

THE REMARKABLE HISTORY OF THE “EMIL RACOVITĂ” INSTITUTE OF SPELEOLOGY (1920-2020) – FROM IDEAS INITIATED AT “LABORATOIRE ARAGO” IN FRANCE TO THE SUCCESSFUL RESEARCH IN ROMANIA

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SPELEOLOGY
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ABSTRACT –The Institute of Speleology** founded by EG Racovitza in Romania, arrived in 2020 at its centennial anniversary. We recount the way in which the idea of an institution dealing with diverse research aspects of the subterranean domain, at the time accessible mainly through the exploration of the caves, became a reality. The favorable cultural atmosphere of the Laboratoire Arago, at Banyuls-sur-Mer, during the time when EG Racovitza worked there, played an important role for the creation of the first institute of speleology in the world. The history of the scientific activity of this institution, founded in 1920 at Cluj under the leadership of Racovitza is briefly recounted. The second part of the essay stresses the existential difficulties of this institute after the death of Racovitza in 1947 and the successes obtained after its reorganization in 1956 as a national centre of speleological research in Romania, nowadays widely recognized within the international scientific community. The long-term functioning of the institute is metaphorically compared to a “dynamical and multifunctional house”. The reasons for such a long existence depend on the personalities of the “house’s inhabitants” and their capacity for active production and communication of innovative research.

Introduction – EG Racovitza and the foundation of biospeleology

The role of the Laboratoire Arago

The Institute of Speleology in Romania, founded by EG Racovitza (Fig. 1), marks his centennial in 2020. On 26 April 1920, the Romanian parliament and king Ferdinand of Romania signed the documents allowing the University of Cluj to launch an institute dealing with research on the subterranean domain, the first such institute in the world.

Racovitza (1926a) indicated that the institution was the official recognition of the existing broad interest in this research field, especially for biological aspects. Racovitza dealt with various aspects of cave research for more than 15 years at the Laboratoire Arago, in Banyuls-sur-Mer, before the conception of this institute in Romania, during which time he associated with the French naturalist R Jeannel. Therefore, for the present anniversary of

the centenary of the Institute of Speleology, one should also consider the enterprise of Racovitza, Jeannel and their colleagues to the establishment of the so-called *Biospeologica* association, as well as their efforts to define the conceptual content of biospeleology and more generally of speleology as a synthetic scientific discipline. C Delamare Deboutteville (1982) noted one of the peculiar aspects for the history of biospeleology, namely that it was related to the activities of a marine research laboratory “La création de la biospéologie dans un laboratoire marin est tout à l’honneur du Laboratoire Arago”.

In his speech for the 50th anniversary of the Laboratoire Arago, Racovitza mentioned that he first visited Banyuls in early 1891 during a field trip of Prof H de Lacaze-Duthiers and his students. Racovitza’s life remained after that closely associated with Banyuls and its surrounding area during more than 30 years. He considered that this period represented the most felicitous years of his life (Racovitza 1937).

** In this publication, we use the term “speleology” including its derived form “biospeleology”, as it is nowadays internationally widely accepted. Racovitza (1907: 381) preferred the variant *Spéologie*, considering the term more euphonic. The Institute he founded in 1920 at Cluj was named “Institutul de Speologie”. Since 1957 the institute is officially named Institutul de Speologie “Emil Racoviță”. Here we will describe the Institute of Speleology founded by EG Racovitza. For the present exposition, we use beside the Romanian name Emil Racoviță the French variant E Racovitza, as this latter is widely used by the scientific community.



Fig. 1. – Portrait of E G Racovitza, photographed in 1928 (courtesy of Dr T Brad).

Lacaze-Duthiers, the initiator of the biological station in Roscoff, on the Atlantic French coast, was also director of the marine biological station in Banyuls on the Mediterranean coast. As early as 1891, he allowed Racovitza to work at the Banyuls laboratory and consistently encouraged his research efforts during the following years. In Banyuls, Racovitza met G Pruvôt, a well-known French marine biologist. The two became good friends and collaborated to the compendium volume “Matériaux pour la faune des Annélides de Banyuls”. Under the supervision of L Boutan, another marine biologist in Banyuls, Racovitza undertook underwater diving, sampling zoological material for his laboratory studies. Racovitza defended his doctoral thesis in 1896, having as subject aspects of the head anatomy of marine annelids and entitled “Le lobe céphalique et l’encéphale des Annélides”.

