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Academician Professor RADU MIRON at 90th Birthday: a Life for Mathematics

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Academician Professor Radu Miron has reached the venerable age of ninety years, sixty-five of which he dedicated to Mathematics education and research, representing the Romanian mathematics school as a Professor at Alexandru Ioan Cuza University in Iaşi, as well as a member of the Romanian Academy. His vast and compact scholarly work has brought him international recognition and has established him as a leader of the Romanian school of geometry.

As a former student, including the doctoral level and then as a collaborator of Acad. Radu Miron in writing papers and books, I had the privilege of witnessing his outstanding career. I dedicate the following lines, with admiration and love to my Professor, Radu Miron.

As a fresh student I noticed in the faculty hallways the presence of a professor who impressed by his confidence and authority. His name was Radu Miron, a young Associate Professor at the Department of Geometry and researcher at the Iaşi Branch of the Romanian Academy. He had just received the prestigious award "Gheorghe Ţiţeica" of the Romanian Academy for the monograph "The Geometry of Myller Configurations" (in Romanian).

Three months later his lectures on Analytical Geometry strongly impressed all my colleagues. In each lesson, he briefly recalled the issues of the previous ones.

Then a new problem followed and its solution was obtained in a cascade of definitions, lemmas, theorems, corollaries and applications. In the end everything became clear and easy. All students learned with pleasure and gained great marks.

I have taken three more geometry courses of his and I have always enjoyed his noble academic attitude, the clarity and the scientific accuracy of his lessons.

Professor Radu Miron and his book "The Geometry of Myller Configurations" have contributed crucially to my decision to study Geometry more thoroughly and to do a doctorate in this discipline under his supervision. This happened between 1972-1977. In the meantime he became Full Professor (1969) and was elected as the Dean of the Faculty of Mathematics.

Despite some new teaching and administrative duties, full of energy, Professor Radu Miron continued to research interesting and difficult topics. Thus he extended

the notion of Myller configuration to spaces with affine connection and developed a theory of distributions in such spaces.

It has been known since a long time that for the study of the Finsler spaces of dimensions 2 and 3 some special ortonormal frames are used. These have been introduced by Berwald and Moor, respectively.

At a Geometry Conference in Debrecen, Professor Radu Miron wondered if such a frame can be built for any dimension. The problem appeared as interesting to Professor Mokoto Matsumoto, the leader of Japan's Finsler School of Geometry, a prominent participant in that Conference.

The issue has been extensively discussed during the Conference, but no solution has been found. Returning to the country, Professor Radu Miron finds a solution he sends to Matsumoto. There is an exchange of letters in which the solution was refined and published in a joint paper in Periodica Mathematica Hungarica 8(1977).

This paper was taken over entirely by Matsumoto in his monograph dedicated to Finsler spaces by speaking of "the Miron frames". This was the first important contribution of Professor Radu Miron to the Finsler geometry.

Such fortunate happenings have appeared several times in the research work of Professor Radu Miron so he is right when he says: *I congratulate myself on the courage to get into new problems that many could not solve. There are some famous problems that have remained unresolved for hundreds of years.*

That first meeting with Matsumoto was for Professor Radu Miron the first step towards studying Finsler Geometry. Soon he will include the theory developed by the Japanese school in a larger one and provide it with modern and efficient methods.

The second step was a talk *Finsler Geometry.Romanian Mathematician's Contributions* he gave in 1977 at the National Conference on Geometry and Topology in Timişoara (Romania). His talent of revealing the beauty of a subject matter stimulated the interest in the study of this Geometry and many young participants at this Conference decided to approach topics suggested by Professor Miron' lecture, taking the advantage of his advice and help.

The third step was his decision to present the monograph of M. Matsumoto, *Foundation of Finsler Geometry and Special Finsler Spaces*, still unpublished, in the Geometry Department. At the same time he asked me to study and to present in the same Department the point of view of French mathematicians in approaching Finsler geometry as it appeared in papers by A. Lichnerowicz, J. Klein, P. Dazord and J. Grifone's PhD thesis.

So he managed to accumulate in a short time a large amount of knowledge that he integrated providing a synthesis and an overview of the development stage of Finsler geometry. These were the basis for the generalizations that he later proposed.

In the winter of 1980, the first National Seminar on Finsler Geometry took place

at the University of Braşov according to a proposal of Prof. Radu Miron. In a four-hour lecture, a text published later on 53 pages, Professor Radu Miron proposed an original viewpoint on the geometry of Finsler spaces, fusing together the influences of the earlier Romanian, Japanese and French researchers. In this lecture, the role of the nonlinear connections is fully clarified as well as that of geometric object of Finsler type. A novelty with great impact later on was the introduction of spaces with metric Finsler structures, called also generalized Finsler spaces.

