

# THE FORMATIVE YEARS OF A BIOLOGIST AT “INSTITUTUL DE SPEOLOGIE EMIL RACOVIȚĂ” [EMIL RACOVITZA INSTITUTE OF SPELEOLOGY]

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*Abstract.* A brief biographic sketch of the author’s scientific education and the research activities at “*Institutul de Speologie Emil Racoviță*” is presented<sup>1</sup>. The text is offered as an homage to the centennial anniversary of this institution with its important contribution to the Romanian cultural activities (1920–2020).

*Key words:* subterranean fauna, Ostracoda, research institute, caves, hyporheal.

## 1. INTRODUCTION

At the beginning of July 2019, Dr. Eugen Nitzu from the Emil Racovitza Institute of Speleology (ISER) asked me if I would like to complete a brief biographical sketch presenting my educational and research activities, as a reminder of my scientific experience and memories from my activity as a biologist at “*Institutul de Speologie Emil Racoviță*” [Emile Racovitza Institute of Speleology], on the occasion of its 100th anniversary if and how my scientific activity in the ISER influenced my further scientific activity.

As compared to other scientists who spent long periods of time at ISER, my stay at this institute was short, just a decade (1962–1972). However, the cultural atmosphere, both scientific and human, initiated by E.G. Racovitza and perpetuated during several generations of dedicated scientists at this institute played an important role in my further development as a biologist and on my overall scientific career. Therefore, I will give information on the education in natural

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<sup>1</sup> In this publication I use beside the term *Speologie* also *Speleology*, this latter including its derived form, *Biospeleology*, as they are nowadays internationally widely accepted. E.G. RACOVITZA (1907 p. 381) preferred the variant *Spéologie*, considering the term more euphonic. The Institute he founded in 1920 at Cluj in Romania was named “*Institutul de Speologie*”. Since 1957 the institute is officially named *Institutul de Speologie “Emil Racoviță*”. Beside the Romanian name RACOVIȚĂ, I will use here the transliterate form RACOVITZA, a solution adopted by E.G. RACOVITZA himself and widely followed by the scientific community.

sciences I received at home and at school. I will continue with an evocation of the time I spent at the ISER and from this latter part I will reflect on the benefits of the ISER-period on my scientific activity until the present-day.

## 2. FIRST CONTACTS WITH THE NATURAL SCIENCES

I was born on 20<sup>th</sup> March 1942 in Bucharest. During 1951 to 1960 I was enrolled at a school with a long tradition – “Liceul Spiru Haret” – now renamed as “Colegiul Național Spiru Haret”. The school was famous for its good teachers in various domains as well as for the graduates who later on became famous personalities. Biology was taught by Professor I.C. Voiculescu, well known for his book *Anatomia și Fiziologia omului*. The so-called laboratory of biology at “Spiru Haret” was excellently organised for attractive teaching programmes. Many of my schoolmates from various school years were well prepared by Professor Voiculescu (nickname “Celula” – Cell) to enrol later on in faculties of medicine or of biology. In my case I decided after ending high school in 1960 to study biology at the University of Bucharest. My interest for natural sciences dated from childhood when with friends during holidays in the Carpathian hills we collected fire salamanders and/or lizards; both animal types were fascinating by their movement and colours. I was in some way also prepared to study biology by the cultural atmosphere in the houses of both pairs of my grand-parents, well-known medical researchers, who came from the famous medical school of the Professor of Medicine Ion Cantacuzino (Jean Cantacuzène). My maternal grandfather, Marius Nasta, was a well-known microbiologist, a specialist in tuberculosis. He took me to his research institute and demonstrated aspects of his current investigations. I received later on (when I was already at the university) three books that I still have, *La descendance de l'homme* of Ch. Darwin, the *Philosophie zoologique* of J.-B. Lamarck and *L'évolution créatrice* of H. BERGSON. The books were acquired by my grandfather when he was a medical student, in the early 20<sup>th</sup> century. My paternal grandfather Daniel Danielopolu, a well-known physiologist, gave me a superb edition in 11 volumes of J.-H. FABRE'S masterpiece *Souvenirs entomologiques* and of course I also visited his Institute of Physiology where he offered me interesting information.

