoecologie marina la institutul national de succes care este azi. Institutul a reusit sa transforme o nava *Someşul* disponibilizata de flota romana de pescuit oceanic, cumparata la pret de fier vechi, in cea mai importanta nava de cercetari marine a Romaniei – *Mare Nigrum*. Prezentam istoria a doua ambarcatiuni fost preluate de la MAPN, actuala navă de cercetări fluviale şi marine costiere *Istros*, precum si a pontonului laborator *Halmyris*, preluat si reparat la Orsova in 1996 si transformat intr-o ambarcatiune cu laboratoare, spatii de cazare pentru cercetatori si o sala multifunctionala, folosita pentru organizarea unor scoli de vara si ateliere.

Autorii nu isi propun sa prezinte un raport de activitate. Imaginile vor ilustra in mod neoficial momente, fapte si actiuni.

O atentie deosebita este acordata cercetatorilor, mai ales in domenii cu implicatii internationale din activitatea institutului Geoecomar.

PROMOTING GEOPHYSICS IN HIGH SCHOOLS (2018)

Cătălina Lăcătuşu, Ancuţa Patraş, Mădălina Tirizică, Denis Mocanu

Faculty of Geology and Geophysics, University of Bucharest

During high school, an average pupil has close to zero knowledge about what geosciences are, but the project *Promoting Geophysics in high schools* gave us the opportunity to change that. We chose to invest the effort of Bucharest Student Chapter of Society of Exploration Geophysicists (SEG of BSC) in this project, because we saw how every year less and less students applied for Geophysics and the main reason is that pupils do not know about the existence of this field of study, or about its importance in environmental protection, discovery of mineral resources, study of natural and anthropic hazards, etc.

Fig. 1. One of the teams of high school students recording magnetic anomalies during field activities in the second stage of the project.

The project had three main stages: high school conferences, a field trip and a workshop. During the first stage, we went to 12 high schools in Bucharest and presented in front of the students what Geophysics represents, where and how we use geophysical surveys and the importance of such investigations. The high school students have shown receptiveness to our presentations and we were happy to see that they were interested and curious about geophysics. By means of a registration form, 15 students from 4 different high schools confirmed their participation to the project.

The second stage took place on 2nd of June and started with an introductory presentation about basic magnetic data acquisition. It was held by two geophysics professors from our faculty, Assoc. Prof. Dr. Eng. Bogdan Niculescu (Head of the Geophysics Department) and Dr. Eng. Gina Andrei, Lecturer at the Geophysics Department.

The next step in our schedule was the actual field trip, in which the participants had the possibility to make contact with the world of Geophysics through real exploration of the underground by using magnetic surveys. The field trip was organized in Bucharest, at Polytechnic University Park, where many magnetic anomalies were recorded, mainly corresponding to buried metallic construction components and underground pipes. Our aim was to attract the attention of the young students and so, on the field, we initiated a contest in which the participants were split into three teams of five people each. Their objective was to find the biggest (most intense) magnetic anomaly within the surveyed perimeter (Fig. 1). Each team had 45 minutes to decide and measure their chosen profile, based on information presented earlier that day by Prof. Niculescu. We discovered three main anomalies, which helped us in ranking the teams.

Figure 2. High school participants and winners at the end of the workshop organized in the project.

The third stage, the final workshop, was held at the end of the day at the Faculty of Geology and Geophysics – University of Bucharest. We downloaded and interpreted the data acquired on the field. The high school students were amazed by the results of the geophysical surveys, which, without penetrating the soil and rocks, could reveal the

unknown of the subsurface, in this way protecting the environment. First, the professors explained how the data is processed and then how it should be interpreted in order to understand the complexity of the underground. All the students did exercises and interpreted the results and, at the end of the conference, we announced the winners depending on the magnitude of the identified anomalies (Fig. 2).

The Society of Exploration Geophysicists brings together the most ambitious and hard-working students. Its mission is to connect, inspire and propel the people and students through Geophysics. All of these goals were accomplished in this outreach project. SEG of BSC would like to express its sincere gratitude to SEG Foundation for their generous support in making the project possible. With their help and our initiative the high school students had the chance to learn Geophysics, meet and collaborate with competent and trained instructors and to make friends with whom to share the same passion.

***Aknowledgements*.** The project *Promoting Geophysics in high schools* was sponsored by the Society of Exploration Geophysicists. We are grateful to coordinating Professors: Assoc. Prof. Dr. Eng. Bogdan Niculescu and Lecturer Dr. Eng. Gina Andrei for their constant support and help in this project.

GEOLOGY: IS IT FOR EVERYONE?

Andreea Mârza*

*) President of the Bucharest Branch of the Geological Society of Romania

Key words:

The geosciences study the complexity of our surrounding nature, as well as the natural resources necessary in our day to day lives in the modern world (from plastic to electronics and electricity). In Romania, in general, the lay public and policy makers are not aware of the importance of geology, therefore it becomes increasingly difficult to build national strategies in terms of resource management. Furthermore, the lack of geological knowledge leads to misinformation, making discussions regarding subjects such as the balance between protecting the natural environment and exploiting resources to benefit the national economy virtually impossible. Therefore, educating the general public, as well as building a relationship between scientists, local communities and policy makers are key objectives of the Geological Society of Romania. This talk is mainly focused on bridging the relationship with the lay public.

Three types of activities are proposed: field excursions, lectures and contests. These activities have been personally tested and are thought to be the best alternatives in order to help the society achieve its goals.

One or two days field trips might focus on geological aspects which are attractive to a target group or might be of general interest, such as: scouting for fossils, hiking through a typical profile of a carbonate platform, explaining deformational mechanisms and the resulting structures from small to regional (gigantic) scale, types of water dams and the anthropic changes they impose and the associated dangers, etc.

Public lectures could pair up with the field trips or be standalone topics. Roughly an hour in length, a specialist will present a topic for the lay public showing examples (photos, analogue modelling: sand box, numerical modelling, etc.), followed by discussions and debates. Besides the educational aspect, topics should also focus on controversial issues such as shale gas, mining, waste management.

Furthermore, two contests are proposed; however, the number of possibilities is only limited by creativity. *Photo contests* are a common example applied by many entities such as the Geological Society of London (GSL) or National Geographic. The winner(s) will be

rewarded with prizes and their photos will be published in the annual calendar of the Geological Society of Romania. The second contest is a *bake off*, the idea is inspired from GSL's Great Geobakeoff. A number of different geological themes will be proposed and the points awarded will be directly proportional to the complexity of the baked products. The masterpieces will be photographed and sent to the SGR's Facebook account or via email. The winners accumulating the highest number of points will be rewarded.

The above mentioned projects will be included in the 2019 events calendar of the Bucharest branch of the Geological Society of Romania and hopefully might be included at national level if found suitable by the local communities across the country. However, in order to have outstanding results, communication with geological institutions, non-governmental organizations and companies is key in educating the lay public.