The introduction and the study of metric Finsler structures is Professor Miron's second major original contribution to the theory of Finsler spaces.

This contribution actually modified the framework of the Finsler geometry and led to new generalization and new points of view.

An interesting one belongs to Professor Radu Miron. He noticed that the techniques from the geometry of generalized Finsler spaces can be also used in the study of the geometry of the total space of any vector bundle. He developed, by using such techniques, an elegant theory of geometric structures and of connections compatible with these, on the total space of a vector bundle, geometrically, with easy-to-follow calculus. His co-workers adapted and applied his idea to various frameworks.

In the early 1980s Prof. Matsumoto and his collaborators have become more and more interested in the new ideas promoted by Professor Miron. Some of them (M. Hashiguchi, Y. Ichijio) repeatedly visited the Faculty of Mathematics in Iaşi. During these visits it was organized the Romanian - Japanese Colloquium on Finsler Geometry which was held at the universities from Iaşi and Braşov in August 1984.

This Colloquium was an important step in expanding the collaboration of Romanian geometers with Japanese geometers, as embodied in numerous joint papers. For instance, Prof. Radu Miron has written joint papers with M. Matsumoto, M. Hashiguchi, Y. Ichijio, H. Izumi, S. Kikuchi, S. Watanabe, S. Ikeda. There was no a Japanese-Romanian colloquium. It would not have been possible before 1989, and after December 1989, Romanian geometers entered the global choir of geometers and no unilateral meeting was justified. They met Japanese colleagues at international conferences organized in different countries, including Japan.

At the fourth National Seminar on Finsler Geometry, that was held also at the University of Braşov (Romania) in January 1986, Prof. Radu Miron proposes the study of spaces endowed with Lagrangians that are no longer homogeneous in the directional variable as is the case with Finsler spaces. He calls them Lagrange spaces and presents the basics of their geometry. The study of Lagrange spaces was enthusiastically continued by many participants at that Seminar.

After 1970, there has appeared in the Theoretical Physics the interest in developing a Finslerian Theory of Relativity that should offer the possibility of describing anisotropy properties of space. As to this matter Professor Radu Miron has a simple

idea, as all great ideas: to consider the Einstein equations in Lagrange spaces as the Einstein equations associated to the canonical metrical connection from the almost Hermitian model. By decomposing the Einstein equations from the model in the adapted frames to nonlinear connection, he obtains two sets of Einstein equations.

Prof.Dr.S.Ikeda from the University of Sciences in Tokyo explained the physical foundations of the entire theory in a work published as the last chapter of the monograph *Vector bundles. Lagrange spaces. Applications to Relativity*, published in Romanian by the Romanian Academy in 1987.

The introduction of the notion of Lagrange space and the establishment of the basic properties of these spaces is the third major contribution of Professor Radu Miron in the Finsler type geometries. The fourth significant contribution is to introduce and establish the main properties of the Hamilton spaces. The idea is coming from Mechanics. To any Lagrangian corresponds, by the Legendre duality, a Hamiltonian. Professor Radu Miron has studied the Hamiltonian spaces as dual to the Lagrange spaces. A difficult step was to determine a nonlinear connection which depends on the Hamiltonian only.

Two years later, in the same National Seminar on Finsler Geometry, Prof. Radu Miron defines and sketches the geometry of two new spaces: higher order Lagrange spaces and higher-order Hamilton spaces, thought to be dual.

The duality of these spaces will be clarified later in a one-night discussion with a famous Japanese engineer, K. Kondo. In the same framework he solves the famous problem of the prolongation of order $k > 1$ of the Riemannian space, brings a solid contribution to the foundation of the Mechanics of the Lagrangians which depends on the higher order accelerations and creates some new geometrical models for the theory of physical fields.

These two notions complete a Finsler-centered painting not only with more and more general notions but also with new techniques useful in the particular case of Finsler spaces as well. By 1988 Prof. Radu Miron left to others the detailed study of these spaces and focused on the possible applications of their geometries.

Of course, developing applications he has also had to solve new geometrical problems. This has clearly happened when he developed a theory of electromagnetism and studied the geometrical optics based on a generalization of a metric due to J.L.Synge, by applying the geometry of generalized Lagrange spaces.

The research of Prof. Radu Miron, his innovative ideas, the efforts to organize a Finsler geometry school in our country, the scientific collaborations with other countries, especially with Japan, were remarked by the members of the Mathematical Section from the Romanian Academy. Consequently, he was proposed and elected correspondent (1991) and then full member (1993) of the Romanian Academy.

