Professor Nicolae Vulpe – 60th anniversary

The mathematical community of the Republic of Moldova congratulates Nicolae Vulpe, University Professor and Doctor Habilitat, on the occasion of the 60th anniversary of his birthday. This is an opportunity to acknowledge his exceptional contributions to the development of the mathematical school of Moldova.

Nicolae Vulpe was born on the 22nd of February 1949 in the village of Brinza in the area of Vulcanesti. In 1963 he graduated from the primary school in his village and continued his studies at a secondary school in Cahul. In 1966 he became a student in the Faculty of Physics and Mathematics of the Pedagogical Institute in Tiraspol where he later graduated with honours and became Assistant at the Chair of Mathematical Analysis of the institute. He also ended his military service about the same time. He was recommended to work in the section of Differential Equations and Methods of Computations, section headed by Constantin Sibirschi, the founder of the school in differential equations of the Republic of Moldova and later on, member of the Academy.

In 1972 Nicolae Vulpe became a assistant of the Institute of Mathematics and Computer Science of the Academy of Sciences, where he remains to this day. He married his former class colleague, both in the school and at the university, and together they raised and educated three children. Constantin Sibirschi initiated the work on algebraic invariants of polynomial ordinary differential equations and he published many articles in prestigious mathematical journals on this subject. He also trained a group of scientists in this direction of research, among them the young Nicolae Vulpe. These scientists continued the work of Constantin Sibirschi after his death and obtained many very valuable results which largely extend his contributions.

The whole mathematical career of Nicolae Vulpe was dedicated to this area of research to which he made important contributions. His sustained work was appreciated and he was promoted first as Junior Scientific Researcher (1975), then

Senior Scientific Researcher (1981), then Head of the Section in Differential Equations (1984) of the Institute, then Principal Scientific Collaborator (1993).

Nicolae Vulpe obtained his Doctorate in Mathematical and Physical Sciences in 1976, in 1985 he brilliantly defended his Habilitation Thesis and in 1999 he became Full Professor. Professor Nicolae Vulpe is author or coauthor of 120 scientific works. All these works are devoted to the qualitative study of polynomial differential systems using the theory of algebraic invariants introduced by Constantin Sibirschi.

The mathematical results of Nicolae Vulpe extend this theory and built applications of this theory by using algebraic comitants (polynomials depending on the coefficients of the systems involved which are invariant under the action of various transformation groups), the method of T-comitants (algebraic invariant polynomials with coefficients invariant under translations) and the method of differenial operators (of Hilbert type or transvectant). Although his investigations spread over a larger area, the focus of his interest was the theory of planar quadratic differential systems, that is systems of two differential equations defined by polynomials of maximum degree two. This area offered an excellent testing ground for proving the power of the method of algebraic invariants for obtaining qualitative results for these equations. In his first articles he studied topological and geometric structures of the homogeneous differential systems and obtained invariant partitions expressed in terms of algebraic invariants.

Afterwards he solved a problem which had a long history of unsuccessful attempts for obtaining its solution: the problem of finding all phase portraits of quadratic differential systems with a singular point which is a center. This is a highly cited paper by numerous authors. This success reinforced his interest in this area in which he since obtained alone or with collaborators many other interesting results such as: the stratification in R^{12} of the class of quadratic differential systems according to their global scheme of finite singularities; a formula which relates the degree of freedom in the class of all quadratic systems subject to having a given configuration of finite singularities (real or complex, simple or multiple): the sum of the degree of freedom and of the number of distinct finite singularities is 4; the determination of the affine invariant criteria for polynomial integrability within the class of quadratic systems; the connection between the existence of a polynomial first integral and the rationality of the solutions of a certain algebraic equation whose coefficients are absolute affine invariants of the systems studied; the determination of affine invariant conditions of quadratic systems possessing rational first integrals of degree two and the construction of all phase portraits of this class on the Poincaré disk as well as of the affine invariant conditions for the determination of each one of these phase portraits; the proof of Darboux integrability of quadratic systems having invariant straight lines of total multiplicities 5 and 6; the classification of all possible configurations of quadratic systems possessing invariant straight lines of total multiplicity 4 and the proof of Liouvillian integrability of all such systems; the topological classification of all quadratic systems possessing invariant straight lines of total multiplicity at least 4 and the construction of the moduli space, under the action of the group of affine transformations and homotheties of time of this whole family; the topological classification of the class of quadratic systems according to their behavior around their infinite singularities.

The contributions of professor Vulpe to the development of the school in differential equations of Chisinau were very much appreciated by the mathematical community of the Republic of Moldova. Professor Vulpe received many prizes such as: "Republican Premium" (1978) for young researchers, awarded to him for a series of articles on the theory of algebraic invariants of differential equations; "Diploma of Recognition" (1999) of the Academy of Sciences of the Republic of Moldova; the "C. Sibirschi Prize" for the series of works on the application of invariant polynomials in the qualitative study of differential equations. We believe that Constantin Sibirschi would have been proud of his former student and disciple, whose work is now internationally known.

Professor Vulpe is regularly invited to attend international conferences abroad and he has been invited to lecture in several universities (the Technical University of Delft, Holland; York University, Great Britain; Université de Montréal, Canada; Universitat Autonoma de Barcelona, Spain). In November of 2008 he participated in a Workshop at BIRS (Banff International Research Station for Mathematical Innovation and Discovery) in Canada where his results were appreciated by some of the best experts in the world in the qualitative theory of differential equations.

Since 1998 Dr. habilitat Nicolae Vulpe has been Editor-in-Chief of the journal "Buletinul Academiei de Ştiinţe a Republicii Moldova, Matematica".

We wish Professor Nicolae Vulpe much happiness and joy from his children and grandchildren and good health and vigor for many years to come as well as much success in his scientific research.