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Prof. C.V. Negoita, Founding Editor of Fuzzy Sets and Systems together with L.A. Zadeh and H.J. Zimmermann, is 80 years young!

1. Negoita was one of the Founding Editors of Fuzzy Sets and Systems

This February 2016 marks the 80th birthday of Prof. C.V. Negoita, who was a Founding Editor of *Fuzzy Sets and Systems* (*FSS*) together with L.A. Zadeh and H.J. Zimmermann (Principal Editor). Their initial pioneering effort has so successfully been continued to the present by the acting Co-Editors-in-Chief, B. De Baets, D. Dubois and E. Hüllermeier. Prof. Negoita served as an Editor of FSS for over 15 years.

Negoita has been a Professor Emeritus since 2009 in the Department of Computer Science at the Hunter College of City University of New York (CUNY) where he was a Professor from 1982 to 2009. Prior to that, he was the Head of the Research Lab for Models for Management Information Systems of the Institute for Management and Computer Science (ICI) in Bucharest, Romania between 1972 and 1982. During 1971–1981 he was also an Associate Professor in System Theory and Cybernetics at the Academy of Economic Studies in Bucharest.

He was one of the main organizers of the Third World Congress of Cybernetics and Systems in Bucharest in 1975, together with the late J. Rose and many others. One early evening, after the congress sessions, he led a gathering of great minds (H.J. Zimmerman, S. Klaczko, D. Ralescu and many others) in a small seminar room of the Academy of

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Economic Studies in Bucharest, where he was teaching. The topic was the creation of a journal devoted to fuzzy sets and systems. Negoita wrote the story of that historic meeting, intertwined with his own life, in his later 2000 novel, *Fuzzy Sets* in the Chapter "The Journal of Fuzzy sets and Systems" [1].

It was 10 years after L.A. Zadeh began his pioneering work in 1965. That was the right moment to think of the first journal dedicated to fuzzy sets and systems. But *FSS* was not born in one evening, not even in one year, it took two years of work till 1977 to be ready for the launch in 1978 at North-Holland, today Elsevier. Negoita was part of this effort during all this period and over 15 years after the launch but no doubt, it was H.J. Zimmermann, the Principal Editor, who led the effort for *FSS* to really take off.

2. Co-author of one of the first textbooks on fuzzy sets applications to fuzzy system analysis

Negoita co-authored with Dan Ralescu one of the first textbooks on fuzzy sets applications to fuzzy system analysis in 1974 (in Romanian), in 1975 (in English, worldwide) [2] and in 1978 (with K. Asai in Japanese) [3]. The book presented in a comprehensive yet quintessential and self-contained manner all the main fundamental results at that moment, with an emphasis on applications to fuzzy systems. It featured among other topics, the fundamental Representation Theorem for Fuzzy Concepts, including fuzzy systems, of Negoita and Ralescu.

The book became quickly a reference source in the new field pioneered by Zadeh and his followers, allowing many to learn in one book the essence of 10 years of innovation and paradigm shift in logic and set theory. The book reflected clearly the potential for fuzzy sets applications to system theory, automata theory and formal languages, linear programming and optimization, optimal control, clustering and approximate reasoning.

3. Author of the first book on fuzzy system applications to expert systems in artificial intelligence

In 1985, Negoita authored the first book on applications of fuzzy sets to artificial intelligence: "Expert Systems and Fuzzy Systems" [4], dedicated to "Lotfi Zadeh, the pioneer". This book helped to pave the way for the official entrance of fuzzy set theory through the main door of artificial intelligence. It presents in an elegant, Goguen-style category theoretic language the fuzzy rule-based systems and their use in approximate reasoning and knowledge engineering, initiated by Zadeh. The central idea is that knowledge diagrams with concepts can be modeled as fuzzy systems. It was probably this book as well as Negoita's original papers from this period which led the IEEE to award him in 1985 the "IEEE Award for New Technical Concepts".

4. Other innovative work in fuzzy system theory and its application to computer science and human system management

One of the most fundamental results in the geometric control theory of linear systems is the Internal Model Principle (IMP) launched by Wonham and Francis [5]. In the mid-70s, Wonham became the central name in linear system control theory due to his intuitive geometric approach. The Internal Model Principle states that the controller of a system (plant) must include a suitably duplicated internal model of the disturbances and references that make up the environment (exosystem) of the plant in order to achieve a structurally stable control (regulation) of the plant.

In 1977, Negoita and Kelemen looked into how this principle can be generalized for fuzzy system control to obtain a Fuzzy Internal Model Principle [6]. In his renowned 1979 book on geometric linear system control theory, Wonham mentioned this "interesting connection with fuzzy system theory" [5] as a "progress in extending IMP to nonlinear systems". Of course, system control theory and fuzzy systems evolved significantly since the late 70s and according to different pathways. However, in those years, it was very rare to have fuzzy sets and systems, the "controversial" new field, to be acknowledged and recognized by the leaders of the established deterministic system theory and classical mathematics.

In the 80s, Negoita became interested in applications of system theory to computer science and particularly to knowledge engineering and artificial intelligence. He realized that while feedback is the main concept for the sequential structure of system control theory, in parallel processing and in knowledge engineering, a new process was needed to describe the synthesis and aggregation of multiple evaluations and interpretations of concepts. As opposed to the linear sequential structure of control theory, knowledge engineering required a multi-faceted, multi-dimensional process to describe knowledge synthesis using fuzzy concepts: Pullback [4].

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