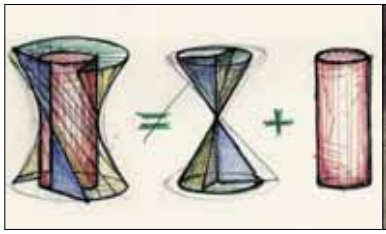
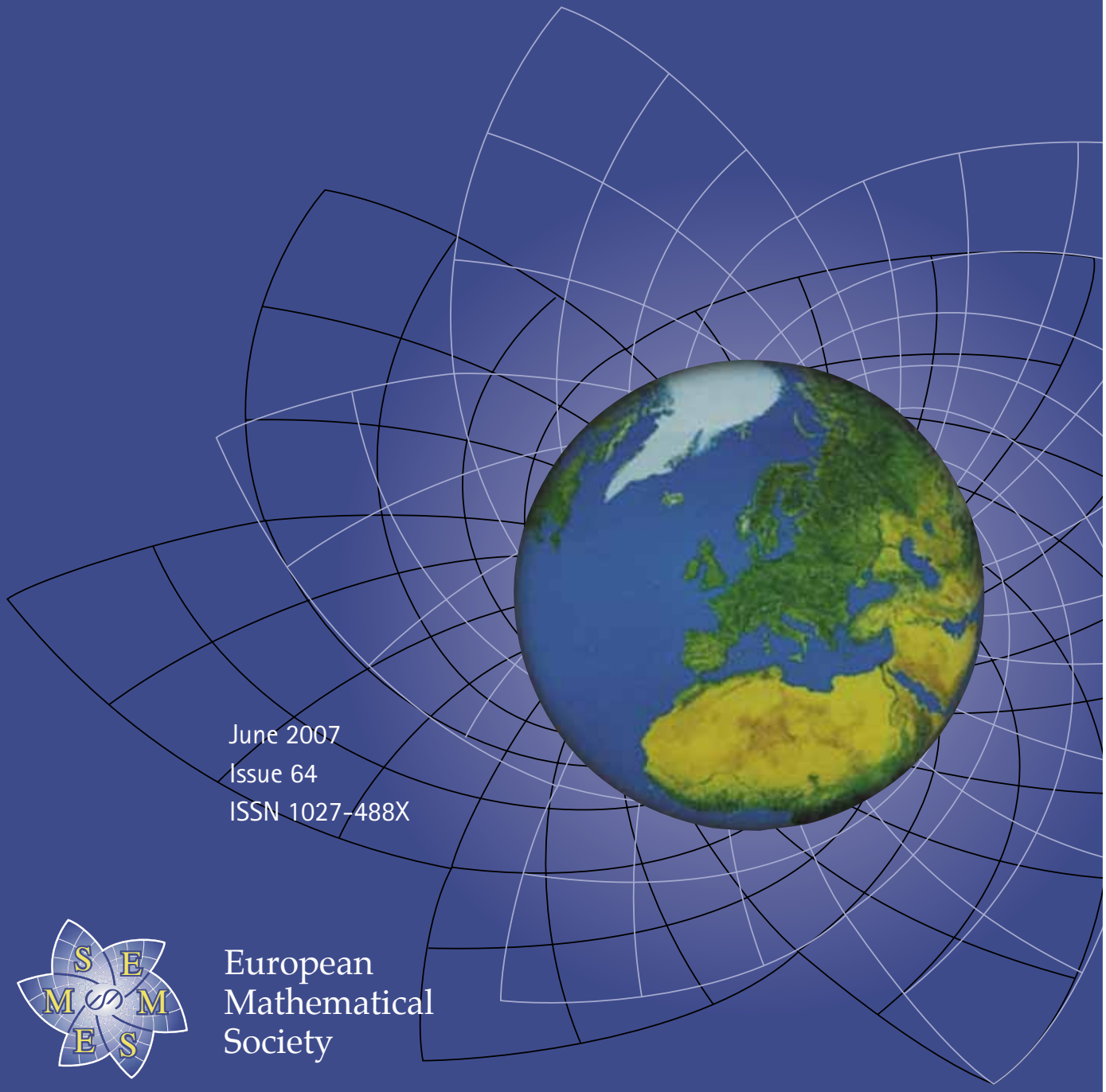
NEWSLETTER

OF THE EUROPEAN MATHEMATICAL SOCIETY







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Interview with Marius Iosifescu (Bucharest)

Interviewer: Vasile Berinde (Baia Mare, Romania)