RESEARCH IN MARINE PROTECTED AREAS FROM THE ROMANIAN WATERS OF THE BLACK SEA

Adrian Popa

INCD GeoEcoMar, Str. Dimitirie Onciul 23-25, sector2, Bucureşti

Marea Neagră joacă un rol foarte important pentru România din punct de vedere comercial și turistic, având în același timp și o importantă componentă ecologică. În același timp, ecosistemul Mării Negre se confruntă cu diverși factori de stres cum ar fi: poluarea, pescuitul, schimbările climatice, eroziunea costieră, etc. Evaluarea habitatelor marine ajută la înțelegerea rolului acestor factori și la evoluția acestora în timp. Scopul acestei lucrări este să descrie pe scurt ariile marine protejate din apele teritoriale și apele de exclusivitate economică a României și situația lor actuală.

Politicile europene din ultimii ani încearcă să găsească strategii care ajută la protejarea acestor habitate pe termen lung: Directiva Habitate (92/43/EEC), Directiva Păsări (2009/147/EC), Directiva Cadru privind Strategia Marină (Marine Strategy Framework Directive - MSFD, 2017) și la creșterea economică sustenabilă pe termen lung în sectoarele marin și maritim (Blue Growth Economy).

Figure 1. Mussels habitat in the Black Sea MPAs.

Siturile de Importanță Comunitară (SCI) sunt definite de **Directiva Habitate** a Comisiei Europene (92/43/EEC) ca zone ce contribuie semnificativ la menținerea sau restaurarea la un statut favorabil a unui tip de habitat sau a unei specii și/sau la menținerea diversității biologice în regiunea din care face parte și poate contribui la coerența rețelei **Natura 2000**.

Ariile protejate speciale (SPA) sunt definite de **Directiva pentru conservarea păsărilor sălbatice** a Comisiei Europene (2009/147/EC) având ca scop protejarea păsărilor sălbatice și a habitatelor lor.

Figure 2. Sulphurous spring offshore Mangalia amidst green and red algae.
Photo courtesy Silvia Iordache.

Toate aceste arii protejate sunt înglobate în rețeaua **Natura 2000**. În apele teritoriale și de exclusivitate economică a României din Marea Neagră există 9 situri de importanță comunitară (SCI) și o arie protejată specială (SPA).

- ROSCI0066 – Delta Dunării - zona marină
- ROSCI0094 – Izvoarele sulfuroase submarine de la Mangalia (Fig. 2)
- ROSCI0197 – Plaja submersă Eforie Nord - Eforie Sud
- ROSCI0269 – Vama Veche-2 Mai
- ROSCI0273 – Zona marină de la Capul Tuzla
- ROSCI0281 – Cap Aurora
- ROSCI0293 – Costineşti-23 August
- ROSCI0311 – Canionul Viteaz
- ROSCI0413 – Lobul sudic al Câmpului de Phyllophora al lui Zernov
- ROSPA0076 – Marea Neagră

Siturile de importanță comunitară au o suprafață de 5213,2 km^2 în nord, 471,138 km^2 în sud și 352,5 km^2 în larg, în total având 6036,838 km^2. În zona costieră există un singur sit desemnat ca arie protejată specială - ROSPA-0076 Marea Neagră. Acesta are o suprafață de 1487,79 km^2 și se suprapune parțial cu siturile de importanță comunitară.

Figure 3. Habitat mapping in ROSCI0094 Submarine sulphurous springs at Mangalia.
Photo courtesy Adrian Teacă.

Din anul 2010, INCD GeoEcoMar este custode al ariilor marine protejate *Izvoarele sulfuroase submarine de la Mangalia* si *Zona marina de la Capul Tuzla*. În anul 2017, în cadrul proiectelor naționale, institutul a început cartări de habitate în zonele marine protejate din sudul șelfului românesc, acestea fiind continuate și în anul 2018, cu scopul imbunatatirii planului de management elaborat anterior, in conditiile in care suprafata acestor arii aflate in custodie s-a marit considerabil. În cadrul acestor cartări au fost efectuate măsurători geofizice, au fost prelevate probe de biologie și probe de sedimente. Procesarea datelor s-a realizat cu programe specializate, iar interpretarea integrată a datelor s-a făcut de o echipă interdisciplinara care a inclus geofizicieni, biologi și geologi.

Pentru exploatarea cât mai eficientă şi în același timp sustenabilă a resurselor marine, dar și pentru planificarea spațială, factorii de decizie au nevoie de o imagine cât mai completă a ceea ce se găsește atât în mediul marin cât și în zona costieră.

Aceste studii au scopul de a oferi o imagine cât mai completă din punct de vedere biologic și sedimentologic a zonelor de interes major în scopul protejării pe termen lung a habitatelor în general și a biodiversității marine în special și minimizării efectelor negative a impactului antropic asupra acestora.

CERCETĂRI ÎN ARIILE MARINE PROTEJATE DIN APELE ROMÂNEŞTI ALE MĂRII NEGRE

Versiunea romana

THE GEOLOGICAL AND PALAEONTOLOGICAL HERITAGE OF ANINA, CARAȘ-SEVERIN COUNTY

Mihai Emilian Popa

University of Bucharest, Faculty of Geology and Geophysics, Department of Geology & Doctoral School of Geology, 1, N. Bălcescu Ave., 010041, Bucharest, Romania
E-mail: mihai@mepopa.com

Anina, previously known as Steierdorf, is a fossil-Lagerstatte locality, with a long history related to Lower Jurassic bituminous, coking coal extraction, bituminous shales and refractory clays. Anina is located in the central area of the Reșița Basin (Reșița-Moldova Nouă sedimentary Zone), Getic Nappe, South Carpathians.