During 1897 and 1899, Racovitza participated in the “Belgica” expedition in Antarctica and on return to Banyuls, he began to study the zoological material he collected during this expedition, an activity permitted by Lacaze-Duthiers and Pruvôt since the material was scientifically extremely interesting. He received new offers to participate in other expeditions, both in Antarctica and in the Atlantic, and/or to return to Romania, where positions at the University of Bucharest and at a biological laboratory in Constanța were offered, but they were firmly declined.

As proposed by Lacaze-Duthiers, in 1900 Racovitza was appointed vice director of the Laboratoire Arago, where G Pruvôt was the chief director. Their extremely harmonious cooperative activities were later positively viewed by other personalities of this institution. O Duboscq (1937) remembers the cooperation as following: “C’étaient deux maîtres, qu’une profonde amitié rendait inséparables, deux frères qui vivaient pour une cause commune, dirigeaient ensemble, sacrifiant leur temps et leur argent à l’extension des moyens de travail et au développement des recherches scientifiques” (Duboscq 1937). Also, P Drach (1969) offered a similar statement: “à cette direction, Pruvôt et Racovitza, l’un comme directeur, l’autre comme sous-directeur, devaient donner le meilleur d’eux-mêmes dans une entente jamais démentie, pour le plus grand bénéfice du développement de la Biologie”. Lacaze-Duthiers, who appreciated both Pruvôt and Racovitza, appointed them as chief editors for the newly founded journal *Archives de Zoologie expérimentale et générale*.

Reviewing the history of biospeleology one will understand the way EG Racovitza changed his interests from marine organisms to the studies of the subterranean fauna. This happened during 1904 when he participated in a cruise of the research ship “Roland” to Mallorca Island, where it was intended to explore the marine cave Cueva del Drach. Beside Racovitza and Pruvôt, the well-known Spanish oceanographer O de Bouen was aboard the ship. On this occasion, a remarkable isopod crustacean was sampled that Racovitza later described as the new species and genus *Typhlocirolana moraguesi*. The study of this small, blind, unpigmented crustacean with elongated appendages, living in low salinity water of the cave displayed phylogenetic relationships to the typical marine isopods of the family Cirolanidae. For Racovitza, this experience represented a real intellectual revelation. He perceived the immense interest of the studies of subterranean fauna for the advancement of general biology. From 1905 ongoing, Racovitza, first accompanied by his wife, later on assisted by R Jeannel, his closely collaborator and friend, explored numerous caves in Southern France. Jeannel at the time completed a medicine study but after visiting the French cave Oxybar, where they discovered new species of blind beetles, decided to switch from medicine to natural sciences, and became a specialist of Coleoptera. During his stay at Laboratoire Arago Jeannel prepared a remarkable doctoral thesis entitled “Révision des Bathyscinae”, a monograph of 600 pages dealing with cave beetles.

The exploration of caves allowed Racovitza & Jeannel to sample a very rich collection of subterranean animals that they also sent to be studied by specialists belonging to the international association *Biospeologica*. Under this name, Racovitza aimed to assemble a wide spectrum of specialists interested in biospeleology in order to sample and describe cave fauna, as well as the more academic

purpose of discussing evolutionary problems related to subterranean organisms.

