

D.V. IONESCU - A ROMANIAN FORERUNNER OF MODERN NUMERICAL ANALYSIS

G. MICULA

The scientist and scholar, Professor Dumitru Victor Ionescu—one of the founders of mathematical education in Romania and one of the pillars of modern numerical analysis—is the creator of a significant mathematical work, which spans almost seven decades.

To reminisce the personality of the scholar D.V. Ionescu involves an inroad into a life history dedicated to science and the academe. This is not an easy task, but one full of responsibilities and emotional echoes for me.

It is not easy to speak about a person you were close to, a person you met in varied aspects of personal life, in and out of the academic world, while keeping an objective tone, especially if that person was your mentor and a dear spiritual parent.

Which of the multiple aspects of his personality has had a deeper impact on you, and on all his acquaintances? How can you speak about his all-encompassing personality, about the humanism of a humanist par excellence, while avoiding the trap of easy encomiums that are so tempting when speaking about a person who is no longer here?

On the 20th of January 1985 Professor D.V. Ionescu passed away. He had been a man whose whole life has been a steady building up of people's souls and consciousness, whose life disappears in time, leaving behind only a shining mirror reflecting the sky, the sky of his life – mathematics.

Throughout his lifetime he was fascinated by the sacred mission of guiding people who aspired to perfection. He wanted to help people discover in him and all around himself, oases of kindness, beauty and gentleness. He wanted to welcome his fellow beings and his disciples with the tokens of his humane understanding.

The whole mathematical world was devastated by the news of his death, not only because he was so famous and so popular, but because his mathematical work is everlasting. Because his love of science, which he engrafted in so many generations is unalterable. Because his model as a professor at the University has become a legend.

Born in Bucharest on the 14th of May 1901, D.V. Ionescu attended and graduated from "Sfântul Sava" High School, after a temporary interruption during the First World War, which forced him into refuge to Moldova.

We should mention that since his primary school days he started a steady collaboration with "Gazeta matematică", and continued it throughout his life.

After obtaining his B.A. (September 1919), D.V. Ionescu enrolled with the Faculty of Science of the University of Bucharest, Department of Mathematics, where he was a student of *Gh. Țițeica*, *A. Davidoglu*, *D. Emmanuel*, *D. Pompeiu*, *N. Coculescu*, *T. Lalescu*, *S. Sanielevici*, *Th. Angheluță*. Although he lived the hard life of a tutoring student, he graduated from University with brilliant results, being highly appreciated by *Gh. Țițeica*, and receiving the "Hillel Prize".

In 1923 D.V. Ionescu went on a scholarship to Paris, on *Gh. Țițeica's* recommendation, where he became a student at the famous "Ecole Normale Supérieure", whose head was, at that time, the mathematician *E. Vessiot*, and where he had as schoolmates, among others *H. Cartan*, *J. Dieudonné*, *P. Dubreil*, *L. René de Possel*, becoming later famous mathematicians.

At the Sorbonne, or at the College de France, he attended the courses of the great mathematicians of the day, such as: *E. Picard*, *P. Montel*, *Ed. Goursat*, *G. Julia*, *E. Vessiot*, *E. Cartan*, *J. Hadamard*.

On 7th of July 1927, he brilliantly defended his Ph.D. in mathematics with the topic: "Sur une classe d'équations fonctionnelles". In this dissertation he generalizes the results of *Darboux*, *Picard* and *Goursat* for partial differential equations of hyperbolic type. The essential results of the dissertation were published in *C.R. de l'Académie des Sciences de Paris*, t. 184, 1927, presented by *E. Goursat* and *J. Hadamard*.

Upon his return to Romania in the Fall of 1928, D.V. Ionescu was appointed Associate Professor at the University of Cluj, developing a lifelong attachment to this institution. On May 15th, 1929, he became a full professor and he got his tenure on July 1st, 1934.

Through the difficult years of World War II (1941–1945), when the Faculty of Science of Cluj was based in Timișoara, D.V. Ionescu was the Dean of the Faculty, being an excellent organizer, successfully defeating the hardship of those times. Thanks to his effort, the following were appointed professors between 1941–1943: *Raluca Ripan*, *Radu Țițeica*, *Caius Iacob*. The years to come were to prove that the Dean D.V. Ionescu made happy choices.

Between 1949 and 1955 D.V. Ionescu was also the Head of the Department of Mathematics at The Cluj Polytechnic, and in 1955 he became the Head of the Department of Differential Equations at the University of Cluj, until his retirement in 1971. From then, until the last moment of his life, he continued his prodigious academic activity as a consulting professor.

Since the foundation of the Cluj Branch of The Romanian Academy, D.V. Ionescu was active in it as Head of the Department of Numerical Analysis.

Even the briefest survey of his mathematical work will bring out his remarkable results in several mathematical fields, such as: functional equations, differential and partial differential equations, integral equations, algebra, geometry, rational mechanics and numerical analysis.

D.V. Ionescu's favourite field was numerical analysis, in which he is unanimously acknowledged, both at home and abroad, as a founder of a school of research. Dealing in the research of the approximation formulae of mathematical analysis over a period of more than fifty years, D.V. Ionescu created a method suggestively called "the method of the function φ ", which now bears the name "D.V. Ionescu method" in mathematical literature.

The *D.V. Ionescu method* mainly consists of attaching to any approximation formula a boundary value problem for a differential equation, or for a partial differential equation. The boundary conditions are conveniently chosen, depending of the approximation formula under study. The solution to the boundary value generates the coefficients of the approximation formula, its nodes, as well as the remainder of this formula as a definite integral.