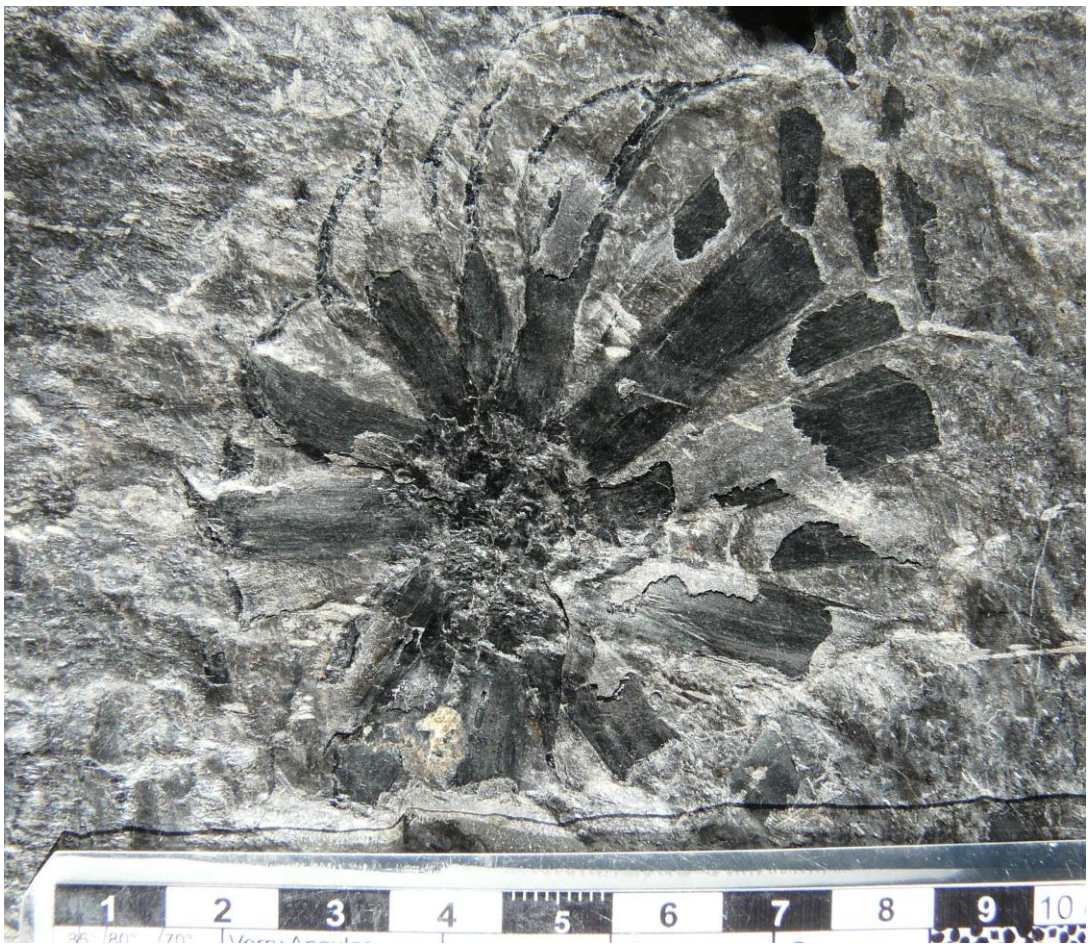


Figure 1. Williamsonia

Coal extraction began in 1792 and ended in 2006, the complex Anina mines becoming one of the deepest European mines, reaching -1300 m in depth and surpassing 100 km of galleries. To these galleries were added open cast mines in the southern area of the locality.

These mining works permitted three-dimensional, high precision studies regarding the distribution of fossil flora and fauna within the coal bearing formation, therefore Anina represented a unique knowledge window.

The Steierdorf Formation (Hettangian – Sinemurian) is a continental, coal bearing formation dominated by braided rivers, lacustrine and alluvial facies, with an exceptional heritage for both biodiversity and preservation. The Uteriș Formation (Pliensbachian – Middle Toarcian), represented by bituminous shales, the Tâlva Zânei Formation (Upper-Toarcian – Callovian), represented by marls, as well as younger, Upper Jurassic – Lower Cretaceous, marine formations, include at their turn rich and well preserved invertebrate faunas.

The palaeontological heritage of Anina is represented by fossil plants (pteridophytes and gymnosperms) (Fig. 1) and ichnofauna (tracks, trackways, feeding traces, vertebrate tunnels), making Anina, next to marine faunas of younger formations, a fossile-Lagerstatte locality. Preserving this heritage includes new Sites of Special Scientific Interest (SSSIs) as key areas for a future geopark.

PATRIMONIUL GEOLOGIC ȘI PALEONTOLOGIC AL ANINEI, JUDEȚUL CARAȘ-SEVERIN

Anina, cunoscută în literatura de specialitate și sub numele de Steierdorf, este o localitate fossile-Lagerstatte cu o lungă istorie legată de extracția huilelor cocsificabile, a șisturilor bituminoase și a argilelor refractare de vârstă Jurasic timpurie. Anina se găsește în partea centrală a Bazinului Reșița (Zona sedimentară Reșița-Moldova Nouă), Pânza Getică, în cadrul Carpaților de Sud. Exploatarea cărbunilor a început la Anina în anul 1792 și a încetat în anul 2006, de-a lungul anilor complexul minier de la Anina devenind unul dintre cele mai adânci exploatări europene, atingând -1300 m adâncime și însumând peste 100 km de galerii în funcțiune. Lor li se adaugă și exploatări la zi (cariere) în partea de sud a localității. Aceste lucrări miniere au permis studii tridimensionale de mare detaliu asupra distribuției faunelor și florelor fosile în cuprinsul formațiunilor purtătoare, Anina fiind o fereastră unică de cunoaștere din acest punct de vedere. Formațiunea de Steierdorf (Hettangian – Sinemurian) este o formațiune continentală dominată de faciesuri fluviatile despletite, lacustre și aluviale, cu un patrimoniu paleontologic excepțional atât din punct de vedere a biodiversității cât și al conservării. Formațiunile de Uteriș (Pliensbachian – Toarcian mediu), reprezentată prin șisturi bituminoase, de Tâlva Zânei (Toarcian superior – Callovian), precum și formațiunile marine mai noi, Jurasic superioare și Cretacic inferioare, ale Bazinului Reșița includ la rândul lor faune bogate și foarte bine conservate de nevertebrate. Patrimoniul paleontologic al Formațiunii de Steierdorf este reprezentat prin plante fosile (pteridofite și gimnosperme) și urme de faună (urme de pași, de hrănire, tuneluri de vertebrate) care fac din Anina, alături de fosilele marine ale formațiunilor mai tinere o localitate fossile-Lagerstatte. Conservarea acestui patrimoniu implică noi arii protejate, ca nucleu pentru un viitor geoparc.