The conceptual ideas of *Biospeologica* were presented by Racovitza in a famous manifesto “Essai sur les problèmes biospéologiques”, published in 1907 in *Archives de Zoologie expérimentale et générale*. The “Essay” was a synthetic review of the information then available about the origin and evolution of the subsurface fauna and about the structure of their environment. Additionally, it proposed a series of perspectives which could advance the scientific research related to the biology of the subterranean domain. Guiart and Jeannel (1948-1963) pointed out that “cet Essai a été d'emblée et est resté le statut fondamental de la biospéologie”. A similar view was expressed by C Delamare Deboutteville (1970) the “Essay” peut être considéré comme le catéchisme de tous les biospéologues modernes”. We also add the statement of the well-known French zoologist, A Vandel, who at the 1st International Congress of Speleology hold in Paris in 1951 mentioned: “l'année 1907 marque un tournant décisif dans l'histoire de la biospéologie. C'est l'année où le grand zoologiste roumain, EG Racovitza, publie son célèbre manifeste. C'est l'année aussi où Racovitza fonde, en collaboration avec le Dr Jeannel, la vaste organisation dénommée *Biospeologica* qui devait contribuer si puissamment à l'essor de la biospéologie.” (Vandel 1953).

Following the description of the cirrolanid *Typhlocirolana moraguesi*, Racovitza continued to study other aquatic and terrestrial isopods sampled in the caves and several publications appeared in the *Biospeologica* series. Two publications on terrestrial isopods were issued in 1907 and 1908 and two monographs appeared later on, one on the sphaeromids (1910) and one on cirrolanids (1912). From 1919, Racovitza also studied various freshwater Asellidae (cf EG Racovitza, list of publications, in Motaș Ed 1964). In all these publications, beside the descriptive aspects, one finds general considerations on the morphology and phylogeny of the various isopod groups studied and one is impressed by the Racovitza's deep knowledge of isopod systematics. It is now recognized that Racovitza ideas were quite similar to what nowadays is known as phylogenetic systematics using principles of W Hennig (1950). In 1970, A Vandel evaluated the impressive assemblage of Racovitza's isopodological studies, realized during a short period of time as following: “Ainsi l'œuvre d' EG Racovitza nous apparaît aujourd'hui représenter l'une des étapes les plus importantes de l'avancement de la science isopodologique” (Vandel 1970).

The Institute of Speleology – Its foundation and the Golden Age period at the University of Cluj

After the end of the World War I, in 1919, the Regional Administrative government of Transylvania in Romania reorganized the University of Cluj and invited EG Racovitza to take a professorship position within this institu-

tion. The offer was initially refused because the teaching activity would have implied a restriction of the time available for research on the subterranean fauna. A repeated offer came after some time with the proposal to build a research institute within the Cluj University. This idea attracted the interest of Racovitza who saw the possibility to realize one of his ideals, to organize a research center devoted to the study of the natural history of the subterranean domain. Before accepting this project, Racovitza wrote a letter, sent from Banyuls in November 1919, to the Commissioner for the organization of the new university at Cluj, Sextil Puscariu, asking for financial possibilities to fund the new institute, which should become “non seulement un facteur de culture roumaine, mais aussi un centre d'attraction pour les étudiants et savants étrangers” (Racovitza 1926a). This condition was accepted, however, the decision to move to Cluj represented for Racovitza a sacrifice. He had lived and worked successfully in France for 34 years, he had a French family, as he married in 1907, in Paris, H Boucart and his three children (René, Jean-Pierre and André) where all born in France. Racovitza had held a fixed position for the last 20 years as employee of the University of Paris and as vice-director of the Laboratoire Arago. He had a deep affection for Banyuls where he acquired also a nice villa named “Les Mimosas” (Fig. 2). At his departure from France, the municipality of Banyuls-sur-Mer attributed to Racovitza the title of “Citoyen d'Honneur”. Numerous letters from the French scientific community, *nota bene* from R Danton, E Topsent, E Chatton, O Duboscq, W Brölemann, P Peyerimhoff, L Fage, expressed congratulation for the realization of an institute of speleology in Romania and addressed their wishes for a successful future of his new enterprise. However, these personalities expressed also their disappointment and/or sadness that their colleague decided to leave France (Racoviță & Stan 2007).

After the foundation of the institute for speleology at Cluj (Fig. 3), Racovitza transferred his vast library and relocated the headquarters of the *Biospeologica* association to the new institute. In this way, the Cluj location became a world-reference centre for speleological research. *Biospeologica* meant a large collection of subterranean animals, more than 20,000 specimens were deposited at the institute and the publication series with the same title were managed also from Cluj. For the series of the *Biospeologica* publication, Racovitza (1926a) mentioned that, at the time, it consisted of 40 printed contributions from which 34 were written by specialists who studied the faunistic material sampled by members of this association. In six other contributions, written by Racovitza and Jeannel, were presented, under the name “Énumération des grottes visitées”, a comprehensive catalogue with information on the caves from where the faunistic material was sampled.