Short Biographical note

Marius Iosifescu was born on the 12th August 1936 in Pitesti, Romania. He went to elementary school and high school in Pitesti, graduated with a mathematics degree in 1959 and obtained his PhD in probability in 1963 from the University of Bucharest. He was an assistant professor, a researcher and the Head of Department of Probability and Statistics at the Centre for Mathematical Statistics (Romanian Academy) and Director of the Institute of Mathematical Statistics and Applied Mathematics. He became a corresponding member of the Romanian Academy in 1991, a full member in 2000 and vice-president in 2002. He is the author of more than 124 research papers and 13 books on probability, stochastic processes and real analysis. He has been a visiting professor, an invited speaker and has given tens of lectures at various universities throughout Europe and in America and Australia. He is a member of the editorial board of JEMS (2004).

To start, please tell us a little about your childhood and background.

I was born on the 12th August 1936 in Pitesti, which was then a small town of some 20,000 inhabitants situated on the river Arges, about 120 km north-west of Bucharest; it is now an important industrial centre with about 200,000 inhabitants. A new university has been created there recently. During my childhood, Pitesti was a clean, unpolluted and attractive town with very good secondary schools modelled after the old French lyceés. My parents were teachers there and as a child I thought I would also become a teacher (note that mathematics was not at all involved in these actual or dreamed teaching posts). Except for the years of World War II, I can honestly say that my parents managed to give me and my younger sister a happy childhood. The terrible realities of war first manifested themselves in frequent American air raids, one of which completely destroyed our home. They were then followed by the disastrous consequences of the 1944 Soviet occupation of Romania, which, a few years later, led to a long period of communist dictatorship. My aversion to brute force, intolerance, violence and arbitrariness dates from that time.

When did you first get interested in mathematics? Did you have good teachers at school? Are there other mathematicians in your family?

I'll start by saying that there is no other mathematician in my family. My interest in mathematics was aroused when I was 14 and I started tackling problems in a Romanian journal for young people called *Revista Matematica si Fizica*. This was a temporary successor to the celebrated centennial journal *Gazeta Matematica*, which, during the period 1895–1948, served as an ideal apprenticeship magazine for the independent work of many Romanian mathematicians. I remember well how a few successful attempts gave me impetus to go on. If my interest in mathematics became a passion, this was largely due to D. Mihalascu (1908–1984), my only mathematics teacher at secondary school. I shall always revere his memory for his tactful guidance, patience and understanding. In 1953, and again in 1954, I was able to win first prize in the National Mathematical Olympiad organized by the Romanian Society for Mathematical (and Physical) Sciences (this body was also the initiator of the International Mathematical Olympiads, the first two of which were held in Romania in 1959 and 1960). These successes led me naturally to the idea of becoming a mathematician. Apart from the subjective motivation, there also existed a favourable objective context to a mathematical career, which was the existence of a mathematical research institute, namely the Bucharest Institute of Mathematics (founded in 1949) of the Romanian Academy. Mirroring the corresponding Soviet institutions of the time, this institute played an overwhelming role in the flourishing of mathematical research in Romania between 1949 and 1975, at which time it was closed down to punish the institute's staff for the careless handling of the presumed love-affair of a VIP's daughter. It was only reestablished in 1990 after the fall of the communist regime. The best mathematics students entered this institute almost automatically after completing their studies. Thus, partly for subjective and partly for objective reasons, my dream was to study mathematics and then enter the Institute of Mathematics. Of course, at the time, my idea of what mathematical research meant was quite imprecise. I spontaneously held the Halmos-like view that "problems are the heart of mathematics".

Tell us about your mathematics education. How was the academic life in your time as a student?

My university years (1954–1959) at the Faculty of Mathematics and Physics (now Mathematics and Computer Science; Physics separated in 1962) of the University of Bucharest fell in a period when all the great names of inter-war Romanian mathematics were still active. Thus, among my professors were D. Barbilian (1895–1961), A. Froda (1894–1973), A. Ghica (1902-1964), Gr. C. Moisil (1906–1973), M. Nicolescu (1903–1975), O. Onicescu

(1892–1983), N. Teodorescu (1908–2000), V. Valcovici (1895–1970), and Gh. Vranceanu (1900–1979). To these should be added C. Andreian Cazacu, T. Ganea (1922–1971), C.T. Ionescu Tulcea, S. Marcus and Gh. Marinescu (1919–1987), who made their names as mathematicians after World War II. Unfortunately, this nice picture was embedded into the Stalinist environment of the time.