DOBROGEA

Antoneta Seghedi

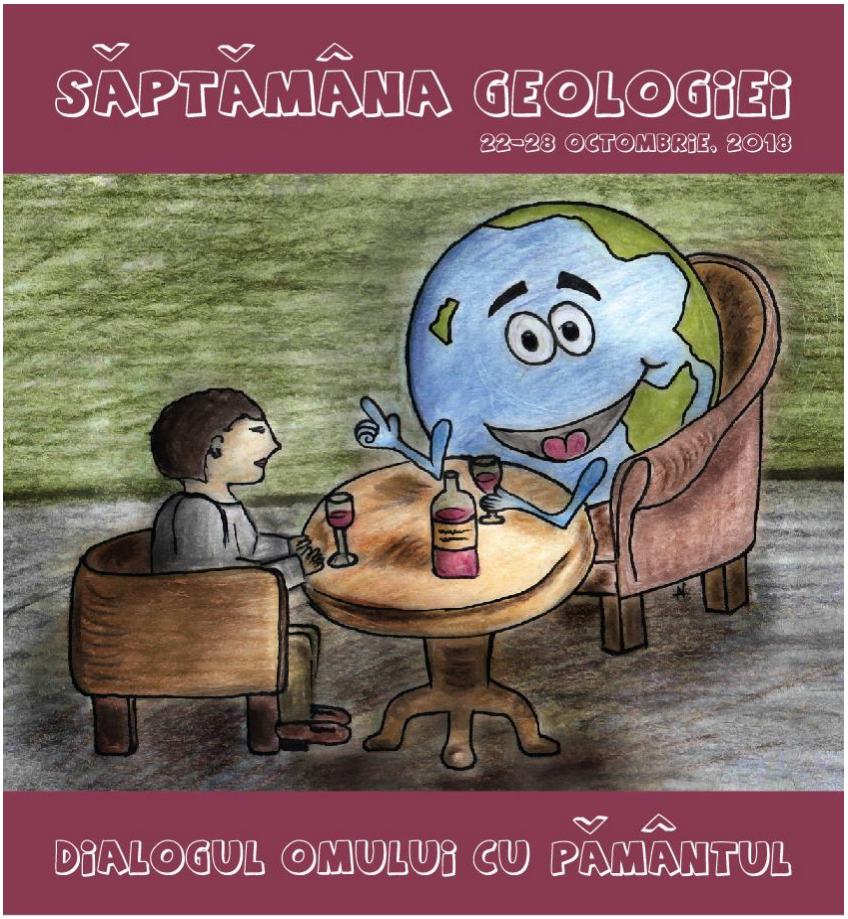
THE EARTH SCIENCE WEEK ORGANIZED IN ROMANIA IN 2018

Antoneta Seghedi

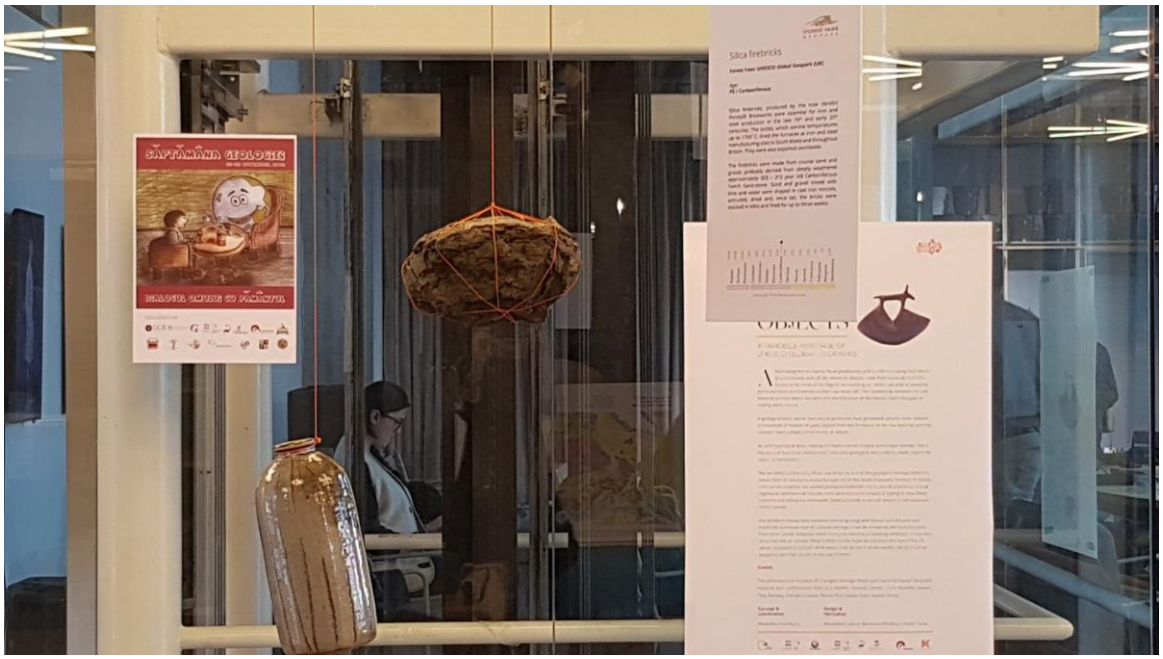
NRDI GeoEcoMar, 23-25 D. Onciul St., sector 2, Bucharest
seghedi@geoecomar.ro

Key words:

The event Earth Science Week was an initiative of the Geological Society of Romania to organized this event by all branches of the Society. The geological community responded to the call, and vvarious programs were proposed by each branch, usually in partnership with universities
organized in Romania



ORGANIZATORI:


SĂPTĂMÂNA GEOLOGIEI
Silica firebricks

THE DEBRIS AVALANCHE DEPOSITS (DADs) IN THE CĂLIMANI-GURGHIU-HARGHITA RANGE, THEIR ORIGIN AND EMPLACEMENT HISTORY AND HOW TO RECOGNIZE THEM IN THE FIELD

Ioan Seghedi[1], Alexandru Szakács[1], Zoltán Pécskay[2], Viorel Mirea[1] and Péter Luffi[1]

[1] Institute of Geodynamics, Romanian Academy, J.-L. Calderon 19-21, 020032 Bucharest, Romania, seghedi@geodin.ro
[2] Institute of Nuclear Research, Hungarian Academy of Sciences, P.O. Box 51, Bem tér 18/c, H-4001, Debrecen, Hungary

Key words: composite volcano, caldera, volcaniclastic deposits

Field volcanological data supported by K/Ar dating document the migration of volcanism from NNW to SSE along the Călimani-Gurghiu-Harghita (CGH) volcanic range, suggesting an almost continuous eruptive activity between 10.2 and 0.03 Ma. During this period a row of closely spaced, juxtaposed or partially overlapping medium-sized composite volcanoes were built. Two of these – Călimani and Fâncel-Lăpuşna evolved to the caldera stage almost simultaneously (7.0-6.8 Ma).

The assignment of the volcaniclastic deposits at the western periphery of CGH to different eruption centers has taken into account various genetic types of volcaniclastic deposits (pyroclastic, debris-avalanche, debris flow). In some cases, identifying the volcanic source has been difficult because of the rather monotonous petrography and geochemistry characterizing the entire range.

Figure 1. Quarry in proximal debris avalanche deposit in Ostoroş volcano, showing tilted, hydrothermally altered amphibole-pyroxene lava blocks of several cubic meters (toreva), in the right, in sharp contact with a monogenetic clast-supported pyroxene andesite lithic breccia, showing jig-saw cracks (see photo detail) in the left.

During the nineties, two major debris-avalanche deposits (DADs) have been identified at the western periphery of CGH. The largest one belonging to the Rusca-Tihu volcano (Călimani Mts.) has displaced ca. 26 km^3 of volcanic debris. The second one, originated in the Vârghiş volcano (North Harghita Mts.), has dispersed ca. 13 km^3 of collapsed material.

Recently, detailed geological mapping, petrographic observations, and K-Ar geochronology enabled a new comprehensive view about the origin and emplacement history of the volcanoclastic deposits including various DADs in the CGH. Major volcanic edifice failure events, besides caldera-forming eruptions, shaped the volcanic evolution of CGH. It has been identified and outlined three new, previously unknown, southward directed DADs in the Gurghiu and North and South Harghita Mts and one eastward directed in North Harghita. The DADs are typically represented by tens of meters thick chaotic mega-breccia with an unsorted, massive, polymictic character. They are heterogeneous at the outcrop scale, displaying sharp lateral variations in texture and lithology. DAD-specific features such as jigsaw cracks, breccia-in-breccia, and plastic (soft sediment) deformation are common. Several volcanoes experienced edifice-failure events and generated large-volume DADs at some point in their evolution: Rusca-Tihu (Călimani Mts.) at ~7.8 Ma, Fâncel-Lăpuşna (Gurghiu Mts.) at 6.8 Ma, Vârghiş (North Harghita) at ~4.8 Ma, Ostoroş-Ivo Cocoizaş at ~ 5 Ma and Luci-Lazu (South Harghita) at ~4.0 Ma. A smaller volume DAD originating in the ~1.7 Ma Pilişca volcano (South Harghita Mts.) has been also identified recently.