This high appreciation of the Romanian Academy has been an additional reason

for Academician Radu Miron to continue.

The change of political regime in Romania opened up new perspectives and possibilities for Romanian mathematicians. Not only did he use these possibilities, but also mobilized many Romanian mathematicians to promote the mathematical ideas and techniques developed in Romania.

The '90s were for Academician Radu Miron years with many achievements. I mention those which, in my opinion, are most relevant.

• He has published on his own or in collaboration five scientific monographs in English, over one thousand pages, at international publishing houses.

• In the decade 1990-2000 he published about one-third of all scientific papers, around five per year.

• He presented scientific papers at 2-3 scientific conferences each year. For this purpose he has repeatedly traveled to Japan, Canada, USA, Egypt, India and almost all European countries. I have been accompanying him for some of these journeys for scientific purposes.

He is an ideal traveling companion. He is always optimistic, he is not afraid of possible difficulties, he is organized and with care for his traveling companions. He also likes to travel for tourism purposes. He visited China by train passing through the former Soviet Union and Mongolia.

• He has completed several research visits to universities in Canada, Japan, Greece, Hungary. Remarkable is his collaboration with Professor Peter Louis Antonelli of Alberta University in Edmonton, Canada. In a congratulatory message, Antonelli wrote:

I first met Prof. Miron in 1991 in Debrecen, Hungary, at a conference on Finsler and Lagrange Geometry. At that meeting, Miron and I set the stage for our 5-year official cooperative research plan, between "Alexandru Ioan Cuza" University of Iaşi in Romania and University of Alberta, in Canada. This involved writing books and papers, organizing conferences and training post- doctoral fellows of which, I. Bucataru, D. Hrimiuc, S. Rutz, T. Zastawniak and B. Lackey, are outstanding examples. There were also extended visits from Profs. Anastasiei and Miron and numerous other scholars over the 5 years.

In the same message, appreciating the value of the books published by Acad. Radu Miron, he wrote:

It is my personal opinion that Prof. Miron's books satisfy a need of those wishing to get to the heart of geometry with clarity, elegance and brevity of exposition... a mighty achievement.

• He taught the students at the Faculty of Mathematics until the age of seventy when he retired. He continued to teach math lessons at the Economics School of a private university until the age of eighty.

• He was involved in the center-right politics locally in the memory of his father who had been liberal between the two world wars. He was several times a municipal or county councilor.

Academician Radu Miron is an open person who easily establishes relationships with interlocutors and offers his friendship through a handshake. He likes to invite friends to lunches or dinners in his family's apartment. I was invited together with my wife many times. At the conferences organized in Iaşi he also used to invite guests from abroad.

He has two daughters. One is an oculist and the other is a math teacher. They are married and each one has two children. Some of them already have children. So he has a pretty big family. I met many of its members. His wife was a great lady (she died a few days before her husband was ninety years old), very nice to the guests, appreciating the work of her husband very much. She accompanied him to some scientific conferences.

Academician Radu Miron loves good meals and quality wines. Sometimes, for a guest from abroad, he prepares himself a special kind of Romanian food that he is very proud of. It was customary for autumn to prepare very tasty sausages with sheep meat and many spices. He prepares also various pickles, especially watermelons.

If the last decade of the 20th century was a decade of intense work, exciting travels and friendships, the first two decades of the 21st century were for Academician Radu Miron decades of rewards. Here are a few.

He was elected as a honorary member of the Academy of Sciences of the Republic of Moldova, he was awarded the title of "doctor honoris causa" at several Romanian universities, he received "Omnia Opera" award for the whole scientific activity and several diplomas of excellence as well.

He received *V.Pogor* award from City Hall of Iaşi and was declared an honorary citizen of the city of Iaşi. Also, Academician Radu Miron was celebrated on his 70th, 75th, 80th,85th anniversaries by Symposiums and international Conferences organized in his honor.

The Conferences were devoted to the main field that he is interested in: Finsler, Lagrange and Hamilton geometries and their applications to Mechanics and Physics. Romanian journals dedicated special volumes to him.

The academic community from Iaşi, together with the Romanian mathematicians, as well as many geometers around the world enjoyed to celebrate the 90th anniversary of Academician Radu Miron by a Symposium on his life and work, organized by the Iaşi branch of the Romanian Academy.

The conference ICAPM 2017 was also dedicated to him. Many geometers from Romania and abroad sent beautiful congratulatory messages.

Dear Academician Professor Radu Miron, Happy Birthday to You!

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