Two other persons helped me decide on my further university studies, the well-known herpetologist Ion Fuhn, the other one, my schoolmate and good friend, Ilinca Juvara (now Juvara-Balș). As my preferences went towards invertebrate zoology Ion Fuhn suggested visiting Professor Radu Codreanu, a former Research Assistant of E.G. Racovitza at the Institute of Speleology in Cluj, who was at the time I visited him a Professor of Invertebrate Zoology at the University in Bucharest. The interview with Codreanu was positive, he suggested that I collect ephemeropters, insects on which it was possible to find parasitic protozoans, one of his biological interests (*inter alia*). Finishing the high school examinations (the so-called “Bacalaureat”) in 1960, with several school friends we organised an

excursion in the Retezat mountains and the Cerna valley. At the time no proper road existed along the Cerna valley, down to Băile Herculane. Crossing the Cerna valley, we met a group of biologists belonging to Emil Racovitza Institute of Speleology, in Bucharest, who were exploring the fauna of various caves in the surrounding area. Two of them, Dan Dancău and Eugen Șerban, explained to us the meaning of Biospeleology and how one can become a biospeleologist.

Autumn 1960 was an important date because I was accepted after some difficulties at the Faculty of Natural Sciences of the University of Bucharest. The difficulties were due to political problems of my maternal grandparents. During the first study year I was fascinated by the way Professor Radu Codreanu presented the different zoological aspects of invertebrates. I remembered his suggestion offered during my pre-university interview, namely to pay attention to protozoans. Coincidentally, after the end of the first study year, visiting my friend Ion Balș – his father was a well-known medical doctor, Matei Balș – mentioned to me the studies on the genetics of Protozoa he had read in a book published by RUTH SAGER and FRANCIS J RYAN (1961). I was advised to pay attention to the exciting aspects of the mechanisms of genetic transmission of information studied on the protozoan *Paramecium*. Especially interesting were the aspects of cytoplasmic transmission of non-chromosomal genes. Therefore, I tried to start cultures of *Paramecium* in the laboratory of my grandfather Marius Nasta. Unfortunately, no preparation worked because of my lack of experience with cultures and because the people in the laboratory were interested in subjects far from this topic so they could not advise me with the necessary technical information. So, I abandoned this study and during the summer of 1962 I went to the address where Dan Dancău and Eugen Șerban worked. Their laboratory was based in a former storehouse on Gutenberg Street in Bucharest. I asked them if they needed a volunteer student to help during their field work. Dan Dancău with his colleague Ionel Tabacaru were supposed to investigate the karstic area of Dobrogea (Dobruja), along the Black Sea coast, in south-eastern Romania. They accepted me for one month of field work. Participation in this expedition opened for me the possibility to work within the Emil Racovitza Institute of Speleology and this field-trip decided in some ways my future career as natural scientist.

### 3. RESEARCH ACTIVITIES AT THE INSTITUTE OF SPELEOLOGY – THE PERIOD 1962 TO 1965

The laboratory of Biospeleology on Gutenberg Street, informally called “Gutenberg Laboratory” (in the following Gutenberg Lab) comprised three rooms, a large one with eight persons, used originally as storage for goods, a small one for two scientists and a material collection room. The largest room was transformed with cupboards into small places where each scientist had a table and microscopes. Ten people worked at the “Gutenberg” laboratory – five zoologists, three palaeontologists and two technical assistants. This strange place of research was

just an annex of the headquarters of the Institute of Speleology in Bucharest which at the time was located in another part of the city, in the house offered to Professor Constantin Motaş, the official director of the reorganised Institute of Speleology in 1956 and several years later was placed within the administrative framework of the Romanian Academy (at the time “Academia Republicii Socialiste Române”).