The new Speleological Institute in Cluj needed not only a leadership but also valuable collaborators. Raco-



Fig. 2. – “Les Mimosas”, the house belonged to EG Racovitza and his family during their stay in Banyuls-sur-Mer (photographed by C Coineau, courtesy of Dr N Coineau).

vitza convinced René Jeannel to come to Cluj. This latter left his academic position in France, where he was appointed as “maître de conférences” at the University of Toulouse, and in Cluj he became the first vice-director of the Speleological Institute. Beside this, he inaugurated at the University of Cluj a teaching programme covering the topic of general biology, a “première” in Romania during those times. Continuing the search for high-qualified scientific collaborators for the Institute, in 1922 Racovitza invited the well-known specialist for aquatic crustaceans, the Swiss PA Chappuis, to accept the second position of vice-director for the speleological institute. Several research assistants were appointed during this period, V Pușcariu at the beginning, and later on (1930) Radu and M Codreanu.

The first period of the scientific activities of the institute at Cluj was related to intense cave exploration and sampling of subterranean fauna. One can get an idea of this research activity from the inspection of 7th series of the “Énumération des grottes visitées”. Foreign colleagues like the archaeologist H Breuil, the entomologists A Winkler & J Malasz or the biospeleologist R Lerouth joined the Romanian team during various speleological campaigns. In this way, Racovitza fulfilled one of his ideals, to realize cultural and scientific exchanges between Romanian and foreign colleagues. Already in 1920, he asked the commissioner of the University at Cluj to foresee funds for such exchanges. Racovitza wrote: “Ce qu’il faut à toutes les universités, et en particulier à la nôtre, université jeune, c’est l’échange de chercheurs originaux, d’inventeurs de faits scientifiques nouveaux... La venue de ces savants sera profitable non seulement aux étudiants, qui doivent être mis au plus possible en contact

avec des chercheurs originaux, mais aussi à nous, professeurs de l’université, et même aux habitants cultivés de Cluj qui se veulent tenir au courant de la science” (quoted after G Racoviță & AM Stan 2007).

Beside the current administrative duties at the institute, Racovitza continued to edit the French journal *Archives de Zoologie expérimentale et générale*, in cooperation with G Pruvôt and later on with O Duboscq and L Fage. At Cluj, Racovitza edited the *Bulletin de la Société des Sciences de Cluj* and the papers of the institutes’ members were collated as reprinted publications in *Travaux de l’Institut de Spéologie de Cluj*. Seven volumes of *Travaux de l’Institut de Spéologie* issued between 1926 and 1936. Other contributions were published in the series *Biospeologica*. In parallel with these editorial activities, Racovitza was involved in the development of modern educational programmes at the university. He invested much energy and persuasion inviting foreign university professors to teach at Cluj, mainly from France, for the domains where no Romanian specialists existed.

R Jeannel was appointed in 1927 director at the Vivarium du Jardin des Plantes, in Paris. He returned yearly to Cluj until 1931 in order to teach the General Biology course. After this period, the lectures continued to be delivered by Racovitza. Jeannel became a professor, with the Chair of Entomology, at the Muséum national d’Histoire naturelle in Paris and resigned from the Institute of Speleology in Cluj.

During the first period of the Institute of Speleology from 1920 to 1930, EG Racovitza, R Jeannel and PA Chappuis developed and/or synthesized different evolutionary aspects related to the origin, evolution and biogeography of subterranean dwelling fauna. Their interactive



Fig. 3. – The Institute of Speleology at Cluj-Napoca, view of its entrance; in front, the statue of E G Racovitză, realized by the artist V Fulicea, 1957 (courtesy of Dr T Brad).

exchange of ideas was very productive, as reported by Racovitză (1928). Chappuis completed for the first time a global synthesis dealing with the subterranean aquatic fauna (Chappuis 1927). Racovitză presented his ideas on the origin and evolution of the subterranean animals in a series of lectures at the Sorbonne University in Paris during 1937. The manuscript was published *post mortem* by G Racoviță (Racoviță 1993). In France, Jeannel continued to publish on the systematics and evolution of subterranean insects. In his books “Les fossiles vivants des cavernes”, issued in 1943, and “La marche de l’évolution”, issued in 1950, Jeannel expressed evolutionary concepts following ideas discussed with EG Racovitză (Codreanu 1982).