Who were your (favourite) teachers?

I'll start by first mentioning my two calculus professors Ionescu Tulcea and Marcus, who taught me in my first and second university years respectively. The course given by Ionescu Tulcea was of a high level of mathematical rigour, from which I learned what mathematical proof is; it was decisive in my formation as a mathematician. From the course given by Marcus, who, following his research interests, oriented his course towards real functions, I learned how to ask (and then answer) mathematical questions. As a result I was able, in 1956, to complete my first (small) piece of original work. Professor Marcus was my first and, unfortunately, last supervisor, as will become clear later on. Next, I'll mention Barbilian, who was quite an unusual man and mathematician, as was his course on number theory. Though his lectures had been prepared well in advance, spontaneous ideas for new proofs and results flashed through his mind during the class, thus offering a live spectacle of creative mathematics. I do not doubt this happened because Barbilian is one of the four or five poets of genius in Romanian literature; as a poet he is known under the pen-name of Ion Barbu. Barbilian's double career as a scientist and as an artist offers support for Karl Weierstrass' well known opinion that a mathematician who is not also something of a poet will never be a perfect mathematician.

How did you choose your subject for research? Who did you do your PhD under? Tell us about his career and the influence on your own scientific activity.

I graduated with honours in July 1959. My diploma paper was based in part on the work done on real functions under Marcus' guidance starting from 1956. Contrary to my expectations, due to the discriminatory political criteria of the time (one had to be of a 'healthy' social origin), I was only offered a position of mathematics teacher at a lycée in Calarasi, a small harbour on the Danube. The fact that Barbilian's career had also started there did not make the offer any more attractive. I therefore declined it and began looking for other possibilities.

In the end, help came from Professor Gh. Mihoc (1906–1981), then the dean of the Faculty of Mathematics and Physics, who knew me from the Mathematical Olympiads and on whose recommendation I got a consultancy position at the Central Board of Statistics in Bucharest. My main duty there was to improve the mathematical education of the staff. Not at all an exciting job but, living in Bucharest, it was at least possible for me to keep up some contact with mathematics. This was also the beginning of a new phase in my career. On the one hand, I started studying some mathematical statistics as required by my job. On the other hand, Mihoc suggested that I should try to carry out research in probability. He proposed that I should first become acquainted with dependence with complete connections, a concept that was his own and Onicescu's joint creation in the middle of the 1930s. This was quite a timely suggestion as a book by G. Ciucu (1927–1990) and R. Theodorescu had just appeared that gathered together all that was then known in the field. My conversion from real analysis to probability was by no means difficult. The former is an indispensable basis for the latter and, moreover, I had taken a solid course in probability with Onicescu in my fourth university year. In the period 1960–1968, both independently and jointly with Theodorescu, I was able to complete some 25 papers on dependence with complete connections.

In July 1963, under Mihoc's formal supervision, I got my PhD degree (in the Soviet nomenclature of the time, this was called a "candidate of science" degree) with a thesis on chains with complete connections with an arbitrary state space. A revised and expanded version of my PhD thesis was published in Russian in the same year and was awarded a prize of the Romanian Academy in 1965. A second doctoral degree, which is roughly equivalent to the English DSc, was awarded to me in December 1969 for the whole of my mathematical work at the time. Meanwhile, in June 1963, I had at last succeeded in becoming a research worker in the Probability Division of the Institute of Mathematics of the Academy (my old dream!). When, in 1964, the Centre for Mathematical Statistics was set up as a development of that probability division, promoted by Mihoc, I moved to it and have remained there ever since.

Can you tell us about some important events in your professional life?

I should start with the publication by important publishing houses of most of my books, all of them based on my own research work. One of these books, on applications of stochastic processes in biology and medicine, won another prize of the Romanian Academy in 1968. Next, I should mention my election at the Romanian Academy, as a corresponding member in 1991 and as a full member in 2000, being then elected in 2002 as one of its four vice-presidents.

Last but not least, the fall of the communist regime opened very good prospects for collaboration with foreign mathematicians and international organizations. It should be noted that even before 1989, always under incertitude and almost insurmountable difficulties, I was able to take advantage of some of the invitations I received for conferences abroad and professorships in France and Germany as well as a six month stay at the

Statistical Laboratory of Cambridge University as an overseas fellow of Churchill College (the architect of this fellowship was Professor D.G. Kendall FRS, honorary member of the Romanian Academy, to whom the Romanian mathematical community should be grateful in many respects for his help in those difficult times).