We suggest that most of the edifice failure events are closely related to a series of tectonic processes including the opening and southward propagation of the Borsec/Bilbor, Gheorgheni, Upper and Lower Ciuc Intermountain Basins and the growth of new volcanoes. The contemporaneous formation of basins and activation of volcanism, the southward propagating fault system, as well as the geometry of the faults and alignment of volcanic centers indicate strike-slip and normal extensional tectonics. Most of the known DADs were displaced in the SSW from their source volcanoes, most likely following the preexisting topography sloping toward the Transylvanian Basin.

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REMARKABLE GEODIVERSITY IN THE PERŞANI MOUNTAINS (ROMANIA) AND PRELIMINARY ASSESSMENT RESULTS OF ITS VOLCANIC GEOHERITAGE

Ildikó Soós[1, 2], Szabolcs Harangi[1, 2], János Szepesi[2], and Károly Németh[3]

[1] Department of Petrology and Geochemistry, Eötvös University H-1117 Budapest, Hungary, ildiko.soos14@gmail.com
[2] MTA-ELTE Volcanology Research Group, H-1117 Budapest, Pázmány Péter sétány 1/C, Budapest, Hungary
[3] Institute of Agriculture and Environment, Massey University, Palmerston North, New Zealand.

Keywords: volcanic geoheritage, geopark, geosite evaluation

The importance of geoheritage and their conservation and protection are becoming more and more accepted by researchers, professionals and the general public. Geoparks are rapidly increasing and their success is shown by the fact that there are currently 140 UNESCO Global Geoparks in 38 countries, worldwide. In addition, there are further national geoparks organized into nationwide networks. Geoparks are based on the local geoheritage and the geodiversity associated with cultural and historic heritage, gastronomy as well as on the activities of local communities. Their operation is based on the same holistic principle represented by protection, education and sustainable development as a whole.

The geological heritage is represented by scientifically, educationally, culturally and aesthetically significant geotopes (and their smaller unites, i.e. geosites) which are also elements of geodiversity. Geoheritage sites include geologic features and landscapes, different rocks and mineral types or fossils connected to different geological and other environmental or even anthropogenic processes (Reynard & Coratza, 2013).

The Perşani Mountain is located in the inner part of the Carpathian Bend Area, at the north-western margin of the Braşov Basin and has an exceptional natural (geodiversity & biodiversity) and an important cultural heritage with a high sustainable development potential. The most known geological heritage is the >176 km^2 Perşani Volcanic Field (PVF) with 21 identified volcanic structures. They were formed at 1.2-0.6 Ma, hence it represents the youngest monogenetic volcanic field in the Carpathian-Pannonian Region (Seghedi et al. 2016; Harangi et al., 2015). It contains lava flows, maars and scoria cones. Many of the volcanic complexes contain all of these volcanic structures and provide geodiversity of basaltic volcanism.

Most of the eye-catching volcanic geotopes were exposed during the long quarrying. The Racoş Basalt Columns were declared natural monuments in 1962 as well the Basalt Columns from Piatra Cioplită. In 1980 the Hoghiz Basalt Micro–Canyon also received this protection along with other geological values (ex. The Mud Volcanoes from Băile Homorod, Dopca Gorge, „Bârlogul Ursului" (Bear's Den) Cave). But all these were preceded by Rupea

Basalt Cliff which became a natural monument in 1954. All of these are considered a nationally protected areas, based on the register of the National Environmental Agency of Romania (http://apmbv.anpm.ro). Thus, protection of the various geological values has decades-long history.

In addition to the volcanic heritage, further geological important formations are found in this area. Near the youngest volcanic rocks on the surface, an ~550 Ma old gneiss is exposed that formed during the Cadomian Orogeny. It is an important territory from paleontological point of view as well, known especially for its Upper Jurassic to Lower Cretaceous ammonites and Upper Cretaceous inoceram faunas.

The geosite assessments in geoparks and in other developing areas have an important role in the protection, conservation, education and sustainable development of the territory. Experts representing a wide range of geosciences have developed different assessment methods for geotope ratings and quantitative evaluation which have been widely applied (Vujičić et al. 2011; Brilha, 2016; Szepesi et al., 2017; Szepesi et al., 2018; Németh et al., 2017). These assessments are important to support scientifically the strengths or the weak points of conservation and tourism utilization of the different geotopes/biotopes. The results show which geotope/biotope has scientific and/or tourism value. They highlight which is the area that needs most protection, because not all the important geoheritage could be available to the general public. There are places which due to their popularity should limit the number of tourists so some sites should be preserved for future generations and for research purposes. Therefore, these geoheritage surveys are particularly important and should be conducted by experts (geologists, biologists, cultural value specialists) or at least strictly supervised by them.

After an attentive study of the specific literature for geosite assessment, we decided to follow the suggestions described by Reynard et al. (2016). A careful search of the scientific references of the Perşani Mountains area was performed before the systematic field work. All the volcanic geotopes found in the literature, marked on the geological and topographic maps, were identified. After the field work a preliminary geotope list was set up. One of the most accepted assessment techniques is the GAM (Geosite Assesment Model) method developed by Vujičić et al. (2011), which defines the main (Scientific/Educational Value + Aesthetic Value + Protection) and additional (Functional Value + Touristic Value) values.

Volcanic geotopes represent an enchanting volcanic process that have equally scared people, ruined their resources but also provided resources, created a geological environment that promoted the flourishing of human society. Thanks to the great interest a number of comprehensive geological heritage and evaluation works were published which popularized the volcanic geological heritage research and increased the interest in geotourism (Németh et al., 2017).

Although the Carpathian-Pannonian Region is presently not an active volcanic area, it is important to protect the witnesses of the past volcanic eruptions and to use it for education. The Perşani Mountain with the complex geological structure provides an excellent educational material on the Carpathian Mountains formation and evolution as an episode of the Earth Natural History. Local people need to know the natural values around them to respect and protect them. They must to be proud of their values, whether they are cultural or natural (biodiversity, geodiversity). Geoparks provide the sustainable

development of a site through geotourism which is a knowledge based tourism and can be an important support for people living in economically disadvantaged areas but with outstanding natural and cultural values.

In addition to further volcanological and petrochemical research, the geotouristic evaluation of volcanic geotopes (Soós et al., 2018) has begun to increase the conservation and popularity of the sites. The results of this study could contribute also to the development of a future geopark, which would promote the local tourism and economy. These works form a part of the Volcanic Heritage survey in the Carpathian Pannonian region (Szepesi et al., 2017; 2018). Based on this, the idea of the 900 km long volcanic route connecting the widely known volcanological sites was formulated. This planned thematic route has been presented at several conferences (Harangi et al., 2015b) with the hope that it will become part of a European Volcano Route Network.

