

ANDREI ȚUGULEA

1928–2017



The Romanian electrical engineering community is deeply saddened by the death of our colleague, mentor, and friend, academician professor emeritus Andrei Țugulea, co-founder and the Editor in Chief of the *Revue Roumaine des Sciences Techniques – Série Électrotechnique et Énergétique*. Andrei Țugulea died on December 14th, 2017. He was 89 years old.

Andrei Țugulea was born on August 19, 1928 at Unțești, Republic of Moldova. In 1938, he starts the secondary school at the National College of Iași continuing at Alexandru Lahovary College in Râmnicu Vâlcea from which he graduates in 1946, town in which he refuges with his family in 1944 running away from Soviet troops. He followed the superior classes at Electrotechnics Faculty (now Electrical Engineering Faculty) from University Politehnica of Bucharest, which he graduated in 1952. In 1958, under the supervision of professor Remus Răduleț, he obtains the PhD in engineering domain with the thesis entitled “Symmetrical fields computation through permeance framing”, which prefigures the finite element method, by applying direct variation methods to compute the Laplacian fields. In 1974 he is awarded the Doctor Docent title. Between 1957 and 1968 he was been successively employed as: teaching assistant, lecturer, associate professor and professor, in 1972 being appointed head of Electrotechnics Department from Electrotechnics Faculty from UPB and between 1976 and he was the dean of this faculty.

Between 1990 and 1991 he was Deputy Minister, respectively Secretary of State and Head of the Science Department from the Education and Science Ministry and member of the Romanian Government. From 1992 till 1996, he was Senator, Member of the Education and Science Senate Commission.

In 1995 he was appointed Head of the Department of Foreign Languages from UPB (now The Faculty of Engineering in Foreign Languages), where teaching is done in international languages (English, French and German).

He participated in the elaboration of the Romanian Technical Lexicon, 2nd edition, 19 volumes, as a Coordinator Editor of the Electrotechnics domain. This monumental work, developed under Professor Răduleț’s supervision, by a team of valuable specialists, is part of other works of the

same nature developed by countries with great tradition in this field.

He was Editorial Secretary of the *Electrotechnics Magazine* and Chief Editor at “*Revue Roumaine de Sciences Techniques*”, “*Électrotechnique et Énergétique*” series. Through the work of valuable specialists, these journals resisted all difficulties and developed, gaining a well-deserved international recognition.

He was a researcher at the Institute of Energetics of the Romanian Academy (1951–1953; 1960–1968), having particularly fertile periods in terms of scientific creation.

In 1991 he obtained the title of Correspondent Member and in 1999 the title of Titular Member of the Romanian Academy. Between 1999 and 2002 he occupied the position of General Secretary of Romanian Academy.

During his career, he guided more than 50 generations of students who keep him a warm memory and show, whenever the occasion, the gratitude for this reputed professor. By combining the exemplary rigour with a great teaching talent, one can say that Professor Țugulea’s lectures have always been a model.

He has taught courses on Basics of Electrical Engineering (Electrotechnics), Introduction in Electrical Engineering, but also on Physics, Thermodynamics and Physics, Electromagnetic Field Analysis and Modelling (the last two in French, at The Faculty of Engineering in Foreign Languages), computation methods for electromagnetic fields, and many others, proof of a vast scientific culture and exemplary spiritual opening. In all courses taught, there was the perfect rigour of the Electrotechnics school formed around Professor Răduleț, as well as the constant preoccupation of revealing the connections of matter with others in the field, all dressed in a “coat” of perfect elegance.

As a PhD supervisor, he guided dozens of PhD students who are nowadays researchers of great value spread around the world and who further transmit to the world the spirit of the school which formed them.

In the spirit of the Electrotechnics Department, imprinted by Professor Răduleț, Professor Andrei Țugulea’s researches focused mainly on electromagnetic field theory, but they were not limited to this topic. It is worth noticing the “broad spectrum” of Professor Țugulea’s concerns, with

fundamental contributions to other fields of science and to electrical engineering.

