

## In Memoriam

**Robert Veniaminovich Goldstein**  
May 7, 1940–September 24, 2017

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Our colleague, eminent scientist, and corresponding member of the Russian Academy of Science, Professor Robert Veniaminovich Goldstein passed away on September 24, 2017 after an acute but hard-fought illness.

R. V. Goldstein (RVG to his laboratory colleagues) was an outstanding and influential scientist in solid mechanics and its various applications. RVG made vast contributions to education and research in solid mechanics and fracture mechanics. He pioneered a number of fundamental results in the theory of elasticity, wave dynamics, mechanics of fracture, mechanics of contact interactions, nano-micro- and meso-mechanics of materials, and mechanics of ice and ice covers.

RVG was born on May 7, 1940 in Moscow. He was interested in mathematics and physics in his high school days, and in 1957, RVG entered Lomonosov Moscow State University. In 1962, he graduated with

distinction from the mechanics-mathematical department. During the 55 years following his graduation, he worked for the Academy of Sciences, beginning as a post-graduate student at the Institute of Mechanics (1962–1965), then a researcher in the Institute for Problems in Mechanics—IPMech (1966–2017) where he progressed from research fellow to Professor and corresponding member of the Russian Academy of Science. In 1988, RVG founded and headed the Laboratory of Mechanics of Strength and Fracture of Materials and Structures at the Russian Academy of Science. His Ph.D. thesis was entitled “Surface waves and resonant phenomena in elastic bodies” (supervised by G.I. Barenblatt and R.L. Salganik 1968), and in 1983, RVG obtained a Doctor of Science degree with the thesis “Fracture mechanics of large-scale structures.”

In the field of the dynamic elasticity theory, he studied resonant phenomena in elastic bodies, supplementary to interfacial cracks growth, and locomotions of loads and stamps with speeds close to the Rayleigh wave speed. A large number of works by RVG with co-authors is devoted to the development of qualitative methods in fracture mechanics, furthering the estimation of stress intensity factors for cracks of complex shape. He also derived the sufficiency conditions for fracture in structural components. He developed a series of fracture models of heterogeneous materials and structures with crack systems (echelons) and a semi-empirical approach for fracture analysis of elastoplastic materials. Using results from testing the corresponding small-scale models, he suggested similarity

criteria for modeling fracture conditions of large-scale structures. RVG with co-authors developed the asymptotic and numerical solutions for three dimensional mixed problems of elasticity, including problems with the unknown boundaries and contact problems with cohesion and friction, along with a number of effective methods for numerical solutions of boundary integral equations and minimization of boundary functional for three dimensional problems of crack statics and kinetics. Through the joint efforts of RVG and his colleagues and scholars, these methods were implemented as packages of the applied computer codes which were successfully used for analysis of stress state and fractures of industrial structures.

From the beginning of 1990, RVG obtained a series of fundamental and applied results in the area of micromechanics of strength and interfacial fracture of micro- and sub-microelectronic products. Over the last few decades, RVG diligently worked in the area of nanomechanics. During this time, he developed discrete-continua models of mechanical behavior of nanotubes, graphene sheets and models of nanocomposites strength and fracture. Another outgrowth of this research is atomistics of fracture where the generalized model of fracture was proposed and the applicability conditions of continual approach in fracture mechanics for the description of nanocrack growth was found. RVG was also interested in the mechanics of materials with negative Poisson's ratio (auxetics), with a strong potential for its applications in technology and medicine.

RVG's research results are published in more than 230 peer-reviewed Russian and international journals. He presented more than 200 lectures in conferences and symposia. The experience, scientific insight, and fundamental results obtained by RVG and his colleagues were effectively used to solve a wide range of problems. He worked as the Principal Investigator for the applied projects for GAZPROM (Russia), Motorola, Inc. (USA), Schlumberger (USA), Michelin (France), and many others.

From 1975 to 1990, RVG initiated and coordinated the translation of crucial foreign scientific books into Russian. Since 1996, he was a member of the Executive Committee of the European Structural Integrity Society. In 2001, he was a member of council of the International Congress on Fracture. In 2005 to 2009, he was the Vice-president of the International Congress on Fracture. In 2012, RVG was the organizer and the Chairman of the Organizing Committee of the 19th European Conference on Fracture (ECF19) in Russia (Kazan). He was also a member of Editorial Board of several scientific journals including the *International Journal of Fracture*.

RVG dedicated extensive time and attention to teaching and collaborating with young scientists. He developed one of the leading scientific schools in the Russian Federation in the area of strength and fracture mechanics of materials, which was awarded grants by the President from 1996 to 2016. He was the supervisor of 19 Ph.D. candidates, and six of his colleagues obtained a Doctor of Science degree during joint research with RVG.

His immense and influential contributions to fracture mechanics were recognized in 2016 with the Griffith Medal from European Structural Integrity Society (ECF21, Catania, Italy) and in 2017 with the George R. Irwin Gold Medal from International Congress of Fracture (ICF14, Rhodes, Greece).

Professor Goldstein's scientific legacy is deep and broad. We have not only lost a scientific visionary, but also an excellent colleague, teacher, and friend.

*Colleagues from Laboratory of Mechanics of Strength and Fracture of Materials and Structures*

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