A brief history of the past 65 years of Romanian Engineering Geology experience

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The Romanian engineering geology experience is a complex and intricate picture that has to be described in terms of contributions to design and execution of engineering works realized during the last century and of individual or collective personalities which significantly contributed at the birth or development of this domain. The history described below refers to engineering geology roots which intertwine with hydrogeology and geophysics in Romania. Six decades of professional activity in the field of engineering geology represent a huge amount of work, effort and often sacrifice of many generations. The quality of their works is demonstrated by the fact that most part of their achievements is still in function and their successors spread all over the world and successfully apply the professional principles inherited. The complete itemization of all persons related to this activity is an impossible task, and authors apology for eventually overlook of persons or contributions and underline that there were mentioned only personalities that passed away.

Keywords: collective personalities, professional principles.

1. The birth of Romanian school of Engineering Geology and national group

The origin of the Romanian school of engineering geology rises in the first decade after the World War II, from the old geological and mining educational institutes. In 1948 the Institute of Geology and Mining Technology detached from Polytechnic Institute of Bucharest (the most important technical university in Romania founded in 1818, [10]), and became the first national educational center dedicated to applied fields of mining and metallurgy, oil and gas exploitation, economic engineering and engineering geology, under the direction of Professor Nicolae Petrulian (1902-1983), [1, 3, 5].

From this point, the further evolution of this high education school of engineering geology followed in the same tonality the turbulent evolution of the country. It was changed for short time (1952-1957) in a faculty beside Mining Institute and

further transferred to Oil and Gas Institute (1957-1974), which becomes The Institute of Petroleum, Gas and Geology [5]. Since 1974, the Faculty of Geology and Geophysics merges with the Geology Department of the Geography and Geology Faculty from the University of Bucharest (founded 1864, [11]), and supported several and radical transformation by joining with Geography or Biology Faculties.
Starting from 1989, an Engineering Geology Department was created in the frame of the Faculty of Geology and Geophysics, beside University of Bucharest, and few years later, in 1992, the Romanian Association for Engineering Geology is founded and joins I.A.E.G. as national group.

2. First Romanian Engineering Geology experiences.

One of the first citations regarding the applied geology for engineering purposes is dated 1921-1922 when the Romanian Railways demand Professor Gheorghe Macovei (1880-1969) to realize a complex geological study on Bistrita Valley, in order to extend and update the railway works. The objective was realized later, between 1949 and 1953, with the expertise in East Carpathians geology of Professor Ion Bãncilã (1901-2001) which helped to the best route choice and design of Piatra Neamţ-Bicaz railway [2].
Preliminary engineering geology studies for dams are realized starting from 1950 by Gh. Cernea and Th. Joja for Siret River, Şt. Ghika Budeşti for Argeş r., N. Gherasi for Sebeş r. and I. Bãncilã for Bistriţa r. [2], in the frame of Romanian Geological Committee. Regarding those pioneering times, the prospecting geological field trips where described by I. Bãncilã as an adventure in which the compass and the photo camera where considered subversive tools and results of the studies were always supervised and approved by Soviet cancellers [2]. Readers must be informed that during the communist regime, in spite of scientific and technical interest, for professors or practitioners it was forbidden to adhere to any international professional association and the participation to international conferences was strictly controlled and surveyed by the authorities. Representative and, unfortunately not unique, was the case of one of the greatest personality of Romanian engineering geologists, Professor Ion Bãncilã, who even he was official decorated for the substantial contribution to the design and execution of the main Romanian large dams, did not have the permission to participate to the First I.A.E.G. Congress, Paris, 1970, to present his paper [2].
Later on, this activity will be extended in the frame of the Institute for Power Studies and Design (I.S.P.E. - founded 1949) and the Institute for Studies, Design and Water Management (I.C.P.E.G.A. - founded 1953) which long time further on will concentrate a main part of engineering geology activity in Romania. An objective summary of this activity counts 237 dams, design and executed between 1949 and 2000 [4, 7].

