PROFESSOR IOAN A. RUS ON HIS 70TH BIRTHDAY: A COMPLETE SCIENTIST, AN ACCOMPLISHED MATHEMATICIAN[*]

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Motto: Force, lucidity, dynamism, generosity, simplicity are virtues which we may all obtain. Originality will be as God pleases.

(Sir Alexander Fleming)

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It is generally accepted that a mathematics faculty member should be involved simultaneously, during his academic career, at a certain extent, into one, two or, very rarely, into more of the following typical academic activities: 1. Research activity; 2. Didactical activity; 3. Editorial activity; 4. Administration activity. As a rule, after getting a permanent position, most mathematicians who do not have any kind of administration duties are concentrating their efforts to one, but generally no more than two activities in the previous list, usually their main efforts being directed to research and teaching. Professor Rus is one of those few mathematicians who succeeded,

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during their career, to cover simultaneously all these main academic activities, in a extremely balanced and successful way. In a first attempt to explain the achievements of his impressive career, we can say that the main force in Professor Rus' life is without any doubt his enthusiasm for mathematics and his inexhaustible intellectual and physical energy. The concise material that follows is saw as a mirror of these facets of Professor Rus impressive activity. The text is keeping the style of the Power Point presentation from which it is excerpted, presentation that was delivered at ICAM5, as a tribute to Professor Rus for the passion with which he is understanding, practicing and professing the mathematics.

Many happy returns of the day !

0. Education

Ioan A. Rus was born in Ianoşda village, Bihor county, Romania, on August 28, 1936. He's education comprises: primary and secondary school studies (1949-1952) in his native village, Ianoşda; high school studies (1952-1955) at "Emanuil Gojdu" High School in Oradea and university studies (1955-1960) at the Faculty of Mathematics, University of Cluj-Napoca. He graduated the mathematics programme, which was followed by his PhD studies at the same university (1964-1966; 1967-1968) and at Lund University, Sweden (1966-1967). He got his PhD in Mathematics in 1968 with the thesis "The Dirichlet problem for strong elliptic systems", under the supervision of Professor Emeritus D. V. Ionescu.

1. Research activity

1.1. Creator of Two Important Research Directions

• Picard and Weakly Picard Operators Technique

Ioan A. Rus introduced and developed the theory of Picard and weakly Picard operators, which is now one of the most strong tools of the fixed point theory with several applications to operatorial equations and inclusions.

Definition 1. (I. A. Rus, 1996) Let $(X, \rightarrow)$ be an L-space. Then $f : X \rightarrow X$ is, by definition, a Picard operator if:
(i) $F_f = \{x^*\}$;
(ii) $(f^n(x))_{n \in \mathbb{N}} \rightarrow x^*$ as $n \rightarrow \infty,$ for all $x \in X$.

Definition 2. (I.A. Rus, 1996) Let $(X, \rightarrow)$ be an L-space. Then $f : X \rightarrow X$ is called a weakly Picard operator if the sequence $(f^n(x))_{n \in N}$ converges for all $x \in X$ and the limit (which may depend on x) is a fixed point of f.

The theory of (weakly) Picard operator is very useful to study some properties of the solutions of those equations for which the method of successive approximations works.

• Fixed Point Structures Theory

The concept fixed point structure (1986, 1993) is a generalization of some notions such as: topological space with the fixed point property, metric space with fixed point property w.r.t. contractions, Menger space with the fixed point property w.r.t. probabilistic contractions, Banach space with the fixed point property w.r.t. nonexpansive operators, ordered set with the fixed point property, operator with the fixed point property on family of sets, object with the fixed point property.

The theory offers solutions for the following problem: if we have a fixed point theorem T and an operator f which does not satisfy the conditions of T, in which conditions the operator f has an invariant subset Y, such that $f|_Y$ satisfies the conditions of T.

1.2. Articles and monographs

His research activity is mainly dedicated to ODE, PDE and Fixed Point Theory. He published more than 145 articles and seven monographs in these fields. We mention here some of his most influential monographs:

I. A. Rus, *Metrical Fixed Point Theorems*, Babeş-Bolyai University, 1979, 111 pages;

I. A. Rus, *Principii şi aplicaţii ale teoriei punctului fix [Principles and Applications of Fixed Point Theory]*, Editura Dacia, Cluj-Napoca, 1979, 261 pages;

I. A. Rus, *Generalized Contractions and Applications*, Cluj University Press, Cluj-Napoca, 2001, 198 pages;

I. A. Rus, A. Petruşel and G. Petruşel, *Fixed Point Theory 1950-2000: Romanian Contributions*, House of the Book of Science, Cluj-Napoca, 2002, 308 pages;

I. A. Rus, *Fixed Point Structure Theory*, Cluj University Press, 2006, 216 pages.

1.3. Citations

His books and monographs (13 titles) total over 443 citations. The top three most cited books are:

1. Principii şi aplicaţii ale teoriei punctului fix (1979): 142 citations
2. Generalized Contractions and Applications (2002): 84 citations
3. Generalized Contractions (1983): 65 citations.