By extending and generalizing the classical results of the well-known mathematicians *J. Radon*, *G. Peano*, *L. Tchakaloff*, *G. Kowalewski*, *R. Von Mises*, *A. Ghizetti*, *A. Sard*, *S. Nikolski*, *P. Turan*, a.o., D.V. Ionescu obtains remarkable results through his method,

in finding as special cases all the formulae of approximation such as quadrature formulae, interpolation formulae, formulae of numerical differentiation, integral representation of the divided differences, approximation of the solutions of integral equations, etc., in one or in more than one dimensions.

D.V. Ionescu's books and treatises have an outstanding scientific and didactic importance. We should mention some of them: Numerical Quadratures (Ed. Tehnică, Bucharest, 1956), Differential and Integral Equations (Ed. Did. Ped., Bucharest, 1964 and 1973), and Divided Differences (Ed. Academiei Române, Bucharest, 1978), the last one receiving the "Gh. Lazăr" Award of the Romanian Academy in 1980.

There are several worthy contributions of D.V. Ionescu to the approximate solution of differential equations that cannot be overlooked, such as the generalizing of the classical methods of the Runge-Kuta type, as well as the multi-steps methods of the Adams type.

At the same time, we should mention the fact that D.V. Ionescu obtained essential results in the numerical solution of the differential equations and of the integral equations, by means of successive approximation, in which the intervening integrals are calculated through specially constructed quadrature formulae. These results complete the classical Picard methods.

By studying general formulae of approximation, D.V. Ionescu reached a constructive method of the spline functions of one or of several variables, which plays an essential role today in the whole modern numerical analysis, and in many of the fields of applied mathematics.

D.V. Ionescu's brilliant scientific qualities were doubled by his qualities as a professor. He was aware that he had to be a follower of his forerunners in Cluj: *N. Abramescu*, *A. Angheliescu*, *Th. Angheluşă*, *Gh. Bratu* and *P. Sergescu*, to whom he was a close friend and he brought his contribution along with them to the upkeep of the prestige of the University of Cluj, in which he educated and formed more than fifty generations of undergraduates.

Through the lessons that he unfolded magisterially in front of his students, as well as through his written courses, D.V. Ionescu was always fascinating and unequalled. His exposition of abstract facts was done with an uncommon mastery, captivating the audience through the way he explained everything, and by the waving of his hand holding a piece of chalk across the surface of the blackboard, leaving behind a trail of mathematical formulae and symbols.

As a professor he directed his disciples on the road of knowledge, gave them light and warmth, helped them fulfill themselves, helped them rise with dignity and honesty, taught them the ABC of work through work and taught them the high responsibility of duty.

Professor D.V. Ionescu has long been a legend, which confers nobility upon the Romanian school, bearing fruits after generations. He had the immemorial knowledge that progress means learning and teaching.

In the academic world he was always a supporter of noble and just causes, always making his duty with loyalty and justice. Plotting against others was never among his hidden purposes, envy never haunted him, he never envied or hated anybody. On the contrary, intellectual honesty governed his hard work to the last moment of his life. His, was a human conscience and more than that: the certainty that every one of us is a human conscience.

He endowed Romanian mathematics with a style of warm and tender nobility, which will forever make us his debtors. The Romanian spirit shall forever be thankful to him for the books and textbooks that he wrote, giving us an incomparable lesson for our souls and minds, in which he generously imparted his thoughts and feelings.

Always helping his fellows, D.V. Ionescu passed through life with the serenity that only people who rise above the average experience can. He was in the company of those who only let feelings enter their hearts and souls through the wide-open door of their loving kindness, as well as the warm, tender heart, forever aware of the needs and pain of their fellows.

D.V. Ionescu meant simplicity, generosity and faith. There is no other homage more suitable for his memory.

Those who knew him, those who knew what his life meant, will ponder upon these lines with deep emotion. His life principle followed the example of Isidor of Seville:

*“Live as if you were to die tomorrow,
Learn as if you were to live forever.”*

Those of us who had the chance to see and to listen to him quite often, always found a pure thought, a subtle understanding of human greatness, tender tolerance as well as truly wise advice.

Professor D.V. Ionescu's life was full of honest work, of kindness, he embodied a high moral standard which was so much more impressive for being so discreet in its manifestations.

What he taught me was that nothing good can be made in the University without love for what we do, without humaneness and kindness for the students, without justice and freedom for the initiative of the young people, from whose ranks the continuators of the spiritual work of tomorrow will spring. He used to shake hands with a friendly, open smile on his face, his generous, kind soul being animated by the desire to spread around him the genuine Romanian kindness and humaneness, because of his organic need to see the people around him happy.

For his students and collaborators Professor D.V. Ionescu was a kind, loyal advisor and a friend. For the University and for the Country, he was an honest, austere, right servant, endowed with a high sense of duty.

D.V. Ionescu was the guiding mind towards the pure fields of mathematics, where there should be no false pretense, where austerity and honesty make up the background against which the generous inclination of sharing with others the fruit of the mind's labour in whatever is most pure and uninterested.

In the world of science, being the disciple of a great professor, is the certificate of spiritual nobility. That is why the writer of these lines considers himself to be a happy person, as a disciple of Professor D.V. Ionescu, who will forever be the kind master whose eyes were touched by the light of the true gift and by the joy of love that understands and forgives everything, a man of patience and kindness, a scholar who knows that the true virtue of the gifted lies in serving. This is what made him foremost in his ideas an achievements.

As his disciples, how can we show our gratitude?

What can be more sublime for a disciple than the guarantee that the flame lit in him by his master, will be passed from one to the other, from generation to generation. Keeping his memory intact, we can only be comforted by the thought that every time a pencil will glide on the white of a sheet of paper, the hand will look on a shelf for the books of the great mathematician. For all those he taught directly or through his books, for all the servants or Romanian mathematics, to whose prestige he contributed, D.V. Ionescu will remain a ray of light, of truth and of life.