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BIBLIOGRAFIA GEOLOGICĂ A ROMÂNIEI REVIZITATĂ IN ANUL CENTENARULUI

Lucian Stanciu

Institutul Geologic al Romaniei, Str. Caransebes nr. 1, sector 1, Bucuresti
e-mail luxluc8@yahoo.com

Key words: data base, file,

La inceput a fost cuvântul…

Apoi in Evul Mediu au fost „o samă de cuvinte”...

De 16 ani există în România o bază de date geonomice in format electronic excel care imi poartă numele. Cele mai importante trei calităţi ale aceste baze de date sunt: e corpolentă, e colorată, este analitică. In 2008 dimensiunea fişierului era de 31000 de titluri, în 2014 numara 92000 de titluri iar in 2018, anul Centenarului, 143000 titluri.

57	57	Lucian Stanciu									1923	Dări de Seamă ale Şedinţelor		
58	58	Lucian Stanciu									1923	Dări de Seamă ale Şedinţelor	I	
59	59	Lucian Stanciu					MRAZEC Ludovic	1	română	masculin	1923	Observaţiuni asupra cutremurelor din Rom	I	Dări de Seamă ale Şedint
60	60	Lucian Stanciu					MRAZEC Ludovic	1	română	masculin	1923	Marnele cu Globigerine tortoniene la Gura V	I	Dări de Seamă ale Şedint
61	61	Lucian Stanciu					CANTUNIARI Ştefan	1	română	masculin	1923	Die Entstehung des krystallinen Gebirges	I	Dări de Seamă ale Şedint
62	62	Lucian Stanciu					MRAZEC Ludovic	1	română	masculin	1923	Despre "Tufenmergel" şi despre structura	I	Dări de Seamă ale Şedint
63	63	Lucian Stanciu					PROTESCU Otto	1	română	masculin	1923	Beitrage zur geologie des Zargebirges und	I	Dări de Seamă ale Şedint
64	64	Lucian Stanciu					PROTOPOPESCU-PAKE E.	1	română	masculin	1923	Untersuchungen uber die Hmmussauren- [	I	Dări de Seamă ale Şedint
65	65	Lucian Stanciu					CANTUNIARI Ştefan	1	română	masculin	1923	Beispiele plastischer und kristalloblastisch	I	Dări de Seamă ale Şedint
66	66	Lucian Stanciu					MURGOCI Gheorghe	1	română	masculin	1923	Solurile dealungul C.F. Anatoliene	I	Dări de Seamă ale Şedint
67	67	Lucian Stanciu					MURGOCI Gheorghe	1	română	masculin	1923	Sinteza geologică a Carpaţilor de Sud (I)	I	Dări de Seamă ale Şedint
68	68	Lucian Stanciu					PROTOPOPESCU-PAKE E.	1	română	masculin	1923	Cercetări agrogeologice în Câmpia Română	I	Dări de Seamă ale Şedint
69	69	Lucian Stanciu					MURGOCI Gheorghe	1	română	masculin	1923	Notite geologice din Taurosul Estic (regiun	I	Dări de Seamă ale Şedint
70	70	Lucian Stanciu									1911	Dări de Seamă ale Şedinţelor	II	
71	71	Lucian Stanciu					ATHANASIU Sava	1	română	masculin	1911	Sur la derniere periode glaciaire en Europe	II	Dări de Seamă ale Şedint
72	72	Lucian Stanciu					MRAZEC Ludovic	1	română	masculin	1911	Minereuri aurifere şi argentifere din mina Li	II	Dări de Seamă ale Şedint
73	73	Lucian Stanciu					POPESCU-VOITEŞTI Ion	1	română	masculin	1911	Studiul sedimentarului din partea de Sud a	II	Dări de Seamă ale Şedint
74	74	Lucian Stanciu					ATHANASIU Sava	1	română	masculin	1911	Asupra prezenţei unui bloc de Favosites cf.	II	Dări de Seamă ale Şedint
75	75	Lucian Stanciu					MURGOCI Gheorghe	1	română	masculin	1911	Die Leitlinien der geologischen bau des we	II	Dări de Seamă ale Şedint
76	76	Lucian Stanciu					ATHANASIU Sava	1	română	masculin	1911	Asupra existenţei Permianului în România	II	Dări de Seamă ale Şedint
77	77	Lucian Stanciu					MACOVEI Gheorghe	1	română	masculin	1911	Asupra vîrstei şi faciesurilor terenurilor sedi	II	Dări de Seamă ale Şedint
78	78	Lucian Stanciu					MERUŢ V.	1	română	masculin	1911	Masivul de sare de la Slănic-Prahova	II	Dări de Seamă ale Şedint
79	79	Lucian Stanciu					MRAZEC Ludovic	1	română	masculin	1911	Profesorul Grigore Ştefănescu (1838-1911)	II	Dări de Seamă ale Şedint
80	80	Lucian Stanciu					PROTOPOPESCU-PAKE E.	1	română	masculin	1911	Dreikantere găsite în regiunea de dune ma	II	Dări de Seamă ale Şedint
81	81	Lucian Stanciu					PROTOPOPESCU-PAKE E.	1	română	masculin	1911	Craniul de Elephas primigenius, de la Dob	II	Dări de Seamă ale Şedint
82	82	Lucian Stanciu					POPESCU-VOITEŞTI Ion	1	română	masculin	1911	Asupra prezenăei pînzei Conglomeratului d	II	Dări de Seamă ale Şedint
83	83	Lucian Stanciu					ATHANASIU Sava	1	română	masculin	1911	Das Erdolvorkommen in Galizien im Lichte	II	Dări de Seamă ale Şedint
84	84	Lucian Stanciu					REINHARD Max	1	germană	masculin	1911	Virsta inbuzirui sienitului nefelinic de la Cit	II	Dări de Seamă ale Şedint
85	85	Lucian Stanciu					PORUCIC T.	1	română	masculin	1911	Bosforul şi Dardanelele - Andrusov	II	Dări de Seamă ale Şedint
86	86	Lucian Stanciu					ATHANASIU Sava	1	română	masculin	1911	Asupra prezenţei cenuşelor andezitice în str	II	Dări de Seamă ale Şedint
87	87	Lucian Stanciu					ENCULESCU Petru	1	română	masculin	1911	Notă preliminară asupra unei cenuşe vulc	II	Dări de Seamă ale Şedint
88	88	Lucian Stanciu					TEISSEYRE W.	1	română	masculin	1911	Comunicare preliminară asupra unor speci	II	Dări de Seamă ale Şedint
89	89	Lucian Stanciu					PROTESCU Otto	1	română	masculin	1911	Die Bildung der Gollithen und Ragensteine	II	Dări de Seamă ale Şedint
90	90	Lucian Stanciu					MACOVEI Gheorghe	1	română	masculin	1911	Cîteva observaţiuni asupra cutei vestbalcan	II	Dări de Seamă ale Şedint
91	91	Lucian Stanciu					POPESCU-VOITEŞTI Ion	1	română	masculin	1911	Relaţiuni între Pînza gresiei de Fusaru şi Pî	II	Dări de Seamă ale Şedint
92	92	Lucian Stanciu					ATHANASIU Sava	1	română	masculin	1911	"Proiodotea haugi n.g.n.sp. Isopode oligocen	II	Dări de Seamă ale Şedint
93	93	Lucian Stanciu					ENCULESCU Petru	1	română	masculin	1911	Cîteva Gloduri (ochiuri) din podişul Moldove	II	Dări de Seamă ale Şedint
94	94	Lucian Stanciu					MERUŢ V.	1	română	masculin	1911	Der Salzauftrieb. Geophysikalische Studien	II	Dări de Seamă ale Şedint
95	95	Lucian Stanciu					PROTOPOPESCU-PAKE E.	1	română	masculin	1911	Asupra aşa zisului sol brun (Nraunerde)	II	Dări de Seamă ale Şedint
96	96	Lucian Stanciu									1912	Dări de Seamă ale Şedinţelor	III	
97	97	Lucian Stanciu					MRAZEC Ludovic, Popescu-Voiteşti Ion	2	română	masculin	1912	Cîteva date noi asupra klipelor carpatice	III	Dări de Seamă ale Şedintelu
98	98	Lucian Stanciu					IONESCU-ARGETOAIA Ion	1	română	masculin	1912	Comunicare preliminară asupra depozitelo	III	Dări de Seamă ale Şedintelu
99	99	Lucian Stanciu					POPESCU-VOITEŞTI Ion	1	română	masculin	1912	Date noi pentru clasificarea Fişiului carpati	III	Dări de Seamă ale Şedintelu
100	100	Lucian Stanciu					BOTEZ Gheorghe	1	română	masculin	1912	Asupra unui Inoceramus salisburgensis Fu	III	Dări de Seamă ale Şedintelu
101	101	Lucian Stanciu					MURGOCI Gheorghe	1	română	masculin	1912	Asupra tectonicei mari a şariajului.	III	Dări de Seamă ale Şedintelu
102	102	Lucian Stanciu					MACOVEI Gheorghe	1	română	masculin	1912	Cîte-va observaţiuni asupra hidrologiei sub	III	Dări de Seamă ale Şedintelu
103	103	Lucian Stanciu					PROTESCU Otto	1	română	masculin	1912	Comunicare asupra originei unor gresii cu	III	Dări de Seamă ale Şedintelu
104	104	Lucian Stanciu					SEIDEL Theodor	1	română	masculin	1912	Determinarea cantitativă a "reacţiunei" solu	III	Dări de Seamă ale Şedintelu
105	105	Lucian Stanciu					TĂNĂSESCU I.	1	română	masculin	1912	Influenţa gazelor asupra nivelului hydrostati	III	Dări de Seamă ale Şedintelu
106	106	Lucian Stanciu					POPESCU-VOITEŞTI Ion	1	română	masculin	1912	Straturile de Comarnic	III	Dări de Seamă ale Şedintelu
107	107	Lucian Stanciu					MURGOCI Gheorghe	1	română	masculin	1912	Raport asupra apeloraţiezienem cu privire	III	Dări de Seamă ale Şedintelu
108	108	Lucian Stanciu					MURGOCI Gheorghe	1	română	masculin	1912	Studiile geologice şi hidrogeologice din jun	III	Dări de Seamă ale Şedintelu
109	109	Lucian Stanciu					MRAZEC Ludovic	1	română	masculin	1912	Observaţii asupra comunicării Existenţa Ap	III	Dări de Seamă ale Şedintelu

