# PROFESSOR DAN PETROVANU – MATHEMATICIAN AND MAN OF CULTURE – SEEN THROUGH THE EYES OF A FORMER STUDENT

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A discrete recall, 35 years after his too early passing away, on the complex personality of the reputed mathematician and eminescologist, Dan Petrovanu, professor at the Faculty of Mathematics, "Alexandru Ioan Cuza" University of Iași, seen through the eyes of one of his many students, professor Teodor Havârneanu.

It is said that an image is worth a thousand words. Still, we had the determination to build in 3,400 words the puzzle image evocating a great man, who should remain in the collective memory as a remarkable personality.

*Keywords:* partial differential equations, functional equations, periodic solutions, stability, eminescology

Along his whole life (January 20, 1930 – February 11, 1988), spent in the so special world represented by the city of Iaşi, Professor Dan Petrovanu lived with nobility, distinction, and erudition, as a worthy successor of a family of intellectuals who gave prestigious names to the Romanian sciences and education system.

His father, Gheorghe Petrovanu, was a doctor who ran a private office (a fact considered by the regime of the time as a stigma, so the young Dan Petrovanu was categorized as ... "citizen with unhealthy origins"). His brother, Constantin

Petrovanu (May 1, 1917, Iași – December 26, 1992, Iași), was a professor at the Institute of Medicine and Pharmacy in Iași and consultant physician in the Clinic of Radiology and Oncology at the "Saint Spiridon" Hospital, who published almost 200 scientific works related to radiodiagnosis, conventional radiotherapy, and cobalt therapy.

The younger Dan Petrovanu made a real periplus throughout the country: first, he attended the primary school in Cernăuți (1937–1941), then a gymnasium in Iași, at the Secondary School for Boys No. 1 (the current



National College). He continued his studies during his refuge (1944–1945) caused by the war at Câmpulung Muscel. Once returned to Iași, he continued at the National High School (the same National College of today), until his graduation in 1948.



He completed his studies at the Faculty of Mathematics (at that time entitled Faculty of Mathematical and Physical Sciences) of the "Alexandru Ioan Cuza" University of Iași and graduated in 1953. He distinguished himself as a complex personality, a brilliant student, a polyglot (he fluently spoke French, English, German, Russian, and Italian), a pianist, a passionate music lover, a chess enthusiast (national champion), and a great writer. As a student, he was considered brilliant by his colleague, acad. Radu Miron, the well-known geometer. Furthermore, he was highly appreciated by all his generational colleagues, among whom we list: professor Constantin Borş, reputed member of the Iaşi school of mechanics; professor Constantin Corduneanu, one of the top mathematicians from Iaşi, pioneer in the field of integral equations; professor Dan Papuc, well-known geometer of the West University from Timişoara; senior researcher Petru Caraman, at the "Octav Mayer" Institute of Mathematics, of the Romanian Academy, Iaşi Branch, a specialist in complex functions.

In the above photo, we distinguish acad. Octav Mayer, together with colleagues from the generation of Dan Petrovanu: E. Goldhagen, P. Caraman, Fraga Ciocârdia (married Caraman), D. Archer, G. Vraciu, Lidia Reinhorn, D. Papuc, E.I. Enescu, I. Brucher.

Dan Petrovanu was also highly appreciated by the numerous renowned mathematicians who were his teachers and even mentors, such as acad. Mendel Haimovici, one of the founding members of the Iaşi school of mechanics; acad.

Octav Mayer, the creator of centro-affine differential geometry; acad. Alexandru Myller, founder of the Iaşi school of mathematics. About acad. Octav Mayer, to whom he always paid great respect, Dan Petrovanu used to say that "he is a specialist in everything, but is good at geometry like no one else" and that "when Mayer enters, you feel that he fills space around him."

His wife, Mrs. Ortansa Petrovanu (Jan. 30, 1931, Iași – Dec. 15, 1985, Iași), professor at the Faculty of Chemistry of the "Alexandru Ioan Cuza" University, was trained at the organic chemistry school of the illustrious professor C. V. Gheorghiu (1894-1956). She carried out a tremendous didactic and scientific activity, elaborating original papers published in both Romanian and foreign scientific journals.

Together, they had a son named Fabius, a young man who inherited from his father discretion, modesty and refinement, and from his mother delicacy, sentimentality, and an interest in chemistry. Professor Mirela Ștefănescu remembers with admiration how Dan Petrovanu spent an entire summer discovering plants from Moldova for his son's herbarium.