The textbooks (7 titles) have got 72 citations, the most cited textbook being: Ecuaţii diferenţiale, Ecuaţii integrale şi Sisteme dinamice [Differential Equations, Integral Equations and Dynamical Systems], Transilvania Press, Cluj-Napoca, 1996, 229 pages, with 33 citations.

The articles authored by Ioan A. Rus (150) have got 743 citations so far. The top three most cited are:

1. Fixed point theorems for multivalued mappings in complete metric spaces, Math. Japonica, 20(1975), 21-24, with 35 citations;
2. Weakly Picard mappings, Comment. Math. Univ. Carolinae, 34, 4(1993), 769-773, with 27 citations;
3. Some fixed point theorems in metric spaces, Rend. Ist. di Mat., Univ. Trieste, 3(1971), fasc.II, 169-172, with 21 citations.

Professor Rus also (co)-authored remarkable publications of general interest (20 titles), with 10 citations. We mention here three of them to illustrate their large ranging topics:

1. Matematica si informatica, trecut, prezent si viitor [Mathematics and Informatics: Past, Present and Future], Editura PROMEDIA-PLUS, Cluj-Napoca, 1998, 195 pag. (with E. Munteanu);
2. Who authored the first integral equation book in the world ?, Seminar on Fixed Point Theory, 1 (2000), 81-86;
3. Petre Sergescu (1893-1954). Mathematicien roumain et promoteur de

l'histoire des sciences, Dictionnaire des relations franco-roumaines, 2003.

By summing up all citations, we find a total number of 1268 citations, distributed as follows:

1. Articles: 743
2. Monographs: 443
3. Textbooks: 72
4. Other publications: 10.

1.4. Research seminars

Professor Ioan A. Rus was and is still a very energetic organizer of research seminars. He founded and coordinated the activity of the following ones:

1. Seminar on Fixed Point Theory (founded 1969; weekly);
2. Basic Mathematics (1980-1988; weekly);
3. Seminar on Applied Mathematics (founded 1998; monthly).

Starting with 1990, his activity of coordinating research seminars has been organized in conjunction with his activity as PhD Superviser. In this capacity he directed so far 21 doctors in mathematics: V. Berinde, A. Petruşel, V. Mureşan, G. Dezso, A. Bege, F. Aldea, M. Şerban, A. Buică, S. Mureşan, A. Sîntămărian, A. Muntean, C. Chifu, K. Baranyai, E. Miklos, Sz. Andras, A. Bica, C. Bacoţiu, V. Dârzu-Ilea, A. Tarţa, I. Olaru, R. Gabor.

2. Didactical activity

2.1. Positions held

Professor Rus has been teaching at a single university, "Babeş-Bolyai" University of Cluj-Napoca, since 1960. Chronologically, the positions held are: Teaching Assistant (1960-1967); Assistant Professor (1967-1972); Associate Professor (1972-1977) and Full Professor (1977-present). He taught the following courses, at undergraduate, graduate or postgraduate level:

A. Basic course: Differential equations and dynamical systems;

B. Special courses: Qualitative theory of differential equations; Fixed point theory; Nonlinear operators; Fixed point structures; Picard operators; Metrical fixed point theory; Mathematical modelling; Biomathematics; The methodology of scientific research in mathematics and informatics.

2.2. Textbooks

He published seven textbooks, directly related to the courses he have taught. We mention four of them:

I. A. Rus and P. Pavel, *Ecuaţii diferenţiale şi integrale [Differential Equations, Integral Equations]*, Babes-Bolyai University, 1973, 228 pages,

I. A. Rus and P. Pavel, *Ecuaţii diferenţiale şi integrale [Differential Equations, Integral Equations]*, Editura Didactica si Pedagogica, Bucuresti, 1975, 223 pages

I. A. Rus and P. Pavel, *Ecuaţii diferenţiale [Differential Equations]*, Editura Didactica si Pedagogica, Bucuresti, 1982, 139 pages

I. A. Rus, *Ecuaţii diferenţiale, ecuaţii integrale şi sisteme dinamice [Differential Equations, Integral Equations and Dynamical Systems]*, Transilvania Press, Cluj-Napoca, 1996, 229 pages.