The research assistants from the Gutenberg Lab greatly impressed me because each of them specialised in the investigation of at least one animal group with relation to the subterranean environment. So, Dan Dancău and Eugen Şerban studied aquatic subterranean crustaceans and Ionel Tabacaru terrestrial isopods and myriapods. I asked if I could take as a research topic also a group of invertebrates. It was suggested that I investigate ostracods, a group of scientific interest because these tiny crustaceans were commonly found in the samples from groundwater of caves, in wells and in springs. They were poorly known and the person who was supposed to become a specialist for them at the Institute of Speleology, Valeriu Puşcariu, a former Research Assistant of Emil Racoviţă, did not succeed in developing a coherent programme, being more interested in problems of nature protection, especially the karst regions in Romania. Thus, I decided to study ostracods. The first reaction was a terrible frustration to separate the valves and extract the limbs with two thin dissecting needles. I used ostracods from a sample I collected in 1962 in a spring emerging near the Limanul cave in Dobrogea. I had problems to identify the species as no books on ostracod taxonomy existed either in the Faculty of Biology or at the Institute of Speleology during those days. Ionel Tabacaru was very effective and offered me two important monographs bought at a Bucharest bookshop, namely the *Ostracoda* volume of W. KLIE, issued in 1938 in the *Tierwelt Deutschlands* by Gustav Fischer Verlag in Jena and still available because the publishing house continued to exist in the so-called D.D.R. The second book available was the monograph of Z. S. BRONSHTEIN, *Ostracoda (Rakoobraznye presnykh vod)* issued in 1947 in the *Fauna S.S.S.R.*, published by the Academy of Sciences of the USSR in Moscow. With these two books I could make my first taxonomic identifications. The researchers from the Institute of Speleology in both departments at Bucharest and at Cluj were happy with the idea I could identify their ostracods collected from various field campaigns. Corneliu Pleşa (Cornel) from Cluj sent me his material sampled for his doctoral thesis at the Vadu Crisului cave. This material was a real conundrum because it contained a new species belonging to a wrongly named genus but still a very important one! I correctly identified it and I published during the following years a new genus *Cordocythere* (for a review on the history of this genus, now named *Kovalevskiella*, see TABACARU, DANIELOPOL AND JUVARA-BALŞ (2018).

Another colleague, Emil Vespremeanu from the Faculty of Geography at the University of Bucharest, brought so-called terrestrial ostracods samples from floating fen soils (the Romanian name is *plaur*) widespread in the Danube delta, but also occurring on various lakes in Romania. This type of habitat was poorly

known in Europe at the time and only two species of terrestrial ostracods were reported in other parts of the world, namely in southern Africa and in New Zealand. The two species that I had at hand I identified as *Scottia browniana* (Jones) and *Darwinula zimmeri* Menzel. I made a description of both of them and Eugen (Nichi) Șerban showed me how to make publishable illustrations. I was really excited and I thought that a note on European “terrestrial” ostracods merited publication in a widely distributed scientific journal. At the time, as nowadays, *Nature* was the dreamed-of journal for any natural scientist. So, in 1964 I sent a brief note to this journal but it was politely rejected for publication. I asked meanwhile my mentor for taxonomic freshwater ostracods, the well-known specialist Trajan Petkovski from the Natural Sciences Museum in Skopje, if one of the journals issued by his museum would publish my ms. Trajan Petkovski organised the acceptance of my ms. and within three months I had published in *Fragmenta Balcanica* my first contribution to ostracodology (DANIELOPOL and VESPREMEANU, 1964). The paper was well received and Professor Peter Sylvester-Bradley, a prominent ostracodologist, sent me congratulations. I continued to sample this interesting habitat during the next years at lake Caldarusani, near Bucharest. It was during this time that I recognised that the ostracods living in a subsoil aquatic system have to be considered as semi-terrestrial organisms (a concept that was with difficulty accepted by my fellow ostracodologists). The argument with which I convinced my colleagues was that floating fen soil crustaceans live in the interstitial water existing within the organic soil between the reed roots. The sampling method I used to collect these crustaceans is named the Karaman-Chappuis method, used for the investigation of the hyporheic habitat (ORGHIDAN, 1959).

From 1963 I accompanied members of the Institute of Speleology, mainly Dan Dancău and Eugen Șerban on various field trips. With Ionel Tabacaru we visited several times the Institute of Speleology at Cluj. I was extremely impressed by the zoological collections initiated by Emil Racovitza under the name *Biospeologica* and which were still there, well curated by Cornel Pleșa in large cupboards. The library of Emil Racovitza at the Institute in Cluj was still intact, very rich and diverse in topics covered. Publications stored in this library represented for me a wonderful source of scientific information. The Cluj members of the institute, especially Cornel Pleșa, and Iosif (Pepi) Viehmann, were always cooperative and generous. This remains even nowadays an invaluable personal memory.