Dan Petrovanu rose in the academic hierarchy, becoming professor at the Faculty of Mathematics and Mechanics (the current Faculty of Mathematics) after he defended his doctoral thesis in 1963 (scientific advisor - acad. Mendel Haimovici).

The prodigious teaching career recommends Dan Petrovanu as a professor loved by students for the professionalism with which he approached teaching of his courses (Differential Equations, Partial Derivative Equations, and Topological Degree) at the Faculty of Mathematics-Mechanics and Physics.

As a student, I attended his Partial Differential Equation and Topological Degree courses. I was impressed by their consistency, the rigor of their demonstrations, and the way that all details were explained so that any student could fully understand the content of the lecture without the need of consulting other additional bibliographic sources. Endowed with an extraordinary pedagogic tact and a native sense of didactic communication, professor Dan Petrovanu managed to make accessible the scientific content of these lectures, known as among the thorniest of the Faculty of Mathematics, because they involve difficulties both in the way of teaching and in the evaluation of the teacher, as well as in the comprehension and assimilation process from the part of the student.

Dan Petrovanu was spending most of his time in his office. Initially, he had the bureau next to that of professor Florica T. Câmpan, known for her works on the History of Mathematics, and that of professor Constantin Corduneanu, the appreciation of whom he thoroughly enjoyed. Later, he had as

cabinet colleague professor Mirela Ștefănescu with whom he shared his passion for mathematics and literature, and professor Gheorghe Moroșanu, with whom he had fruitful scientific collaborations.



During the rare times when he interrupted his work, Dan Petrovanu used to take short walks to enjoy nature – he loved the roses from the Copou Park or from the Botanical Garden, adored coffee, about which he said: "coffee... produces intelligence", and he was subdued by smoking, which eventually caused his untimely end. He was often a remarkable presence in Copou Park in the evening, his head uncovered, regardless of weather. As a passionate mountaineer, he used to go hiking in the mountains of Moldova, especially in the Ceahlău Massif, together with his colleagues and friends, professors Petru Caraman and Radu Anton.

Since his student years, the erudite Dan Petrovanu regularly attended theater and concert halls. A sociable and very communicative man of culture, he loved discussions on various subjects of mathematics, art, literature, and philosophy, in which he showed particular interest, regardless of his field of expertise. Eager to know about everything, and having an encyclopedic spirit, he showed a rare intellectual refinement. He assumed precious, erudite personal ideas and informed, original opinions. Everything he did came out of passion, and he was totally involved in each step he took. He was not arrogant, he was uncompromising, and he always recognized real value.

From the very beginning of his university career, the "Alexandru Miller" Mathematical Seminar, officially the library of the Faculty of Mathematics in Iaşi, became a center for refined discussions on various interesting topics. Around the years 1970–1980, Dan Petrovanu often continued the discussions from the Mathematical Seminar at Casa Universitarilor, where he had lunch with professor Mirela Ştefănescu, philologist Neculai Alexandru Ursu, the literary critic Nicolae Barbu, the economics professor Augustin Tătaru, the pharmacology professor Sava Dumitrescu, biologist Paul Borcea or the piano player Adriana Bera. Professor Mirela Ştefănescu remembers that Dan Petrovanu had the vocation of friendship, with his brilliant mind and encyclopedic spirit, being recognized as the soul of the Iaşi group of all those passionate about literature, in general, about each newly published book.

In her article entitled "An Eminescologist Mathematician", professor Mirela Ştefănescu recalls the moment when, in the spring of 1978, she discovered, in a volume of translations made by Gheorghe Asachi, edited by their mutual friend N. A. Ursu, a poem written by Moshos from Syracuse. She has discovered similarities between it and the verses found in the Eminescian manuscripts, which Perpessicius considered the precursors of lyrics from the *Pajul Cupidon* poem. Professor Dan

Petrovanu was very impressed by this idea and suggested to professor Mirela Stefanescu to publish another article on this topic, in the prestigious "Literary Conversations" magazine. This discovery was the spark that ignited Dan Petrovanu's passion for eminescology. There followed a series of three articles published together, under the pseudonym E. T. Dinescu, formed by the letters of the names of the two authors, mutually agreed upon. From 1980 on, Dan Petrovanu published two articles as single author, also under a pseudonym, after which he gave it up, taking full responsibility for his own ideas, signing eminescology researches in his own name. In these studies, his profound research spirit was fully manifested, proving that he is a skilled historiographer specialized in Eminescu's famous manuscripts and a talented literary critic who made astonishing discoveries on the Eminescian universe of sensibility, thought, and culture. Approached by vocation to the spirit of Eminescu, as a complex intellectual of unique sensitivity, experience, and spirit, he became fascinated in deciphering the philosophy behind the great poet's verses. Dan Petrovanu dedicated the last ten years of his life to a thorough study of the connections between Eminescu's work and literature, German philosophy, art, and science of his time.