Corpolenţa fişierului Geonomie-Stanciu-2018 este data de cele 117 coloane ale tabelului Excel. Cele mai importante criterii de sortare (itemi) sunt coloanele extreme (1 şi 117). Sortarea după coloana 1 – pe care am denumit-o coloana big-bang – te readuce in faza iniţială a creării bazei de date putând face corecţii colective de termeni sau corecturi

lingvistice individuale in ori care alta coloană. Coloana 117 ese importanta pentru ca indică proveninţa iniţială a informaţiei din cele 19 subfişiere „sudate” intr-un mega fişier excel cu peste 500000 de titluri. Celelalte coloane ale tabelului Excel sunt structurate in trei module: 1 – modulul organizatoric, 2 – modulul bibliografic clasic şi modulul ştiinţific multilateral dezvoltat (88 coloane).

Mi-am imaginat şi un submodul sociologic aferent itemului Autori care imi permite să selecţionez autorii după naţionalitate, sexul primului autor şi numărul de autori. Criteriul „naţionalitate” imi facilitează acesul la autorii străini care au scris despre Romania sau in Romania. Utilizînd itemul „naţionalitate” pot livra bibliotecilor străine partenere informaţii utile pentru ele in legatură cu diseminarea informaţiei create de autorii străini in publicaţii tipărite in Romania. Banuiesc că nu multe baze de date analitice create in străinătare imi pot livra electronic listinguri documentare cu autorii români care au tipărit in seriale străine. In alt item important cu care mi-am accesorizat baza de date este coloana „tip document” care-mi permite sa fac selecţia informaţiei după mai multe criterii: articole, cărţi, recenzii, informaţii, teze, ghiduri, dicţionare, hărţi, enciclopedii.

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De 16 ani există în România o bază de date geonomice in format electronic excel care imi poartă numele. Cele mai importante trei calităţi ale aceste baze de date sunt: e corpolentă, e colorată, este analitică. In 2008 dimensiunea fişierului era de 31000 de titluri, în 2014 numara 92000 de titluri iar in 2018, anul Centenarului, 143000 titluri.

Corpolenţa fişierului Geonomie-Stanciu-2018 este data de cele 117 coloane ale tabelului Excel. Cele mai importante criterii de sortare (itemi) sunt coloanele extreme (1 şi 117). Sortarea după coloana 1 – pe care am denumit-o coloana big-bang – te readuce in faza iniţială a creării bazei de date putând face corecţii colective de termeni sau corecturi lingvistice individuale in ori care alta coloană. Coloana 117 ese importanta pentru ca indică proveninţa iniţială a informaţiei din cele 19 subfişiere „sudate” intr-un maga fişier excel cu peste 500000 de titluri. Celelalte coloane ale tabelului Excel sunt structurate in trei module: 1 – modulul organizatoric, 2 – modulul bibliografic clasic şi modulul ştiinţific multilateral dezvoltat (88 coloane).