During 1964 I started to prepare my master thesis (at the time named Diploma Thesis). My supervisor was Professor Radu Codreanu. He was always friendly and ready to help. As at the Gutenberg Lab of the Institute of Speleology, Codreanu named me colloquially “Grecu” (meaning “the Greek” because of my family roots in Greek Macedonia). It was decided to prepare for my thesis a synthesis on systematic and geographic distribution of limnic ostracods of Romania, using my own material and taxonomic identifications. I completed this project in 1965 and published most of my thesis in two large publications (DANIELOPOL,

1965, 1968). During this period at the Speleological Institute the three mentors for my biospeleological research, Dan Dancău, Eugen Șerban and Ionel Tabacaru, supervised and improved my ostracod studies. I continued also to get help for ostracod taxonomy via the expert support of Trajan Petkovski. This allowed me to describe in addition to the already mentioned genus *Cordocythere* Danielopol, 1965 a new one, *Microdarwinula* (DANIELOPOL, 1968) as well as a new species, *Eucypris petkovskii* (DANIELOPOL, 1965).

During the summer of 1965, I completed the final examinations at the university and I got the academic equivalent to a Master of Sciences degree (in Romanian “Diplomat Universitar”). The same year I was lucky enough to get a permanent position as a Research Assistant at Emil Racovitza Institute of Speleology. Professor Traian Orghidan, who succeeded to the direction of the Institute after Professor Constantin Motaș, supported my nomination at the Romanian Academy. This new situation allowed me to continue studies on ostracods and contributed positively to my cultural development as a biologist.

#### 4. RESEARCH-ASSISTANT – THE PERIOD 1965 TO 1972

At the end of 1965 I settled in the Gutenberg Lab where I looked for a convenient working place and for microscopes. As the large room with many cupboards was full, I got a half place at the table generally used for coffee preparation (Fig. 1). A colleague from the Gutenberg Lab (Francisc Botea) offered me his Zeiss microscope and Eugen Șerban helped me to get a stereo-microscope from the Speleological Station at Closani, in Oltenia. So, in 1966 I could work on samples I already had. Dan Dancău, Eugen Șerban and Ionel Tabacaru checked my work, especially the way of preparing the limbs on microscope slides in such a way as to be able to observe the fine details at high magnification. The technique I learned during those times was of invaluable help for the fine morphological analyses I did subsequently. As this approach was not used by ostracodologists I subsequently demonstrated it during different workshops and I also published it (DANIELOPOL, 1982A; NAMIOTKO *et al.*, 2011).

My colleagues, Eugen Șerban and Ionel Tabacaru were experts in describing complicated structures of the copulatory organs of crustaceans. EUGEN ȘERBAN (see his doctoral thesis published 1972) with his technique and accuracy of description produced a complete revision of the systematics of the Bathynellacea (PERINA AND CAMACHO, 2016). I learned from them how to dissect the hemipenes of Candoninae ostracods and a first contribution of this type of research was given in 1967 to the 2<sup>nd</sup> International Ostracod Symposium held at Hull, UK. The presentation was a success and is still cited (PATRICK DEDECKKER, 2017, pers. comm. to D.L.D.) and the ms. was published in the proceedings (DANIELOPOL, 1969).



Fig 1. Ilinca Juvara-Balș, staying closely to Danielopol's working desk at the Gutenberg laboratory.  
(Photo made in 1972, courtesy of Dr. Ilinca Juvara-Balș).

During 1966 and 1969 I participated in various field-work campaigns (Fig. 2). Beside the three colleagues mentioned above, two other biologists joined us, Ilinca Juvara-Balș and Doina Zincenco. These latter colleagues also became permanent members of our Gutenberg Lab. With Dan Dancău, Eugen Șerban and my new colleague Ilinca Juvara-Balș I returned to the Cerna valley and participated to a new round of cave explorations (DANCAU *et al.*, 1968). We travelled mainly with a truck belonging to the institute with which we transported not only our equipment but also the food necessary for long periods of time. With Ionel Tabacaru we visited caves in the Apuseni Mountains several times (1966 and 1969). The Ferice cave was especially interesting because of its terrestrial fauna. The cave had been first explored by Emil Racovitza and Rene Jeannel during 1927. We were looking for the terrestrial isopod *Biharoniscus fericeus*, an endemic species described by my colleague Tabacaru. With Dan Dancău I explored the aquatic fauna existing along the Danube valley before the development of an impoundment lake at the Portile de Fier, the Orsova area (DANCĂU and DANIELOPOL, 1972).



Fig 2. An image of the way to transport material during a sampling expedition in the Apuseni Mountains (1969) with the truck belonging to Emile Racovitza Institute. From left to right: Dan L. Danielopol, Ilinca Juvara-Bals, Constantin Ploeanu (the truck driver) and Ionel Tabacaru (Photo Cornel Plesa).