In the opinion of the research historiographer, Ştefan Gorovei, expressed in the article "A Scholar", the attributes of the writing of eminescologist Dan Petrovanu are rigor, sometimes radiographic and harsh, impeccable logic, quick reasoning, concise – sometimes too concise – expression, and sense of humor.

Reading some of his articles, you cannot help but admire his clear, natural writing, but at the same time very technical<sup>1</sup>, well-argued by the lucidity of a mathematician, and documented with examples (which he called "coverings") taken over from articles, books<sup>2</sup> or manuscripts and discussed from multiple perspectives: logical<sup>3</sup>, philological, historical<sup>4</sup>, philosophical.

<sup>&</sup>lt;sup>1</sup> "[...] we notice that they are in trochaic rhythm, without rhyme, with 8 feet in the odd verses and 7 feet in the even verses, a «metrical pattern» that occurs, without exception, in all Geibelian or Heysee translations of Romancero." (Dan Petrovanu. Eminescu and Geibel: from Romanze vom Elfenbrunnen to Făt Frumos din tei. Journal of history and literary theory, year XXXIII, January-March 1985, no.1, pp. 58–60.)

<sup>&</sup>lt;sup>2</sup> A quote from Ion Slavici:" [...] His (Eminescu, n. n.) idea of predilection was that everything that has life is excessive heat, which led him to the conviction that, without differential mathematics, we cannot penetrate the true nature of things. [...]". (Dan Petrovanu, Renata Möhlenkamp. Eminescu and Adolf Fick. Eminescu manuscripts of physiography. Review of literary history and theory, year XXXIII, 1985, no. 2, pp. 76–81.)

<sup>&</sup>lt;sup>3</sup> "[...] the Eleatic principle formulated by Parmenides [...]: only what exists can be thought and, consequently, by thinking a thing, it necessarily acquires existence, because non-existence cannot be thought." (Dan Petrovanu. Eminescu and Geibel: from Romanze vom Elfenbrunnen to Făt Frumos din tei. Journal of history and literary theory, year XXXIII, January-March 1985, no.1, pp. 58–60.)

<sup>&</sup>lt;sup>4</sup> "[...] I tried to find the «German original» sought among the Spanish romances translated by E. Geibel-which led to the partial result of the above identification" (*ibidem*)

His literary discourse impresses by the fluency of ideas, its profound internal logic, and thoroughness of a historiographer who searches for and presents hypotheses related to a particular subject connected to the theme analyzed impartially by him. Each article is a testimony of his high cultural level, evidenced through the structure of the phrase, through the semantics of words, through the quotations provided in different languages, including Latin<sup>5</sup>, which semiotically enrich the text, but also through the properly structured figures of style<sup>6-9</sup>, meant at adding meaning for avoiding difficult reading.

The passion for Eminescology was as intense as that for mathematics, without diminishing the quality of either. As a teacher, he actively participated in the Scientific Seminar on Differential and Integral Equations, led first by professor Constantin Corduneanu and then by professor Nicolae Luca.

The library established in 1910 by acad. Alexandru Myller from his own contribution and also from state funds, known as the "Alexandru Myller" Mathematical Seminar, developed over time a valuable mathematical book collection, in which the Scientific Annals of the "Alexandru Ioan Cuza" University of Iaşi, Mathematics Section represented a scientific landmark (the journal originates from the Annales Scientifiques de l'Université de Jassy, founded in 1900 and issued since 1964 in one volume, two issues per year, its abstracts being published in the prestigious Mathematical Reviews and Zentralblatt für Mathematik).

The "Alexandru Myller" Mathematical Seminar represented an essential center of attraction for young mathematicians because it was here that they could be trained at the first Romanian school of mathematics. Dan Petrovanu recalled that the

<sup>&</sup>lt;sup>5</sup> "I hasten to add an «explanation» of the «post hoc ergo propter hoc»" type. (Dan Petrovanu, Renata Möhlenkamp. Eminescu and Adolf Fick. Eminescu manuscripts of physiography. Review of literary history and theory, year XXXIII, 1985, no. 2, pp. 76–81.)