After 1989, the situation changed for the better, so I was able to do joint work with J.-M. Deshouillers in Bordeaux and C. Kraaikamp in Delft, in both cases on probabilistic number theory. Finally, I should mention my responsibilities to the Romanian party in: (i) a Common European Project TEMPUS, "Development of Applied Mathematics in Romania", also known as "MATAROU" (1991–1994), in the framework of which 64 young Romanian mathematicians were able to study for a Masters or a PhD degree in universities of the European Union; and (ii) a convention, SAFE (which stands for Soros, Ambassade de France, ENS), from 1993 to 2000, which welcomes students of sciences or humanities from Romania and, since 1996, Bulgaria and Moldova to the French ENSs (Ecoles Normales Superieures), under which 100 people were selected in a very rigorous manner for two-year scholarships at these famous schools.

Two names are to be praised in this latter context: D. Cioranescu (of Romanian origin) from the University Paris VI for (i), and C. Duhamel from the University Paris-Orsay (on a mission at the French Embassy in Romania at the time) for both (i) and (ii). These projects set favourable conditions for a series of French-Romanian Colloquia of Applied Mathematics held every two years from 1992, alternatively in France and Romania, following a suggestion of Professor H. Brezis from the University Paris VI in his address at the Romanian Academy on his reception there as an honorary member. So, we have arrived already at the 8th colloquium in this series, which was held in Chambéry (France) at the end of August 2006. I am proud that D. Cioranescu, C. Duhamel and I are considered founders and promoters of this series, which should certainly go on through the good work of younger people from both Romania and France.

What were the main trends and results in your area of interest in the last 30-40 years and what are the present trends?

I think that Brownian motion and Ito's stochastic calculus, as well as the results associated with them, played a paramount part in stochastic process theory during the last two thirds of the 20th century. For the near future, we could also think that Malliavin's calculus will play a similar part. At the same time, we should be aware of the enormous potential interdisciplinary nature of stochastic process theory that is able to open unexpected ways to very important applications in different fields. In this respect I like very much a conclusion of D. Mumford's essay, "The dawning of the age of stochasticity", pp. 197–218, *Mathematics Frontiers and Perspectives 2000*, according to which "… stochastic methods will transform pure and applied mathematics in the beginning of the third millennium".

Which of your mathematical results are you proudest of?

It is hard to select a single item or a few items from my mathematical results over my very long career. I'll thus say that I am proud of the current state of dependence-with-complete-connections theory to which I have greatly contributed. However, to give a single result I am proud of, yet which is not far from that theory, there is the elementary solution to the celebrated 1812 Gauss' problem on continued fractions, first solved in 1928 by an intricate (and not entirely correct) method.

Are you predominantly a researcher or a teacher?

I am essentially a researcher. My teaching activities were restricted to several professorships abroad and to the supervision of many PhD students in Romania. Actually, almost all of my professional career (almost 47 years now) has been associated with only one research institute, the Centre for Mathematical Statistics (founded in 1964) that since 2002 has become the Institute of Mathematical Statistics and Applied Mathematics (ISMMA).

Who is your most admired mathematician or scientist, if any? Why?

You'll perhaps be surprised to learn that my most admired mathematician is W. Doeblin (1915–1940), who in his very short life was able to contribute a great deal to the current form of several chapters of probability theory. It has recently appeared that in a paper written in the winter of 1939, only published in December 2000 in a special issue of *C.R. Math. Acad. Sci. Paris*, anticipating contemporary one-dimensional diffusion theory, Doeblin proposed a deep, original synthesis of the two main approaches to stochastic process theory: the analytic, initiated in the 1930s, and the probabilistic, dealing with the trajectories of a process, developed during the second half of the last century. Doeblin's fate was tragic, recalling that of E. Galois. The reader might like to consult a recent paper by B. Bru and M. Yor, "Comments on the life and mathematical legacy of Wolfgang Doeblin", *Finance Stoch*. 6 (2002), 3–47.

What do you consider the most profound and influential development of the last century in your area of research?

Before answering your question, some clarification is in order. I am a probabilist who is also interested in real analysis and number theory (from a probabilistic point of view). The central topic in my original research work is dependence with complete connections, the theory of which was initiated by a note published in 1935 in *C.R. Math. Acad. Sci. Paris* by the Romanian mathematicians O. Onicescu and Gh. Mihoc, the co-founders of our Bucharest probability school. In his book, *L'évolution créatrice* (Alcan, Paris, 1907), on page 21 the famous French philosopher H. Bergson wrote, "Le moment actuel d'un corp vivant ne trouve pas sa raison d'être dans le moment immédiatement anterieur … il faut y joindre tout le passé de l'organisme, son hérédité, enfin l'ensemble d'une très longue histoire".

