Tengiz Gegelia

(1928–1994)

This year we celebrate the 90th anniversary of the birth of prominent Georgian mathematician Professor Tengiz Gegelia.

Tengiz Gegelia was born on January 28, 1928, in Patara Jikhaishi, a village in Georgia near the city of Kutaisi. In 1945 he entered the Faculty of Physics and Mathematics of Tbilisi State University and completed his university education in 1950. In 1950–1954 he was a post-graduate student, and in 1954–1956 an assistant at the chair of differential and integral equations of Tbilisi State University. In 1956–1966 Gegelia worked as a senior researcher at A. Razmadze Mathematical Institute of the Georgian Academy of Sciences. In 1966 he headed Department of Continuum Mechanics of Institute of Applied Mathematics. In 1980 this department was moved to A. Razmadze Mathematical Institute and Tengiz Gegelia was at its head until his death in 1994.

T. Gegelia defended Candidate of Science thesis in 1954 and his doctoral thesis in 1964. Since 1967, he was a professor at the Tbilisi State University. In 1981–1994, he held the chair of differential and integral equations at Tbilisi State University. In 1974, T. Gegelia was elected a corresponding member of the Georgian Academy of Sciences.

Tengiz Gegelia's mathematical activity covered several fundamental areas: problems of the potential theory and singular integral equations, problems of the classical elasticity theory, as well as the theories of other models of elastic medium such as couple-stress and thermomoment elasticity and electroelasticity. In his first papers published in 1952-1954 T. Gegelia considered singular integral

equations with the Cauchy kernel and boundary value problems of the theory of holomorphic functions. He studied these problems for much wider classes of lines than those of straight or piecewise-smooth ones which where considered before. These lines can have an infinite number of angular points, cusp points and points of more complicated structure. To accomplish such an extension, he generalized the notion of the integral in the sense of the Cauchy principal value and investigated the so-called loaded singular integral operator. The results he obtained then formed the basis of his Candidate of Science thesis.

In 1955–1963 Tengiz Gegelia published a series of papers on multidimensional singular integral operators. He investigated differential properties of functions represented by singular integrals as well as of solutions of the corresponding singular integral equations. He also considered singular potentials in various spaces of smooth functions. Other noteworthy results obtained by T. Gegelia in this field include a formula for the difierentiation of singular integrals, a formula for the change of integration order in iterated singular integrals, as well as an estimate of the continuity modulus of the multidimensional singular integral by means of the continuity modulus of the density and the main smoothness characteristics of the kernel and the integration surface. In particular, for a Cauchy type integral, the latter estimate yields the well-known Zygmund inequalities. These papers made an important contribution to the investigation of boundary value problems of elasticity. Victor Kupradze and he were the first scientists who investigated the solvability of the system of boundary integral equations corresponding to the Neumann boundary value problem of elasticity. Together with his associates T. Gegelia investigated boundary value problems of various nonclassical models of elastic medium, which take into account couple and thermal stresses, electric, diffusive and other fields. It also should be mentioned the study of the asymptotic behaviour of solutions of various systems of elasticity in the neighbourhood of isolated singular points. These results significantly stimulated application of the potential method and the theory of singular integral equations to investigation of three-dimensional problems of elasticity. Most of the above-mentioned results of T. Gegelia were included into the well-known monographs *"Three-dimensional Problems of the Mathematical Theory of Elasticity and Thermoelasticity"* by V. Kupradze, T. Gegelia, M. Basheleishvili, and T. Burchuladze and *"Development of the Potential Method in the Theory of Elasticity"* by T. Burchuladze and T. Gegelia and into his other monographs and papers.

The scientific activities of T. Gegelia won him a wide recognition. He was a member of many national and international scientific organizations and societies. In 1976 he was elected a member of the Bureau of the Scientific Council on Solidity and Plasticity of the USSR Academy of Sciences, and from 1982 he was chairman of the elasticity theory sector of the said Council. From 1984 T. Gegelia was a member of the International Society of Interaction of Mathematics and Mechanics (ISIMM), and, from 1985, a member of the USSR National Committee on Theoretical and Applied Mechanics.

T. Gegelia made a great contribution to the search and development of young talented mathematicians in Georgia. In spite of constant intensive work, he yet managed to find time for teaching at a mathematical secondary school. Tengiz Gegelia was the author of many original textbooks for university and secondary school curricula. He showed interest in teaching mathematics and was regarded as a commonly acknowledged authority in this field. For many years he headed the Methodics Council of the Georgian Public Education Ministry and chaired the organizing committee for holding mathematical olympiads in Georgia. He was the initiator of founding the specialized mathematical school under Tbilisi State University. which is still successfully functioning.

Tengiz Buchukuri

List of Main Publications

(i) Monographs

[1] Three-dimensional Problems of the Mathematical Theory of Elasticity (with V. D. Kupradze, M. O. Basheleishvili, T. V. Burchuladze). (Russian) *Izdat. Tbilis. Univ., Tbilisi*, 1968.

[2] Wybrane zagadnienia teorii sprezystosci i termosprezystosci (With V. D. Kupradze, M. O. Basheleishvili, T. V. Burchuladze). *Zaklad. Narodowy Imienia Ossolinkich Wydawnictwe PolskejAkademij Nauk, Warszawa*, 1970.