Coming back to the Gutenberg Lab I invested much energy in sorting the material and continued the morphological description of some special organisms considered as potential new species. It was a period when I mastered the technique of describing carefully and as completely as possible the limbs of ostracods, assembling drawings made with a *camera lucida* in large plates suited for publication. Much of the work done during this period I used for my doctoral thesis (DANIELOPOL, 1978).

The scientific communication within our Gutenberg Lab was extremely vivid. Palaeontologists and zoologists debated about the definition of species, the phylogenetic lineages, about parallel and convergent evolution, etc. Ionel Tabacaru was a firm supporter of Racovitza's ideas imprinted by a neolamarckian view, while Ilinca Juvara-Balș and myself were more attracted by Darwinian models as explained in the Ernst Mayr's essays we could read at the time. There were strong debates about the types of morphologic traits, their evolutionary origin and their importance for species and/or superspecific taxonomy. Eugen Serban, Petre Samson, Ionel Tabacaru and to a lesser extent Elena Terzea, Dan Dancău, Costin Rădulescu and Iosif Capușe offered pro- and contra- arguments from their current studies.



The younger generation of the research assistants, Ilinca Juvara-Balș, Doina Zincenco and myself just followed the vivid discussions of those dynamic colleagues. Fig. 3 is a reminder of our enthusiasm when we could communicate with colleagues from countries of Western and/or Central Europe who came to our institute. This unique intellectual atmosphere had an important effect later on in my biological career in Austria. For instance, with Ionel Tabacaru we could produce several studies dealing with the phylogeny and the parallel evolution of isopods (e.g. TABACARU AND DANIELOPOL, 1999) and on the phylogeny of Eumalacostraca (e.g. TABACARU AND DANIELOPOL, 2011). In these papers we used ideas and cladistic algorithms propagated by Willi Hennig. My good friend Tabacaru noted that Emil Racovitza, had already in 1910 offered arguments for the development of phylogenetic taxonomy (cf. *inter-alia* TABACARU *et al.*, 2018).



Fig 3. In Bucharest at the Institute of Speleology during a visit in 1970 of Dr. Alain Mangin from the *Laboratoire Souterrain du CNRS*, at Moulis, France. From left to right: Dan Dancau, Dan Danielopol, Ionel Tabacaru, Iosif Capuse and Eugen Serban (Photo T. Orghidan).

The discussions held in the Gutenberg Lab stimulated further reading during a long period of time. I started by late 1970 carefully reading Emil Racovitza's publications issued in a special volume (RACOVITZA, 1964) edited by Constantin Motaș. This opened new perspectives for the way to express my views on the origin and antiquity of subterranean ostracods (DANIELOPOL, 1980) and on the way to treat either the so-called adaptive morphological traits of groundwater dwelling

crustaceans or their origins (see *inter alia* ROUCH AND DANIELOPOL, 1987; DANIELOPOL AND ROUCH, 1991; DANIELOPOL *et al.*, 1994). The 1980 essay on the origin and antiquity of subterranean ostracods represents my thesis at the University of Vienna which allowed me to reach the position of a University Docent in 1983. I officially started to teach special topics on morphology and systematics of different groups of crustaceans as well as on the general ecology of groundwater systems. These new activities resulted in promotion in 1994 to University Professor for Zoology and Limnology/Groundwater Ecology (Tit. Ao-Univ. Professor) in the University of Vienna.

Some of the ostracods I described during this period as new species were dedicated to colleagues who had so effectively supported the research I completed. For instance, a species from wells in Dobrogea was named *Mixtacandona tabacarui* (DANIELOPOL AND CVETKOV, 1979), another one from the Olt valley wells *Pseudocandona serbani* (DANIELOPOL, 1982b).

The taxonomy I used was fully based on phylogenetic ideas, mainly reflecting Racovitza's views. I always tried to reconstruct phylogenetic lineages to see the origin and affinities of the taxa used. In this respect, and as compared with other colleagues who had only recent living fauna for study, I was lucky because I could combine my data on living subterranean ostracods with information existing for fossil ostracod groups. My first success was the recognition of a Pleistocene species which could be interpreted as belonging to the genus *Mixtacandona* Klie, this latter known only through living groundwater dwelling species. I intended to present these data to an ostracod symposium organised during the 23<sup>rd</sup> International Geological Congress, held in Prague, 1968. Unfortunately, political turbulence triggered the cancellation of the meeting but my contribution was subsequently published (DANIELOPOL, 1972a). Despite the sad events in Prague in August 1968, I was able to meet and discuss with several well-known geologists and palaeontologists like Gheorghe Murgeanu, a well-known Romanian geologist and his young assistant Dan Jipa, as well as with ostracodologists like Ken Mckenzie, Henri-Jules Oertli and Ivar Hessland.