Intended to be a non-trivial extension of Markovian dependence, in the spirit of this Bergsonian quota-

tion, the theory of dependence with complete connections aims to describe probabilistic evolutions where the whole past should be taken into account, unlike its celebrated Markovian predecessor where only the last moment of the past really counts. Mathematical models based on dependence with complete connections occur in mathematical learning theory, stochastic approximation, branching processes with random environments, probabilistic number theory (especially in the metric theory of different continued fraction expansions of irrational numbers), social psychology, partially observed random chains (in particular hidden Markov chains) and their control, decision theory and dynamic programming, inventory theory, and many other fields. For details one can consult my joint book with the late S. Grigorescu (1945–1997), *Dependence with Complete Connections and its Applications*, Cambridge Univ. Press, Cambridge, 1990, as well as my older joint book with Theodorescu, *Random Processes and Learning*, Springer Verlag, Berlin, 1969.

Nowadays, quite a lot of mathematicians have become interested in dependence with complete connections under the nomenclature of iterated function systems, which, among other things, are used in the construction of fractals. Coming back to your question, I'll tell you that the most important result in my subject originates from 1950. This is a general ergodic theorem for a class of non-compact linear operators that occur in a natural manner in dependence with complete connections theory. It is due to Ionescu Tulcea and Marinescu and greatly generalizes a special case of it that was considered in 1937 by Doeblin and R. Fortet (1912–1998), both important early contributors to the subject.

What are you working on right now?

Dependence with complete connections has been a topic of interest for mathematicians from France, the USA, Canada, Germany, Greece, the Netherlands, Sweden, Brazil and the former Soviet Union. Currently, most of the work on it is done abroad (see my remark above on iterated function systems). Three years ago I concluded a collaborative agreement, under Deutsche Forschungsgemeinschaft sponsoring, with a Duisburg group from the Duisburg-Essen University headed by Professor U. Herkenrath. Several papers on dependence with complete connections produced by this group have already been published. In the past, more precisely in the period 1994–2001, I did joint work with C. Kraaikamp of the Technical Delft University on a very nice and elegant application (still stemming from Doeblin) of dependence with complete connections to the metrical theory of the continued fraction expansion. This collaboration, which was sponsored by the Dutch organization for scientific research (NWO) and later (after 1999) by France's CNRS from a PICS (Projet International de Coopération Scientifique), resulted in our joint book, *Metrical Theory of Continued Fractions*, Kluwer, Dordrecht, 2002. These collaborations are still going on nowadays and my work is done within them. So, a new book on dependence with complete connections is being prepared jointly with the Duisburg group.

Let me now come to another aspect of your work. You are a full member of the Romanian Academy, belonging to its mathematics section, and you are also one of the four vice-presidents of the academy. What activities does this section run, coordinate or supervise?

Firstly, the section is responsible for the quality of the work done in its mathematical (and astronomy) institutes: 2 (+1) in Bucharest, 1 in Cluj-Napoca and 1 in Iasi. This means that each year these are evaluated by the section's members. I am happy to say that, in general, the evaluations result in good and very good marks. Secondly, the section edits the mathematical journals of the Romanian Academy: *Rev. Roumaine Math. Pures Appl.*, *Math. Rep. (Bucur.)* (formerly *Studii si Cercetari Matematice*), *Mathematica (Cluj)*, *Revue Anal. Numér. Théor. Approx.*, *Romanian Astronomical Journal*, and *Proceedings of the Romanian Academy Series A*. Next, the section coordinates meetings, the organization of which is entrusted to its institutes. For example, the Bucharest Institute of Mathematics organized the 5th Congress of Romanian Mathematicians in 2003 and it is planned to hold the 6th congress in 2007. Also, my own institute (ISMMA) always takes part in the organization of the French-Romanian Colloquia of Applied Mathematics. Finally, the section awards the annual mathematics prizes of the Romanian Academy (five in all) and elects new members when vacancies arise.

Please give a brief description of the organization and main activities of the mathematical institutes of the Romanian Academy.