<sup>&</sup>lt;sup>6</sup> Metaphor: "The immensely ironic tone, of vitriolic acidity practiced by the poet in addressing the «literary thefts», the «unconfessed imitations» with the «localization of the characters' names» spares us from comments; [...]." (Dan Petrovanu. Eminescu and Geibel: from Romanze vom Elfenbrunnen to Făt Frumos din tei. Journal of history and literary theory, year XXXIII, January-March 1985, no.1, pp. 58–60.)

<sup>&</sup>lt;sup>7</sup> Analogy: "Eminescu [...] did not convert Austrian coins into Romanian lei", suggests that he was not a plagiarist. (Dan Petrovanu, Renata Möhlenkamp. Eminescu and Adolf Fick, Eminescu's physiography manuscripts. Review of history and literary theory, year XXXIII, 1985, no. 2, pp. 76–81.)

<sup>&</sup>lt;sup>8</sup> Inversion: "Did Eminescu think that he was processing (creatively) an anonymous poem from Romancero, which was actually Geibel's?" (Dan Petrovanu. Eminescu and Geibel: from Romanze vom Elfenbrunnen to Făt Frumos din tei. Revista de historie y teorie literarra, year XXXIII, January-March 1985, no. 1, pp. 58–60.)

<sup>&</sup>lt;sup>9</sup> Rhetorical question: "Could the scenario of the poem Romanze vom Elfenbrunnen be mimicked (in detail) after a (possible, known) popular source?" (*ibidem*)

Mathematical Seminar came to life through the activity of the teachers who continuously attended it. Even acad. Alexandru Myller, although advanced in age, used to drop by the Seminary every day and, out of respect and appreciation, his former students, now young teachers, took turns to keep company with the magister who suggested and urged them to read treatises and trendy, cutting-edge books.

The academic activity of Dan Petrovanu included a consistent research component, embodied in a series of articles published in prestigious magazines from the USA, Italy, and Romania, and also in his scientific correspondence with reputed mathematicians from the USA, Finland, and Romania. His scientific contribution, although carried out only for thirty years and interrupted by his premature death, was recognized in the field of partial derivative equations and in that of functional equations, as well as his doctoral thesis, entitled "Qualitative study of the differential constraints for a completely integrable mechanical system. Asymptotic behavior and stability of solutions for completely integrable Pfaff general systems".

Professor Dan Petrovanu's scientific career is structured into three stages. The first refers to the study of Pfaff systems, in which he obtained results on the existence, behavior, and extension of their solutions. Also, during this period he performed studies devoted to an integral equation class.

The second stage is dedicated to the study of periodic solutions for various classes of partial differential equations. Notably, in this stage, he obtained valuable results that attracted the unique appreciation of renowned mathematicians, such as Lamberto Cesari, Constantin Corduneanu, Socio G. Sansone, and Gérard Hecquet. Also, during this period, he was a visiting professor (1969) at Michigan University (USA) invited by the mathematician L. Cesary.

Finally, in the third stage of his scientific career, professor Dan Petrovanu approached studies of classes of elliptic, parabolic, and hyperbolic functional equations, obtaining, in collaboration with professor Gheorghe Moroșanu, a series of valuable results regarding the existence, uniqueness, and regularity of the solutions of these equations.

The problems studied and results obtained by Dan Petrovanu cover a wide area in the sphere of partial differential equations. In his doctoral thesis, he presented results on the extension and asymptotic behavior of the solutions of fully integrable Pfaff systems. He then established significant results for integral and discrete Hammerstein equations, among which special mention should be made of the existence of periodic solutions for certain classes of hyperbolic partial differential equations, especially for Tricomi's problem. We also recall the results of holomorphic solutions at a singular point for linear total differential systems. Finally, we particularly note the results obtained in collaboration with professor Gheorghe Moroșanu regarding the existence, uniqueness, regularity, and asymptotic behavior of the solutions of a class of parabolic partial differential equations with monotone nonlinear boundary conditions and the existence, uniqueness, and regularity of the solutions of hyperbolic partial derivatives systems of equations with nonlinear boundary conditions.

Dan Petrovanu was a man loved by his friends and by providence because "in the morning of the day whose end he could not see, any more, fully conscious of the diagnosis of his illness, he continued to talk calmly with his friends, parted with them cheerfully and joked, then, after an hour and a half, he parted with life. Last reading: *Memories from the House of the Dead*." (Stefan Gorovei)

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