Mi-am imaginat şi un submodul sociologic aferent itemului Autori care imi permite să selecţionez autorii după naţionalitate, sexul primului autor şi numărul de autori. Criteriul „naţionalitate” imi facilitează acesul la autorii străini care au scris despre Romania sau in Romania. Utilizînd itemul „naţionalitate” pot livra bibliotecilor străine partenere informaţii utile pentru ele in legatură cu diseminarea informaţiei create de autorii străini in publicaţii tipărite in Romania. Banuiesc că nu multe baze de date analitice create in străinătare imi pot livra electronic listinguri documentare cu autorii români care au tipărit in seriale străine. In alt item important cu care mi-a, accesorizat baza de date este coloana „tip document” care-mi permite sa fac selecţia informaţiei după mai multe criterii: articole, cărţi, recenzii, informaţii, teze, ghiduri, dicţionare, hărţi, enciclopedii.

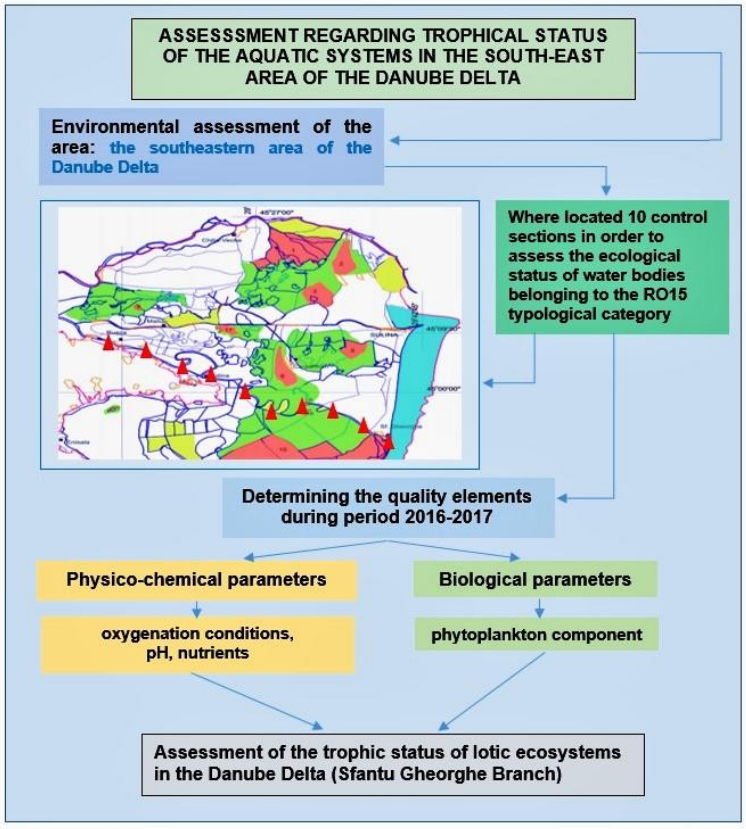
ASSESSSMENT REGARDING THE TROPHIC STATUS OF THE AQUATIC SYSTEMS IN THE SOUTH-EASTERN AREA OF THE DANUBE DELTA

Elena Stănescu[*1], Mihaela Scrădeanu[2], Aurora Daniela Neagoe[1], Daniel Scrădeanu[2], Virgil Alexandru Iordache[1]

[1]Research and Education Center for Practical Environmental Management Applications and Ecological Services "DAN MANOLELI" - CESEC, University of Bucharest, email: elenastanescu1972@gmail.com
[2]University of Bucharest, Faculty of Geology and Geophysics, Traian Vuia street 6, district 2, Bucharest, Romania

Keywords: Danube river, aquatic ecosystems, trophic status, chlorophyll a

This paper presents the results of the assessment of the trophic status of lotic ecosystems in the Danube Delta (Sfantu Gheorghe Branch) in order to transpose into practice the requirements of the Water Framework Directive. The assessment of the ecological status of water bodies belonging to the RO15 typological category was based on the determination of the physico-chemical quality elements (oxygenation conditions, pH, nutrients) and biological (phytoplankton component).



The conclusions are based on the interpretation of the results obtained in 10 control sections monitored during the period 2016-2017, sections located in the area selected for investigation in the southeastern area of the protected area of the Danube Delta.

Geographic location of the control sections for sampling in the investigated area was performed by the technique of positioning by satellite (GPS).

GEOCONSERVATION NOT ONLY FOR PROTECTION, BUT ALSO FOR SUSTAINABLE DEVELOPMENT CASE STUDY: BUZĂU LAND ASPIRING GEOPARK

Cristina TOMA

University of Bucharest, Faculty of Geology and Geophysics, Doctoral School
cristina.toma@tinutulbuzaului.org

Key words: communities, mud volcanoes, traditional products

When local communities hear about nature conservation they get scared and think this means interdiction for every activity and disapprove this idea. Until some point it is normal because they heard about relatives or friends living near national parks or in natural parks where strict legislation applies and they couldn't do grazing whenever they want and wherever they want as it was traditional, they couldn't build new enclosures where the want and so on. Many thought the same interdictions would apply in a geopark and they didn't embrace the concept in the first place. In order to surpass this moment we need to educate and create awareness. In Buzău Land Aspiring Geopark the idea of developing a geopark started around 2009 and was enhanced in 2014 with a 3 years project with SEE funding which involved research and work with the local communities, and this was one of the pillars which created awareness in the local community about the what a geopark means and which are its advantages.

A very interesting approach that I used when communicating what a geopark is to the communities, was the one I found on the Geological Survey of Ireland's website, (www.gsi.ie), in 2015, which I adapted for my case study : "what the geopark is NOT!"

A geopark is not only about geology and geography, it is also about birds and plants and animals and people, historic places and buildings and arts. The secret of the geopark is to interconnect all of this in the management strategy, to have a holistic view over them and have interdisciplinary approaches when managing them. The geopark is not only for specialists, but also not a thematic park.

Also a geopark is not one area, it is a large territory with common values (natural and cultural) which have to be conserved so they would represent a resource for sustainable development. In a geopark each area of that large territory is important and has to be included in the management plan, the focus is not only on the most attractive area, for example in Buzău Land, the mud volcanoes.

The geopark doesn't come with those strict legal regulations from the national park, also the geopark doesn't have to be a protected area, like a natural park, it may have protected areas inside, for example in Buzau Land we have Natura 2000 areas in Meledic Plateau (SCI), Mud Volcanoes from Pâclele Mari and Pâclele Mici (SCI) and national nature reserves like The Lilac Hill in Cernăteşti.

Figure 1. The Old Ladies from Ulmet are not only a very aestethic feature of the geodiversity in the Buzău Land Geopark, but also the link between man and earth, as people have stories about these spectacular sandstone concretions, which makes them a means of development.

So the geopark is a large territory managed by an organism which has to establish partnerships with the local authorities, universities, research institutions, museums and especially with the local communities, meaning the people from the territory. The scope of the geopark, as UNESCO defined it (www.unesco.org) is to find means to protect and conserve the geoheritage, natural and cultural heritage, educate and raise awareness in the local communities about the importance of the natural and cultural values they have, enhancing the sense of pride and belonging to that area, so that they want to protect them and actively participate in their own sustainable development. This means encouraging new local innovative businesses related to geoturism, as local guides, accommodation, workshops with local craftsmen, traditional products which enhance the visitors experience of the specific area.

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