3. Editorial activity

Professor Rus was Editor of Seminar on Fixed Point Theory (yearly, 1981-1999) and Studia Univ. Babeş-Bolyai, Mathematica (2000-2003), and is also founder and editor of the journal *Fixed Point Theory - An International Journal on Fixed Point Theory, Applications and Computation* (since 2000), the first international journal entirely dedicated to fixed point theory, applications and computation.

He is a member of the Editorial Boards of the following journals:
1. Mathematica (Cluj);
2. Studia Univ. Babes-Bolyai, Mathematica;
3. Carpathian J. Mathematics;
4. Gazette des Mathematiciens (Paris);
5. Pure Mathematics Manuscripts (Calcutta);
6. The Global J. Math. & Math. Sciences;
7. Scientiae Mathematicae Japonicae;
8. Notices from the ISMS.

He is a reviewer of the American Mathematical Society (Mathematical Reviews) and European Mathematical Society (Zentralblatt für Mathematik) and Consulting Editor of the Contemporary Who's Who.

4. Administration activity

The administration positions held by Professor Rus during his academic career are:

1973-1976: vice-dean, Faculty of Mathematics

1976-1984: vice-rector, Babeş-Bolyai University

1985-2002: head, Chair of Differential Equations

1992-1996: vice-rector, Babeş-Bolyai University

1998-2002: head, Department of Applied Mathematics.

He was also Director of the Research Center Nonlinear Operators and Differential Equations (accredited in 2001). He served for many years (1992-2006) as a Member of the Mathematics Commission of the National Council for Titles, Diplomas and University Certificates.

5. Other activities

He is a member of the following professional societies:

1. Romanian Mathematical Society (since 1956);

2. American Mathematical Society (since 1971);

3. European Mathematical Society (since 2003);

4. Japanese Assoc. Math. Sciences (1995-2005);

5. Societe Mathematiques de France (1998-2000);

6. Societe de Mathematiques Appliquees et Industrielle (1999-2000);

7. International Federation of Nonlinear Analysts (1995-1997);

8. Council of ISMS (since 2005).

Professor Ioan A. Rus was the chair of two editions of the International Conference on Nonlinear Operators, Differential Equations and Applications:

ICNODEA-2001

- sponsored by the Alexander von Humboldt Foundation

- more than 90 participants from 15 countries.

ICNODEA-2004

- almost 200 participants from 30 countries.

6. Honours, Awards

He was awarded Ordinul "Meritul Ştiinţific" clasa a III-a (Award of the Romanian President nr. 280 (1979)), Profesor universitar evidenţiat (Ordinul nr. 5641 din 15 iunie 1985); Centennial Silver Medal-Centenary of "Gazeta Matematică" (1995).

He was elected as Doctor Honoris Causa (Honorary Doctor) of North University of Baia-Mare (23.09.2004) and of Technical University of Cluj-Napoca (13.06.2005).

7. Selected Bibliography

(1) I.A. Rus, *Principii şi aplicaţii ale teoriei punctului fix [Principles and Applications of Fixed Point Theory]*, Ed. Dacia, Cluj-Napoca, 1979.

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(4) I.A. Rus, *Maximum principles for elliptic systems*, in Optimization, Optimal Control and Partial Differential Equations (Eds. V. Barbu, J. F. Bonnans, D. Tiba), Birkhäuser, Basel, 1992, 37-45.

(5) I.A. Rus, *Ecuaţii diferenţiale, ecuaţii integrale şi sisteme dinamice [Differential Equations, Integral Equations and Dynamical Systems]*, Transilvania Press, Cluj-Napoca, 1996.

(6) I.A. Rus, *Generalized Contractions and Applications*, Cluj University Press, Cluj-Napoca, 2001.

(7) I.A. Rus, A. Petruşel, G. Petruşel, *Fixed Point Theory 1950-2000: Romanian Contributions*, House of the Book of Science, Cluj-Napoca, 2002.

(8) I.A. Rus, *Picard operators and applications*, Scientiae Math. Japonicae, **58**(2003), 191-219.

(9) I.A. Rus, *Strict fixed point theory*, Fixed Point Theory, **4**(2003), 177-183.

(10) I.A. Rus, *Fixed Point Structures Theory*, Cluj University Press, Cluj-Napoca, 2006.

(11) I.A. Rus, *Set-theoretic aspects of fixed point theory of multivalued operators: open problems*, Notices from the ISMS, September 2005, 1-6.