[3] Three-dimensional Problems of the Mathematical Theory of Elasticity and Thermoelasticity (with V. D. Kupradze, M. O. Basheleishvili, T. V. Burchuladze). (Russian) *Nauka, Moscow*, 1976.

[4] Three-dimensional Problems of the Mathematical Theory of Elasticity and Thermoelasticity (with V. D. Kupradze, M. O. Basheleishvili, T. V. Burchuladze). Translated from the second Russian edition. Edited by V. D. Kupradze. *North-Holland Series in Applied Mathematics and Mechanics*, 25. *North-Holland Publishing Co., Amsterdam–New York*, 1979.

[5] Development of the potential method in elasticity theory (with T. Burchuladze). (Russian) *Trudy Tbiliss. Mat. Inst. Razmadze Akad. Nauk Gruzin. SSR* **79** (1985), 226 pp.

[6] Boundary value problems of mechanics of continuum media for a sphere (with R. Chichinadze). *Mem. Differential Equations Math. Phys.* **7** (1996), 1–222.

(ii) Papers

[7] On some singular integral equations of particular form. (Russian) *Soobshch. Akad. Nauk Gruzin. SSR* **13** (1952), 581–586.

[8] Hilbert's boundary value problem and singular integral equations in the case of intersecting contours. (Russian) *Soobshch. Akad. Nauk Gruzin. SSR* **15** (1954), 69–76.

[9] On boundary values of Cauchy type integrals for unsmooth surfaces. (Russian) *Soobshch. Akad. Nauk Gruzin. SSR* **15** (1954), 481–488.

[10] on a generalization of G. Giraud's theorem. (Russian) *Soobshch. Akad. Nauk Gruzin. SSR* **16** (1955), 657–663.

[11] On properties of certain classes of continuous functions under a Hilbert transformation in E^n. (Russian) *Soobshch. Akad. Nauk Gruzin. SSR.* **19** (1957), no. 3, 257–261.

[12] The fundamental lemma of I. I. Privalov for space potentials. (Russian) *Soobshch. Akad. Nauk Gruzin. SSR* **18** (1957), 257–264.

[13] Boundedness of singular operators. (Russian) *Soobshch. Akad. Nauk Gruzin. SSR* **20** (1958), 517–523.

[14] Behavior of a generalized potential near the boundary of the region of integration. (Russian) *Trudy Tbiliss. Mat. Inst. Razmadze* **26** (1959), 189–193.

[15] Differential properties of some integral transforms. (Russian) *Trudy Tbiliss. Mat. Inst. Razmadze* **26** (1959), 195–225.

[16] Composition of singular kernels. (Russian) *Dokl. Akad. Nauk SSSR* **135** (1960), 767–770; translation in *Soviet Math. Dokl.* **1** (1960), 1299–1302.

[17] Properties of n-dimensional singular integrals in the space $L_p(S; \rho)$. (Russian) *Dokl. Akad. Nauk SSSR* **139** (1961), 279–282.

[18] Integral equations containing integrals taken over a surface with edges. (Russian) *Dokl. Akad. Nauk SSSR* **141** (1961), 773–776.

[19] On the boundary values of functions of potential type. (Russian) *Trudy Vychisl. Centra Akad. Nauk Gruzin. SSR* **2** (1961), 285–313 (1962).

[20] On the formula for the change of order of integration in iterated singular integrals. (Russian) *Trudy Tbiliss. Mat. Inst. Razmadze* **28** (1962), 41–52.

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[23] On the regularization of singular integral operators. (Russian) *Trudy Tbiliss. Mat. Inst. Razmadze* **29** (1963), 229–237 (1964).

[24] On an inversion formula of A. Bicadze. (Russian) *Trudy Vychisl. Centra Akad. Nauk Gruzin. SSR* **3** (1963), 81–87.

[25] On the fundamental three-dimensional boundary-value problems for composite isotropic elastic media (with M. O. Basheleishvili). (Russian) *Dokl. Akad. Nauk SSSR* **160** (1965), 50–53.

[26] On a certain property of solutions of singular integral equations. (Russian) *Trudy Tbiliss. Gos. Univ. Ser. Mekh. Math.* **110** (1965), 43–56.

[27] Certain special classes of functions and their properties. (Russian) *Trudy Tbiliss. Mat. Inst. Razmadze* **32** (1967), 94–139.

[28] Certain boundary problems of the moment theory of elasticity (with M. O. Basheleishvili, O. I. Maisaia). (Russian) *Annot. Dokl. Sem. Inst. Prikl. Mat. I. N. Vekua* **1** (1970), 43–54.

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[33] A study of certain boundary value problems of a micropolar medium (with R. K. Chichinadze). (Russian) *Annot. Dokl. Sem. Inst. Prikl. Mat. I. N. Vekua* **9** (1974), 15–19.

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[37] Some boundary value problems for micropolar media that are bounded by several surfaces (with R. K. Chichinadze). (Russian) *Investigations of some problems in thermoelasticity theory and moment elasticity theory* (Russian), pp. 3–32. *Tbilis. Gos. Univ. Inst. Prikl. Mat., Tbilisi*, 1977.

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[54] Uniqueness theorems in linear theory of microporous solids (with L. Jentsch). *Z. Anal. Anwendungen* **13** (1994), no. 1, 73–82.

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