By far, one of the most dominant personalities in the field of engineering geology was Professor Ion Bãncilã, "recommended" by his long and highly professional activity. He successfully participate to design and execution of the most important large dams in Romania, [2]: Izvorul Muntelui-Bistriţa River (1961), Vidraru-Argeş r. (1965), Iron Gates-Danube r., (1971-1984) and many others, of less importance: Stâmtori-Firiza r. (1964), Rovinari-Jiu r.(1965), Paltinul- Doftana r. (1971), Valea de Peşti r.(1972), Poiana Uzului-Uz r. (1973), Sãcele-Târlung r. (1975), Cibin r. (1979), Ştefãneşti-Prut r. (1978), Pecinegu-Dâmboviţa r. (1984), Valea Neagrã-Runcu-Mara r. (1987), Siriu-Buzãu r. (1994), Maneciu-Teleajen r. (1994). At the time of birth of the first large dam (Izvorul Muntelui-Bistriţa, 1950-53), I. Bãncilã was sustained by Czech specialists Quido Pfefermann Zaruba and Vojtech Mencl, but later on, beside him grows up a large group of engineering geology specialists in design and execution of large dams in Romania and in other countries. Beside them, I. Băncilă coordinates the edition of an appreciated book of Engineering Geology (1980, Technical Printing House, two volumes, in Romanian).

In the same time (1949), other large scale engineering works are started (Danube - Black Sea Canal) and involve several teams of Romanian and Soviet specialists. Between Romanian specialists the most significant where Professor Gheorghe Macovei and Professor Radu Ciocârdel (1915-2010) who, beside professor engineer N. Maslov, and the geologist engineers N. Prosciuhan and C. Pestovski, "piled up a broad documentation, materialized in The Technical and Economic Memoir regarding the Construction of the Danube-Black Sea Canal, which contained 17 volumes" [8]. After an apotheosis debut, the works for the canal has been stopped for two decades, but the large experience of Russians in engineering geology inspired the Romanian leaders to sustain this domain in further years [3]. Danube-Black Sea Canal was accomplished later, starting from 1972, in three years, based on 144 volumes of studies and researches, plus 358 volumes representing the proper designing part, with schemes, graphs, tables about the Canal and the adjacent works and with more than 70 Romanian architects, civil, hydrotechnical and geological engineers, climatologists, botanists, etc. working in shifts [8].

All these engineering geology experiences related to dam construction, drainage and waterproofing, water impoundment, underground or open mining, harbors and canals, tunnels, required solid knowledge of applied hydrogeology, domain born in Romania half a century ago [9]. For this reason, many personalities who contributed to the foundation of engineering geology proved also competences in the field of hydrogeology. Starting with Gh. Macovei who realized the first hydrogeologic map of South Dobrogea, later on I. Bãncilã (1956, 1958, 1965), P. Bomboe (1963), R. Cãdere (1964), R. Ciocârdel (1952, 1957, 1969), V. Harnaj (1963, 1965).

3. Romanian Engineering Geology school.

At the Institute of Geology and Mining Technology the first course of engineering geology was sustained in early 1950 by Professor Ştefan Ghika Budeşti (1904-1959), succeeded by Professor Petre Bomboe (1924-2011). The broad personality of Professor Petre Bomboe dominated the Romanian School of engineering geology for many decades. He was the youngest and long-lasting dean of the Faculty of Geology and Geophysics from the University of Bucharest (17 years), position which allows him to sustain engineering area of geological sciences. His field of activity covered beside engineering geology and hydrogeology also statistics and applied mathematics for geology purposes. He also participated to the foundation of the Department of Geology at Dar Es Salaam University, Tanzania, and implementation of engineering geology at Antofagasta University, Chile. He coordinates also some of the most appreciated courses of Engineering Geology 1980, or Mathematical Geology, 1979, (University Printing House, in Romanian).

Beside him, following the next decades, many outstanding professors contributed at the strengthening of the Romanian engineering geology school: Alexandru Codarcea (1900-1974), Iulian Gavăt (1900-1978), Gheorghe Murgeanu (1901-1984), Ion Huber-Panu (1904-1974), Radu Cădere (1905-1993), Viaceslav Harnaj (1917-1988), Ştefan Airinei (1920-1989), Radu Botezatu (1921-1988), Vasile Lăzărescu (1926-1989), Mircea N. Florea (1926-2011) and others. The limited space of this publication do not allow us to present the scientific activity of all of them, and we confine to underline the personalities and enthusiastic commitment for the true values of Romanian engineering school of the last two of them.