During his time in Romania, Racovitză became more and more involved in various social activities. He became the president of the Society for Advancement of Sciences at Cluj, Senator in the Romanian parliament, representing the University of Cluj, Rector of the university and President of the Romanian Academy. In this way he was obliged to reduce his research on the isopods, his major scientific passion. As was noticed by several naturalists (Drach 1969, Bacesco & Marinescu 1982), Racovitză’s most creative output and best scientific period was the time he spent in France at Laboratoire Arago.

The Recession period

In Romania, starting with 1930 the economic crisis severely reduced funding of research and the Institute of Speleology had existential difficulties. In addition, Raco-

vitză experienced family tragedies, particularly the death of his second son, the chemist Jean-Pierre. His third son, André, could not travel to France in 1939 to defend his doctorate thesis in mycology at the University of Paris (the thesis was published *in absentia* only in 1959 in two volumes with an introduction of R Heim). Following the Ribbentrop-Molotov pact and the Vienna Dictate, Romania lost important territories, part of Transylvania, including the city of Cluj. These territories came under Hungarian jurisdiction. The Natural Sciences Faculty at the University of Cluj was obliged to translocate at Timișoara, in the south-western part of Romania. Racovitză, as president of the commission for translocation of the faculty, was confronted with many administrative problems and his research assistant R Codreanu took over his teaching activities. Codreanu became professor in 1942 and assured the continuity of the General Biology course.

After the end of the Second World War, Racovitză moved again to Cluj where he found the location of the Institute of Speleology and the rich collections unaltered. This unexpected situation is due to PA Chappuis, who remained in Cluj during the War. He benefited from diplomatic immunity as Swiss citizen and honorary consul. Naturally, the scientific activity of the Institute of Speleology regressed due to political changes and a critical economic situation in Romania (Codreanu 1973). However, two positive events made E Racovitză happy for a while.

The first scientific event is the discovery within the river-bed sediments and the alluvial sediments along the mountain streams Crișul Repede and the Someș, near

Cluj, of an unexpectedly diverse Crustacea and Hydracarina fauna, with many taxa new to science. This success was mainly due to the intense sampling activity performed by PA Chappuis during 1940 (Orghidan 1972). The sampling method used by Chappuis was transmitted to a group of excellent naturalists from the Faculty of Sciences in Bucharest, Prof C Motaş, J Tanasachi and T Orghidan. Their scientific results acquired during 1945 demonstrated again the originality of the river-bed sediments as a subsurface environment where both stream dwelling organisms and typical blind hypogean animals displayed a notable diversity. Orghidan continued to investigate this type of habitat favorable for the development of abundant populations of tiny crustaceans and aquatic mites during the next years and in 1955 decided to name this spectacular environment the “Hyporheic Biotope” (Orghidan 1959).

The second event which made Racovitza happy arrived shortly before he died at hospital on 19 November 1947 after years of misery. He was 79 years old. The positive event was the scientific exploration of the large glacier within the cave “Scărişoara”. The complex is better known under the Romanian name “Gheţarul de la Scărişoara”. Racovitza explored this cave during 1921-1925 and presented in a publication issued later on (1927) a preliminary description of the glacier and its scientific interest. During 1947, a group of young enthusiastic speleologists from the University of Cluj, M Şerban, D Coman, R Givulescu and M Pop, achieved a thorough exploration of the cave and described in better terms the glacier.