Two important palaeontologists, namely Dan Patrulius and Theodor Neagu, helped me during that period with useful information for phylogenetic and palaeogeographic reconstructions of ostracod groups. With the latter I continued discussions for many years. In late 1960 Professor Neagu sent me a young student to learn something from my experience about living ostracods. His name was Radu Olteanu, who became an experienced ostracodologist and specialised in Parathetyan fauna. Later on, we published together on some exciting groups of ostracods like *Cytherissa* (DANIELOPOL *et al.*, 1990) and on "*Hungarocypris*", now named *Herpetocyprilla* (DANIELOPOL *et al.*, 2008).

During visits to the Institute of Speleology at Cluj, with the support of my colleague Cornel Pleșa, I was able to discover in the material stored with the *Biospeologica* collection, two important ostracods. One was the commensal ostracod

*Sphaeromicola dudichi* Klie, fixed on a specimen of the amphipod *Chelura terebrans*, apparently collected by Emil Racovitza at Collioures in southern France, near the biological station Banyuls sur Mer where he worked for several years. I could compare this ostracod with paratypes of *Sphaeromicola topsenti* Paris, a stygobitic species also present in the *Biospeologica* collection. It turned out that the epigeal dwelling commensal ostracod from Collioures represented a new genus that I named *Hartiella*, type of a new tribe, Hartiellini (DANIELOPOL, 1971). The next ostracod I found in the *Biospeologica* collection was an ostracod sampled in the Betharram cave, in Ariège, southern France. Pierre-Alfred Chappuis, the Research Assistant of Emil Racovitza at the Institute of Speleology in Cluj, sampled microcrustaceans during one of his visits to the cave and described two new copepod species, *Cyclops racovitzae* and *Canthocamptus pyrenaicus* (CHAPPUIS, 1923), and he found the interesting ostracod that we studied later on.

First, with my colleague Ken McKenzie we reviewed the possible affinities of this ostracod and we arrived at the conclusion that the species group to which the Betharram ostracods belonged represented a new genus, we named it *Psychrodromus* (DANIELOPOL AND MCKENZIE, 1977). Later on, with other colleagues we described the Betharram material as a new species, *Psychrodromus betharrami* (BALTAÑÁS *et al.*, 1993).

During the summer of 1969, Traian Orghidan with colleagues from the Speleological Institute and from the Cuban Academy of Sciences organised a biospeleological expedition to Cuba. In addition to many interesting crustaceans sampled by Traian Orghidan there was an extraordinary ostracod that I named *Thaumatocypris orghidani* (DANIELOPOL, 1972b). The discovery of this ostracod was remarkable because at the time the genus *Thaumatocypris* was known by only one living marine-abyssal species and two other Jurassic fossil taxa. The whole history of this discovery is recounted in TABACARU AND DANIELOPOL (2017). *Thaumatocyprids* were later on discovered in anchialine caves in many places of the world, from the Caribbean to Canary Islands, the Indian Ocean and Western Australia. The different species were placed in the genus *Danielopolina* Kornicker and Sohn which also contains a deep-sea dwelling species (for a review see DANIELOPOL *et al.*, 2000a).

Another remarkable discovery during the 1969 biospeleological expedition to Cuba was due to Lazar Botosaneanu. Using the Karaman-Chappuis' method of digging holes on a marine beach of Cuba he discovered a minute interstitial dwelling ostracod belonging to the Bairdiacea group. From the crustacean material sampled by my colleague Botosaneanu, I described a new genus and species *Pussella botosaneanui* (DANIELOPOL, 1973). The morphology of this ostracod was remarkable for the reduced chaetotaxy and those existing and specialised for ambulatory movement were extremely elongated (DANIELOPOL, 1976b). A well-known specialist of bairdiids, Rosalie Maddocks, recognised another species of *Pussella* and proposed the group as a new subfamily, the Pussellinae (MADDOCKS,

1976). Later on, with my friend Karel Wouters we described Upper Cretaceous (Turonian) pussellids, displaying a similar psammobiotic morphological facies as those of the living known species (DANIELOPOL and WOUTERS, 1992).

