VIKTOR KUPRADZE – 110

110 years have passed since the birthday of the outstanding Georgian scientist, a public figure and a statesman, academician Viktor Kupradze. Mathematicians and mechanicians throughout the world are well familiar with his name. Academician Viktor Kupradze made a tremendous contribution to the theory of differential and integral equations, problems of mathematical physics, the theory of elasticity and applied mathematics.

Viktor Kupradze was born on 2 November 1903 in village Kela in Georgia, in a railway worker's family. Little Viktor went to the specialized school in Kutaisi, where a comparatively extended course in mathematics was taught. Viktor's turn for mathematics attracted the attention of his teacher and, following his advice, in 1922 Kupradze became a student of the physico-mathematical faculty of the Tbilisi State University. In 1927 he graduated from the University with honours and as nominee of professors Andria Razmadze and Nikoloz Muskhelishvili, founders of the worldwide known Georgian mathematical school, was left at the University to be prepared for research work.

In 1930-1933 he was a post-graduate student at the Academy of Sciences of the USSR in Leningrad (St. Petersburg), where his supervisors were the prominent Russian scientists Alexei Krilov and Vladimir Smirnov.

In the period from 1933 to 1935 Kupradze worked as scientific secretary at the Steklov Mathematical Institute of the Academy of Sciences of USSR.

In 1935 he defended his doctor's thesis (skipping the candidate thesis) on the topic: "Boundary Value Problems of the Electromagnetic Wave Theory". In the same year Kupradze returned to Tbilisi where he was appointed director of the Tbilisi Mathematical Institute.

During the Great Patriotic War (the World War II) V. Kupradze served in the Soviet Army, participated in the cruel battles for Crimean Peninsula. Due to his fluent German, he was the Executive secretary of Editorial Board of the military newspaper "Zoldatenvaargait" published in German. In 1943 he was demobilized and appointed pro-rector of the Tbilisi State University, responsible for research work.

From 1944 to 1953 Kupradze was the Minister of Education of Georgia.
In 1946 he was elected full member of the Academy of Sciences of Georgia.
In 1954–1958 he held the position of the rector of Tbilisi State University.
In 1962 the Georgian Mathematical Society was founded and V. Kupradze was elected its first president.

In 1963 Kupradze was elected academician-secretary of the department of mathematics and physics of the Academy of Sciences of Georgia, where he worked fruitfully till 1981. At the same time he headed the chair of differential and integral equations of the Tbilisi State University. From 1947 to 1985 Kupradze was a member of Presidium of the Georgian Academy of Sciences.

V. Kupradze widely participated also in the public life of Georgia and the former USSR. In 1947 he took part in the Congress of Asiatic and African Peoples held in Delhi. From 1954 to 1963 he was Chairman of the Supreme Soviet (Parliament) of Georgia. In 1955 he was sent to the USA (New York) as a Soviet delegate to the 10th Session of the UN General Assembly. V.Kupradze actively was involved in the international scientific cooperation. Being member of various reputable organizations such as the National Committee of Soviet Mathematicians, National

Committee on Theoretical and Applied Mathematics, Bureau of the Scientific Council on Plasticity and Strength of the Academy of Sciences of the USSR, also member of the presidium in Mechanics" V. Kupradze played a significant role in strengthening scientific contacts between the scientists of different countries. He was a member of the editorial boards of domestic and international scientific journals, including "Uspekhi Matematicheskikh Nauk", "Differentsial'nye Uravneniya", "Journal of Thermal Stresses" etc.

Specially must be mentioned that V. Kupradze was an excellent teacher, thesis adviser, and lecturer with a considerable personal magnetism and charm. For over 40 years he had been the head of the chair of differential and integral equations at Tbilisi State University and brought up several generations of Georgian mathematicians. He had also many disciples and followers throughout the countries he visited. Attracted by Kupradze's charisma, many of his pupils became famous scientists and fruitfully continue mathematical scientific and academic activities both in Georgia and abroad.

V. Kupradze passed away on 25 April 1985, about 28 years ago, but all those people who knew him will cherish the memory of his warm, unforgettable personality and his profound intelligence.