In 1948, Chappuis published two volumes in the *Travaux* series representing the scientific output of the members of the Speleological Institute (*Travaux de l'Institut de Spéologie* vol VIII-1933-1939 and vol IX-1939-1944). One year later, Chappuis was obliged by the communist regime ruling in Romania to leave the country. In a letter to Prof C Motaş, Chappuis expressed his disappointment at this decision because he considered Romania his adoptive country. Chappuis later moved to France where he gained the position of vice-director of the Laboratoire Souterrain in Moulis, belonging to the Centre National de la Recherche Scientifique (CNRS). In 1950, Chappuis (Racovitza 1950) published a long manuscript in the series *Biospeologica* dealing with isopods of the genus *Stenasellus*, which has been prepared by Racovitza before his death. The manuscript, quasi-ready for printing, had remained unpublished in Romania due to the critical situation of the Institute. Additionally, in 1951 Chappuis and Jeannel published Series 8 of the “Énumération des grottes visitées” (1927-1949), including *inter alia* also the caves visited in Romania. The series *Biospeologica* continued to publish manuscripts dealing with various aspects of biospeological research until 1962. During its long period of existence, *Biospeologica* series issued 81 publications printed in nine volumes.

After Racovitza's death and the departure of PA Chappuis in 1949, the Institute of Speleology was left with only one active researcher, M Şerban (appointed in 1946) and an honorary director, Prof V Radu, who took care of the institute until 1953. The administration of the University of Cluj, rejected on political grounds the appointments of several new research-assistants (D Coman, P Bănărescu and I Viehmann) at the institute. Moreover, the dean of the Faculty of Natural Sciences and Geography, V Marincaş, proposed to close completely the Institute (Coman 2015). Through the intervention of Prof G Macovei, at the time president of the Geological Committee, a powerful national organization, the total dismantlement of the institute was avoided.

During 1950, the directors of the Geological Committee, G Macovei and G Murgeanu, decided to organise two groups of speleologists one in Bucharest, the other at Cluj for exploration of the caves in Romania and for their possible resource exploitation. The Bucharest group was represented by V Puşcariu, M Dumitrescu, J Tanasachi & T Orghidan and those of Cluj had as members D Coman, M Şerban, P Bănărescu & I Viehmann. Puşcariu was one of the early research-assistants of Racovitza at the Institute of Speleology in Cluj, the other members of the Bucharest group were biologists at the Faculty of Sciences dealing with, beside their teaching activities, research on the morphology, systematics and ecology of various animal groups. A special mention merits Prof M Dumitrescu and Prof T Orghidan, two charismatic and enthusiastic naturalists who prepared the growth of a whole generation of young and dedicated students, the future members at the Institute of Speleology in Bucharest.

The Institute of Speleology – Redeployment of its activities

A flourishing scientific period

In 1956, Prof C Motaş was released from the communist jails where he spent seven years. He had been indicted in 1949 to 20-year jail for an imaginary political delict. Motaş was a well-known acarologist who studied the aquatic mites living in subterranean habitats and who recognized very early the scientific interest to study the ecology of alluvial sediments of running waters, an important subterranean domain, which at the time was poorly investigated. Motaş was also recognized in Romania as an excellent director of research. Two of the Racovitza collaborators, Prof R Codreanu and V Puşcariu as well as Prof T Orghidan, a passionate speleologist, and Dr J Tanasachi, proposed to Prof C Motaş to reorganize the speleological research at a national level following the principles of the Institute of Speleology of Racovitza. This project was accepted, and on 21st of June 1956 the Ministry of Education validated the idea to initiate an Institute of Speleology with two departments, one located

in Bucharest and one at Cluj. In 1957, the institute was officially named *Institutul de Speologie “Emil Racoviță”*. In 1963, the jurisdiction of the Institute of Speleology moved from the Ministry of Education to the new reorganized Romanian Academy, at the time named *Academia Republicii Populare Române*. It was decided that the Bucharest department will be also the central administrative place (Pop & Codreanu 1975). This part of the institute had two main laboratories, one centered on biological subjects directed by Prof M Dumitrescu and one dealing with geological and/or paleontological topics directed by the well-known paleontologist E Jekelius. Prof C Motaș, as general director, took Prof T Orghidan as vice-director until his retirement in 1963. After that, Orghidan became full director of the institute until 1985 when he unexpectedly died.