The Romanian contributors published their results in a special volume: *Cubano-Romanian biospeological expedition to Cuba* edited by TRAIAN ORGHIDAN (1973) which received the “Emil Racovitza Prize” of the Romanian Academy in 1975. My contribution on the Pussellidae first published in this volume (DANIELOPOL, 1973), received the “Emil Racovitza Prize” only in 1998.

During my stay at ISER I had few possibilities to study the ecology of aquatic systems or the ecology of selected crustacean groups. However, in the Gutenberg Lab I was confronted with strong discussions about the position of the hyporheic habitat, described and named as such by Traian Orghidan (ORGHIDAN, 1959) within the domain of the aquatic sciences. For Dan Dancău the habitat recognised by Orghidan represented a well-defined ecological system, while for Eugen Şerban it represented just the peripheral part of a large groundwater ecosystem. The study of such large ecological systems was termed Phreatobiology by Constantin Motaş (MOTAŞ, 1958; DANIELOPOL, 1992). It was only many years later, when I could develop various long-term research projects in which I incorporated the hyporheic habitat within dynamic groundwater systems, that I understood that Orghidan’s concept could be equated with an ecotonal system; it could be viewed as a peripheral zone of larger groundwater ecosystems connected to surface running water systems (DANIELOPOL, 1989; DANIELOPOL *et al.*, 2000b, 2001; WARD *et al.*, 1998). It is this expanded view of approaching the study of groundwater systems that later explained the huge biological diversity existing in the subsurface aquatic domain (DANIELOPOL *et al.*, 2000c).

##### 5. RETROSPECTIVE VIEW ON THE IMPACT OF THE ISER ON MY SCIENTIFIC CAREER

The short period I worked at the ISER within the Gutenberg Lab was very rich as both a scientific and human experience. It allowed me to assimilate the cultural vision of Emil Racovitza. For him the aim of the Institute of Speleology, beginning in 1920 in Cluj, was to provide not only good working conditions for the appointed scientists, mainly zoologists, but also to create a stimulating atmosphere for free exchange of their experiences and ideas. Note that the essay *L’Institut de Spéologie de Cluj et considérations générales sur l’importance, le rôle et l’organisation des instituts de recherches scientifiques*, published in 1926, still remains a model of a sociological study for the way scientists should organise a successful research laboratory. I benefited from the principles that Emil Racovitza used for his Institute of Speleology in Cluj, perpetuated by Constantin Motaş and Traian Orghidan and their students after 1956 in Bucharest. Like Emil Racovitza, Constantin Motaş, Traian Orghidan and their students, used a charismatic approach to their scientific

relations with their younger colleagues at the institute and/or with students and/or visitors. For reviews on this topic see *inter alia* ORGHIDAN (1970), CODREANU (1973), TABACARU AND DANIELOPOL (2020). Considering my own activities after leaving the ISER in 1972, I adopted many of Emil Racovitza’s ideas about the way to organise and to carry out scientific research while at the Institute of Limnology, belonging to the Austrian Academy of Sciences (1973–2007), as well as during various educational programmes I gave at the University of Vienna. These positive aspects allowed me to establish with the help of my colleagues and students Groundwater Ecology as a successful research direction within Austrian limnology (see *inter alia* SCHIEMER, 2014 for the way freshwater biology developed in Austria).

In conclusion, the biographic overview presented here should be perceived as a tribute to the extraordinary Institute of Speleology, launched in 1920 by Emil Racovitza. With these notes I intend to pay a tribute not only to the personality of this eminent scientist, but also to those actors who created the cultural medium within which I developed and worked. MARSHALL MCLUHAN in his 1964 book *Understanding Media* used for his first chapter the title *The Medium is the Message*. This celebrated dictum should be perceived here as evidence for the successful combination of the “RACOVITZA tradition” with the charismatic way of doing science by several generations of dedicated scientists at the Institute of Speleology in Cluj and Bucharest. This successful way to organise biospeleological research was recognised by many of us who worked at ISER. TABACARU AND DANIELOPOL (2020) offered in their historic review of the Institute of Speleology several vivid examples. In my case, as mentioned above, I could transmit it to further young scientists, and this represents a huge satisfaction at the end of my career as naturalist with roots in research of the morphology and evolution of crustaceans as well as in the development of modern groundwater ecology.

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