The mathematical inheritance of V. Kupradze is very rich. He began his scientific activities in the late twenties of the 20th century. His fruitful and tireless work actually has lasted about 55 years.

V. Kupradze's contributions to mathematics and mechanics can be divided into six large groups:

(1) Problems related to the justification of Sommerfeld's Radiation Conditions and boundary value problems (BVP) for the Helmholtz equation;

(2) Diffraction and scattering of electro-magnetic waves;

(3) Mathematical problems of the theory of elasticity (BVPs of statics and steady state oscillations, and initial boundary value problems of general dynamics);

(4) Theory of one- and multi-dimensional singular integral equations and their applications;

(5) Investigation of refined models of the theory of elasticity (Thermoelasticity, Cosserat model etc.);

(6) Problems of numerical simulation and approximate solutions of BVPs of mathematical physics, Method of Fundamental Solutions.

V. Kupradze was the first scientist who mathematically justified Sommerfeld's principle, originally formulated in 1912, for a solution of the Helmholtz equation, describing the so called outgoing waves. Using the potential method, Kupradze proved the corresponding existence and uniqueness theorems of radiating solutions and, moreover, predicted that the radiation condition should imply the decay condition [23]. Fundamental results obtained by V. Kupradze in the mathematical theory of diffraction and scattering of electromagnetic waves are reflected in his monographs [1-4]. The basic transmission problems of diffraction and boundary value problems of propagation of electromagnetic waves, described by the Maxwell system of differential equations and appropriate interface and boundary conditions, V. Kupradze reduced to the equivalent integral equations. On the basis of Sommerfeld's principle, he gave a full investigation and proved that for arbitrary wave number the problems are uniquely solvable.

From the 40s investigation of two- and three-dimensional problems of the elasticity theory held an ever growing place in the scientific activities of V. Kupradze. Building up a strong research team, he was concerned, together with his disciples, with extending the potential method to the basic boundary value and (complicated, nonstandard) transmission problems of the mathematical theory of elasticity. He explicitly constructed the matrix (now called as "Kupradze's matrix") of fundamental solutions of the system of steady state elastic oscillations and formulated the radiation conditions at infinity in the elasticity theory (now called as "Sommerfeld–Kupradze principle"), which played a crucial role in the proof of uniqueness theorems for exterior BVPs.

It should be mentioned that, in contrast to the classical theory of BVPs for harmonic and metaharmonic functions, in the elasticity theory the potential method reduces the spatial basic BVPs to the corresponding integral equations on the two-dimensional boundary of a body under consideration, which are strictly singular and they can be treated only in the Cauchy principal sense. At that time the theory of one dimensional singular integral equations had already been worked out, but in the case of many dimensions the theory was developed rather poorly.

During the subsequent 20 years V. Kupradze, and his collaborators developed and worked out the theory of multi-dimensional singular integral equations on manifolds. Afterwards they successfully applied the theory of singular potentials and newly created theory of singular integral equations to the analysis of boundary value problems of statics and steady state oscillations, as well as initial boundary value problems of general dynamics of the theory of elasticity. By the same approach, basic problems of some refined models of the theory of elasticity (anisotropic elasticity, thermoelasticity, couple-stress elasticity and so on) have been also completely studied. These results are gathered in the monographs [5-14]. Among them the fundamental work (jointly with T. G. Gegelia, M. O. Basheleishvili, T. V. Burchuladze) "Threedimensional Problems of the Mathematical Theory of Elasticity and Thermoelasticity" (North-Holland Publ. Comp., Amsterdam, 1979) became a companion desk book for scientists working in the field. First Russian edition of the book (Published in Tbilisi in 1968) has been devoted to the 50th anniversary of Tbilisi State University and was awarded the State Prize of Georgia in 1971. V. Kupradze also worked out convenient algorithms for approximate solutions of boundary value problems. One of them is a new universal method - Method of Fundamental Solutions [14].

The theory and the methods developed by V. Kupradze are widely and successfully applied to many theoretical and practical spheres of mathematical physics and engineering even nowadays. That means that Viktor Kupradze as a celebrated scientist is still alive - as an intellectual and spiritual bridge from the 20th century to the 21st one.

David Natroshvili

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