Professor Vasile Lăzărescu was one of the greatest and most beloved teachers of the Faculty of Geology and Geophysics for more than 40 years. In spite of all political harassments that surrounded him under communist regime, he excels in complexity and profundity of understanding the geologic environment. He contributed to tectonic maps of Romania and Europe in the frame of UNESCO project related to Balkan seismicity and wrote one of the best books of Physical Geology (1980).

Professor Mircea Florea had successfully sustained for four decades courses of Soil and Rock Mechanics, Geotechnics and Stability of slopes. He published over 100 articles, most of them related to the contrast between mechanical properties of bedrock and shallow deposits, piping and unsaturated water flow phenomenon and their implication in the stability of tailing dams. His deep and true generosity sustained over years many generations of engineering geologists, which still preserve for him a great respect and gratitude. He is the author of several important books: Landslides, 1979, Soil and Rock Mechanics, 1983, and Tailing Dams Stability, 1996, (Technical Printing House, in Romanian).

As we mentioned before, the communist regime limited the scientific communication with occidental word, but permitted the change of knowledge with the rest of communist countries (Vietnam, North Korea, Cuba), with African new states or

South American countries. In consequence, large numbers of foreign students applied for Romanian school of engineering geology, and many Romanian geologists worked abroad between 1960 and 1980. Between 1974 and 1989, in Romania the needs for engineering geologist grows up and the Faculty of Geology and Geophysics increased considerably the number of graduate students. Most of them contributed to the economic and industrial development of Romania (before 1989): 213 dams design and executed after 1970, [4,7], over 10000 km of new railways with art works, 82000 km of roads, 62 airports, over 200 tailing dams and mining waste deposits, 70 km of metro lines with 51 stations, etc.

4. Romanian Association for Engineering Geology

In 1992, at the initiative of founding members, Romanian Association for Engineering Geology (ARGI) was founded. Almost as many years, ARGI is a member without interruption in the International Association for Engineering Geology and the Environment (IAEG). Most of the members works in universities, private or multinational companies and offer their expertise for rehabilitation and new construction of subway, airports, motorways, national and county roads, railway sections, bridges overpasses or underpasses providing traffic improvement in major cities, unconventional energy sources (wind turbines and photovoltaic cells), natural disasters hazard and risk maps, hazardous and radioactive waste disposal, geoenvironmental protection, cultural heritage preservation etc. During the last two decades several conferences, national and international symposia organized by ARGI, among which we mention:

– International symposium "Engineering Geology and Geoenvironment Protection", Mamaia, May 23-28, 1994; volume published;
– National Symposium "Mining geological engineering", Motru, 1996; volume published;
– National Symposium Landslides - the impact on the environment and society, hazard zoning and prevention of effects", Bucharest, 30 September - 1 October, 2004;
– National Symposium (with international participation) "Landslides - the impact on the environment and society" October 25-27, 2007 (organized by the Geological Institute of Romania - IGR in collaboration with ARGI), May 21-22, 2010;
– Contributions to annual Sympozia organized in 2005 - 2012 by the Faculty of Geology and Geophysics;
– Conference held within the framework of the bilateral program "Engineering Geology and Waste Disposal" between Bucharest University and Bundesanstadt fur Geowissenschaften und Rohstoffe from Hannover, in Bucharest, 1997;

In August 1999 ARGI supported organization in Bucharest University of the event The 5th Conference "Mechanical Behavior of Salt - MECASALT 5", sponsored

by companies and universities from the United States and Romania. Participation of ARGI members in government committees on laws of expertise: We cite only the Law no. 575 of 22 October 2001 approving the plan for upgrading of the national territory - Section V - natural risk zones, or geotechnics regulatory in specialized Technical Committee No. 6 "Geotechnical engineering and foundations" of the Ministry of Regional Development and Public Administration.
International activity: The ARGI President is member of the IAEG Council, which governs and manages IAEG. In this capacity he represented ARGI at the majority of IAEG congresses every 4 years, for the election of the IAEG President and of the Executive Committee, and at other IAEG annual meetings of the Council. The Romanian Group of engineering geology is part of the core of countries with continuous activity in the IAEG for more than 20 years and had in the past few years, in particular by the efforts of the treasurer of the association, an ever-increasing number of members and associate members, contributors IAEG, with and without subscription to Bulletin of Engineering Geology and the Environment. A part of ARGI achievements was presented to the IAEG Secretariat as contribution to mark in 2014 the anniversary of 50 years from the establishment of the International Association for Engineering Geology and the Environment (IAEG).

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