Soon after the reorganization of the institute, the scientists of both departments, in Cluj and Bucharest, started a series of campaigns dealing with the exploration of new caves and with the sampling of faunistic material. A general map of the karstic areas of Romania with the position of all the known caves was produced during this period. From the numerous publications issued, one has to mention the study “Recherches sur les grottes du Banat et d’Olténie” issued in two volumes and published in France (Botoșăneanu *et al.* 1967). The abundant faunistic material sampled during this period in the various caves allowed the description of a large number of taxa new for science, as well as the development of various studies dealing with the biology, ecology and biogeography of whole animal groups of exclusively subterranean origin. A group of paleontologists studied fossil mammals especially from Dobrogea. Their publications offered beside new information on the origin and evolution of these animals, also information on the Quaternary palaeo-climate of the eastern part of Romania.

Starting with 1962, a new journal, *Travaux de l’Institut de Spéologie “E Racovitza”* was issued as an annual periodical, reaching its 58th issue in 2019. Two other series of publications, *Miscellanea Speologica Romanica* and *Theoretical and Applied Karstology*, offered the possibility to publish promptly new information.

In addition to the cave exploration in Romania, several speleological expeditions were organized abroad. In Spain, T Orghidan and his students visited Mallorca Island and *inter alia* revisited also Cueva del Drach where Racovitza’s ideas in biospeleology were started. Several expeditions in Cuba, in cooperation with local colleagues and from France, brought an impressive number of results. Four volumes were published during 1973-1983 (Orghidan *et al.* 1973-1983). Other expeditions explored subterranean habitats in Bulgaria, Yugoslavia, Israel and Venezuela.

One of the important projects achieved by the members of Institute of Speleology was the contribution to the Franco-Romanian project *Encyclopedia biospeologica*. It

was V Decu, from the Speleological Institute, who motivated C Juberthie, from the Laboratoire Souterrain of the Centre National de la Recherche Scientifique (CNRS) at Moulis in France, to start a large compendium dealing with all aspects related to subterranean habitats, both terrestrial and aquatic, as well as their organisms. The first volume was published in 1994, it was followed by two other volumes issued in 1998 and 2001. In addition to Romanian and French specialists, a large number of international scientists also cooperated.

The memory of E Racovitza and the foundation of the Speleological Institute were evoked at several symposia with an international participation. Two memorial volumes “Livre du centenaire EG Racovitza” (Orghidan Ed 1970) and “Livre du cinquanteaire de l’Institut de Spéologie E Racovitza” (Orghidan Ed 1973) were issued.

Under the leadership of Profs C Motaș and T Orghidan, studies on the subterranean aquatic fauna received special emphasis. Especially notable was the research dealing with groundwater dwelling animals and which could be sampled in the large number of existing wells, generally used as drinking-water supply in Romania. In addition, the hyporeic habitats and their interstitial dwelling organisms were also studied (Negrea 2007).

The modern Institute of Speleology, during the directorship of T Orghidan and C Rădulescu, had an active research program dealing with physical aspects of the karstic areas and their caves, a marked improvement in research coverage compared with that existing during the time of the Institute led by Racovitza, Jeannel and Chapuis.

Nowadays, the Institute of Speleology, under the general direction of Prof I Povară and Dr D Murariu, has diversified its fields of research. Within the Bucharest department, the research is carried on within four compartments: (1) Biospeleology and Edaphobiology of the Karst, (2) Geospeleology and Karstology, (3) Karstology, Karst, Inventory and Protection of Karst areas and Caves, (4) Hydrogeochemistry. In Cluj-Napoca, the research activities are organized within one large multidisciplinary department.