Among the areas addressed and the results obtained, we mention:

- Quasi-stationary electromagnetic fields in conducting media with applications for electromagnetic shielding and for electromagnetic field penetration in ferromagnetic bodies with ferromagnetic laminated structures (together with Professor. R. Răduleț and Alexandru Timotin). These studies are the result of a fruitful collaboration with Electricité de France (EDF). The cooperation with Electricité de France represented an excellent opportunity to capitalize on the scientific potential of the Electrotechnics Department from UPB.

- Within this collaboration, there have been elaborated methods and programs to compute the magnetic field, the eddy current losses and the associated phenomena in the front part of the large synchronous turbo-alternators from the nuclear power plants. The results have been capitalized both in France and in Romania. To these researches participated also other members of the Electrotechnics Department among which an important contribution was given by professors Alexandru Timotin, Andrei Țugulea and Augustin Moraru.

- The study of the transient over-voltage transmission in the electrical transformers windings (in cooperation with EDF). In this research, theoretical models for the quasi-stationary electromagnetic field in the electrical transformers and computer programs to simulate the functioning states of complex electric networks with nonlinear elements. The results of these researches have been applied both in the country and in France.

- The study of ferroresonance phenomena in electrical networks (in cooperation with EDF).

- The introduction of the transient parameters and of the circuit theory with such parameters (together with Academician Prof. R. Răduleț and Alexandru Timotin). The works were awarded with the “Traian Vuia” prize. In this way, a new field of research has been opened, in which the circuit theory with electromagnetic field effect elements is well-established and therefore, the concept of “circuit electromagnetic element” concept could be defined. This represents a bridge between the electric circuit theory and the electromagnetic field theory. The applications of this theory are numerous and they are constantly developing.

- The electromagnetic field and the propagation equations with transient parameters for electric lines with losses.

- Establish the two-dimensional equations of microwave in planar structures (together with Acad. Prof. R. Răduleț).

- The general theory of power circulation in non-sinusoidal and distorted states of the electrical networks. In a series of papers published or presented at international level, there is

elaborated a general theory of power circulation in an electrical network, based on the general power conservation theorem and by separating from the total power (active or reactive), the useful power (from the fundamental harmonics) and the distorted residue (the sum from the high order harmonics). In this way, the concepts are well-defined and they create the premises of big importance practical applications.

- The generalization of the circuit distorted phenomena (theory of Acad. C. Budeanu) to the electromagnetic field and to the almost periodic time variations.

- The application of the thermodynamics of irreversible processes in the study of the transport phenomena in semiconductor materials. The material laws are presented from the point of view of thermodynamics of irreversible processes. So, it is inferred the existence of material laws, some of which have not yet been highlighted.

- Developing a general theory of the quality of physical and technical processes.

He received the following awards and prizes:

- Member of the National Science and Art Foundation,
- The National Order for Merit in the rank of High Officer,

- „Traian Vuia” prize – mentioned above,

- The Gold Medal at the EUREKA International Exhibition Salon, Bruxelles, 2006 with Mircea Ignat and Ioan Puflea.

Electrotechnics Department of the University “Politehnica” of Bucharest, deeply appreciates the exceptional merit of the academicians Remus Răduleț, Alexandru Timotin and Andrei Țugulea in developing postgraduates studies at the level of doctoral thesis, restructuring the 5-year electrical, electronic, power engineering undergraduate studies by introducing a more systematic presentation of the electric and magnetic phenomena in the form of rigorous and well-formulated theorems and laws. Numerous personalities were formed during almost 90 years in this Romanian Electrotechnical School.

The scientific, pedagogical, cultural and social activities of Professor Andrei Țugulea were impressive, offering and example of honesty, balance and sustained work, and, above all, professional competence. During the long time from the establishment of the Romanian Electrotechnics School until today, highly professional researchers and professors have been trained, as well as other researchers from abroad to solve more difficult problems in the electric or magnetic field area. There have been researchers who have obtained for their achievements prizes and decorations, including titles of correspondent member of the Romanian Academy. They continue to be a pride of the country, and for the present and future generations, examples that are worthwhile to follow.

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