Very sketchily, these institutes are divided into large teams embarked on general research projects. The members of a team then deal with pieces of such a project. A basic subsidy comes from the government but, especially in the last few years, even more money comes from research grants, both Romanian and foreign, while close contacts with applied research institutions and other bodies are encouraged. The best researchers have the possibility to be supervisors of PhD students even if they are not formally doing teaching at university, while the PhD theses

are defended at the institutes (see also the answer to the preceding question). May I add that the contribution of the institutes to the total Romanian mathematics output is overwhelming.

Let's now discuss the present situation of mathematics research in Romania in both universities and research institutes. How do you see the evolution in the last 15 years and what do you predict for the near and far future?
In this respect, several things should be mentioned. First, it is clear that in the pre-1989 years there was an overproduction of (very good) mathematicians in Romania. The solution, illegal under the communist regime and utilized only moderately until 1989, whilst being legal and therefore used more commonly after 1989, was immigration to free countries, where a good mathematician is much better paid and enjoys incomparably better working conditions than in his own country. Currently, we have a shortage of well-prepared young mathematicians, which is still aggravated by both massive immigration and an unwillingness of many gifted young people to read exact sciences. Rather than mathematics, they prefer instead to read economics or law in order to get much better paid jobs than teaching or research positions. One should nevertheless note that there are currently slight signs of improvement, meaning that the brain drain might be stabilizing or even diminishing.

What can be done to attract talented young students into mathematics and, especially, to keep the best qualified mathematicians in the mathematics departments of Romanian universities?
I am sorry to tell you I think that under the current economic conditions in Romania nothing can be done in this respect. For the time being, it only remains to count on the willingness of people to decide to follow their vocation and accept poor material conditions for that. Recent steps (highly contested by the establishment) taken to recruit university professors and main research workers on the basis of strict transparent objective criteria will only produce effects in a pretty distant future.

What about your students and disciples? Are they working in Romania or abroad?
Since 1974 I have supervised some thirty PhD students who were able to complete their dissertations. Among them, there were some genuinely gifted people. Many others were unable to complete but even these took advantage of keeping in contact with recent mathematical developments. Most of my PhD students who enrolled after 1989 left the country before completing their dissertations. For some of them, joint supervising arrangements were possible. Briefly, just one of my better post-1989 PhD students is working in Romania and is still doing joint work with me.

What are your opinions about the recent changes in the Romanian mathematics education system and those in the whole education system? Are they directed correctly? Is the mathematics section of the Romanian Academy involved to a certain extent in the decision process regarding mathematics education at all levels?
What should be first shown is to point out the extreme instability of these changes at all levels of our education system. As a general rule, if some steps are taken by some official, then his/her successor is often willing to cancel them in part or totally and to start practically from scratch. Even good aspects of our education system are changed for the worse under the motivation of what the European Union is asking. Needless to say, our section is never consulted about the problems of mathematics education, everything being left to more or less self-declared "experts". It becomes increasingly clear that the problems of our education system are part of a global problem of worldwide education systems, where action is needed in five major areas: (i) ensuring quality of learning for all; (ii) addressing teacher shortages; (iii) providing opportunities for adults to continue learning; (iv) financing lifelong learning; and (v) reacting to the increasing diversity of student populations. To put it in a few words, education needs to adapt to a changing world.

Do you have any particular message you would like to give to young mathematicians?
I think that, regardless of the field, whether scientific, humanistic or artistic, a gifted young person should be conscious of the fact that if they decide to accept it and pursue a career based on it, his/her gift will be a burden and a great responsibility entailing deprivation and sacrifice.

I recently noticed, watching TV during the last edition of the International Music Festival, "George Enescu", held in Bucharest, that you have a deep musical education. What about music in your life? What about music and mathematics?
I think that to maintain one's spiritual health any mathematician (pure or applied) and, more generally, any scientist should become interested in some artistic or humanistic endeavor. My *violon d' Ingres* is precisely music and the violin, to the point that had I not been a mathematician I should have wanted to be a musician. It becomes clearer and clearer for me that mathematics and music are among the very few oases of light in a world increasingly darkened by folly, intolerance and dishonesty. Actually, the connections between music and mathematics were recognized several thousand years ago and had an important revival in the 1980s. In recent years, advances in digitalization of music data as well as the availability of sophisticated mathematical tools adapted to the specific needs of music theory have made it possible to leave behind the purely qualitative or at best partially subjective approaches of the past to pursue more quantitative treatments.

Thank you very much!

The interviewer, Vasile Berinde [vberinde@ubm.ro], is the EMS publicity officer and an associate editor of the Newsletter.