One of the ideas of E Racovitza, as mentioned above, was to attract foreign scientists to visit the Institute of Speleology and to develop active programmes of scientific exchanges with their Romanian colleagues. After the reorganization of the Institute under the era of Profs C Motaș and T Orghidan, many well established scientists, in addition to young researchers, either came for short visits or worked within long-term cooperative projects. Personalities like A Vandel, C Delamare Deboutteville, P Briant, B Sket, DC Culver, TC Kane, M Vachon, C and L Juberthie, B Gèze, B Rensch, Y and N Coineau, S Ruffo, G Osella, E Pretner, F Dov Por, A Mangin, V Sbordoni, M Cobolli, A Camacho, and many others came to Romania, and colleagues from the Institute of Speleology visited research laboratories in Europe and/or north

America. Especially profitable was the time the young students from Bucharest and Cluj spent at the Laboratoire Souterrain du CNRS at Moulis. Within this sociological context, it is worth to quote B Gèze who, as president of the International Union of Speleology, at the time, expressed his admiration for the achievements of the Institute of Speleology and its members as follow: “Grâce à Racovitza, la Roumanie est l’une des patries de la Spéléologie. Ceux qui ont aujourd’hui succédé à ce maître de réputation mondiale tiennent très haut le flambeau qui éclaire les cavernes. Non seulement ils n’ont pas démerité devant leur *grand ancien* mais ils poursuivent et développent son œuvre dans toutes les directions de la Science.” (Gèze 1969).

Final view – The Institute of Speleology as dynamical and multifunctional house

We will summarize the long centennial chronicle of the Institute of Speleology presented above with a series of metaphorical images, in order to capture the significance of the major steps in the evolution of this cultural edifice and the importance of EG Racovitza’s ideas for the scientists who had the chance to work within this institution.

The Institute of Speleology represents a large “house” which had a period of glory during the time between its foundation in 1920 and the Second World War. A period of recession followed during the war and in the post-war years, following the advent of the communist regime in Romania. A redeployment of “Racovitza’s house” started after 1956 within a new “virtual twin building”, like two neighboring houses, inhabited on one side at Cluj by local scientists who retained a vivid memory of the “grandfather Racovitza”, and the other side in Bucharest where the “adoptive children” of Racovitza (Profs C Motaş, T Orghidan & M Dumitrescu) showed an impressive enthusiasm for educating several generations of “children” impregnated with Racovitza’s ideas. Within this “virtual structural building”, nowadays at Cluj and Bucharest, new young inhabitants continue to work in relative stability.

The “Racovitza’s house” at Cluj was planned by its “architect” many years before its foundation in 1920, namely during Racovitza’s time at the Laboratoire Arago, at Banyuls-sur-Mer. The “house” in Cluj and later on in Bucharest was inhabited by students, as mentioned, infused with the spirit of Racovitza’s ideas. The “Essai sur les problèmes biospéologiques”, published in 1907, remains until nowadays the backbone of a scientific tradition within the Institute. This is clearly visible in the publications of the students who personally met EG Racovitza, like R Codreanu, V Puşcariu and C Motaş. The next generations continued this tradition. L Botoşăneanu wrote in 1960 a book on “living fossils” issued later in a reworked version and co-authored with C Delamare Deboutteville (Delamare Deboutteville & Botosăneanu 1970). G Racoviţă published documents on his grand-

father Emil, *inter alia* the volume “Pensées évolutionnistes” (1993). One should mention also the analysis of the “Essai sur les problèmes biospéologiques”, made by L Botoşăneanu and V Decou (1973), the work of M Gruia (1993) and the republication of the “Essai” in English and Romanian versions by OT Moldovan and G Racoviţă (2006). We have also presented Racovitza’s views and style of work in various publications, see for instance Tabacaru *et al.* (2018).

From the metaphorical scenario of the Speleological Institute of Racovitza as a “dynamical and multifunctional house”, one could derive a general epistemic principle with deep consequences, namely that a successful institute of research depends largely on the personalities of its inhabitants and their capacity for active production and communication of innovative research. Both aspects have excellent prospects to stimulate new challenging ideas. EG Racovitza expressed beautifully this *credo* embedding it in a brighter humanistic perspective: “The act of knowing means for humanity, thorough organization, rational activity, cooperation, solidarity and peaceful evolution” (Racovitza 1926b). These thoughtful and generous words were expressed in the discourse given by Racovitza at his election to the Romanian Academy. We wish that this ideal should accompany the destiny of the “Emil Racoviţă” Institute of Speleology during its next period of activity.

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