

$M^3D$ :

# Mechanics *and* Mechanisms *of* Material Damping

**Kinra/Wolfenden**

*editors*



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*Vikram K. Kinra and Alan Wolfenden, Eds.*

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**IN MEMORIUM  
HERBERT KOLSKY  
1917–1992**



*Professor Herbert Kolsky ("Harry" to all who knew him personally), was a pioneer and leader in the field of experimental investigation of the behavior of materials under sudden loads. He was also a splendid teacher, whose graduate students will remember him affectionately for his painstaking guidance and a warm sense of humor. One of us, V. K. Kinra, had the privilege of being his graduate student at Brown University. He taught courses at all levels with memorable zeal and gusto as a faculty member since 1960 at Brown University, first in the Division of Applied Mathematics and later with a dual appointment in the Division of Engineering. Kolsky was a lively and original lecturer, and was welcomed as speaker at numerous seminars and conferences; most recently he delivered an invited keynote lecture at this Symposium. He was in demand as a visiting scholar, and lectured in China, France, India, and Israel. He accepted invitations, among others, for sabbatical visits at Imperial College in London, Middle East Technical University in Ankara, Turkey, Oxford University, the Swiss Federal Institute of Technology (E.T.H.) in Zurich, and the University of California at Berkeley.*

*Born in London, England, and graduating in 1937 from Imperial College with honors in physics, Kolsky earned Ph.D. and D.Sc. degrees from the University of London in 1940 and 1957, respectively. He was awarded an honorary D.Sc. by the E.T.H. in Switzerland in 1984. Following wartime work in a research group at Imperial College, London, he served for nine years as head of the physics department at Butterwick Research Laboratories of Imperial*

*Chemical Industries in Welwyn, England. Supported by a Fulbright Fellowship he then spent two years as visiting professor at Brown University, returning to England in 1958 to accept a "Special Merit" appointment as Senior Principle Scientific Officer at the Royal Armament Research and Development Establishment at Fort Halstead, Seven Oaks, Kent. He was persuaded to return to America in 1960, and enjoyed more than thirty fruitful years of research until his death; his last paper appears in this volume. He was a Fellow of the Institute of Physics, the American Physical Society, the Acoustical Society of America, and the American Academy of Mechanics.*

*Kolsky published about 100 papers on a variety of subjects, including the properties of metals and polymers under dynamic conditions, the propagation and interaction of cracks in brittle materials, the penetration of solid bodies by projectiles, and the performance of fibre-reinforced composites under impact conditions, to name only a few interests. But two accomplishments in particular should be singled out. Kolsky had an extraordinary influence on the field of research which is concerned with the characterization and quantitative measurement of properties of materials as they respond to loads that are suddenly applied with high intensities, so that damage in the form of permanent deformation or rupture occurs. This field of investigation is of obvious practical importance, for example, in the design of aircraft and other high speed vehicles, and in the analysis of penetration of armor by projectiles. It involves the intrinsic difficulty that the basic properties can only be determined if the deformation of the specimen being tested can be analyzed mathematically, whereas such an analysis can only be made if the properties of the material are already known. Kolsky's achievement was to devise an ingenious but simply constructed apparatus which enables this dilemma to be largely circumvented. In the literature this apparatus is generally referred to as the "split-Hopkinson bar," because it derives from old ideas of a pressure bar due to B. Hopkinson. However, Kolsky's method involved ideas far beyond the Hopkinson bar, and the apparatus that more properly should be called the Kolsky bar has become a standard, very widely used device, with hundreds in many variations being employed in laboratories around the world.*

*Kolsky's other signal contribution was a landmark book "Stress Waves in Solids" published in Oxford in 1953, and since reprinted by Dover. It has been translated into Russian and Chinese. It is a concise treatment, but so authoritative on the basic theory and its experimental underpinning that it still serves as a kind of "Bible" for students and researchers, as it has done for nearly 40 years. This exemplary contribution was honored in the citation for the Worcester Reed Warner gold medal of the American Society of Mechanical Engineers, awarded to Kolsky in 1982.*

*Kolsky was a man of bright spirit who will be greatly missed by his friends and colleagues around the world. They will remember among other things his marvelous ability to come up with a verse of poetry or an anecdote precisely fitting the occasion. As a homage to his many contributions to the field of experimental mechanics, we dedicate this book to Professor Harry Kolsky.*

*Vikram K. Kinra  
Alan Wolfenden  
College Station, Texas*

# Foreword

The symposium on M<sup>3</sup>D: Mechanics and Mechanisms of Material Damping was presented in Baltimore, Maryland, 13–15 March 1991. The symposium was sponsored by ASTM Committee E28 on Mechanical Testing in cooperation with The Office of Naval Research. Vikram K. Kinra and Alan Wolfenden, Texas A&M University, presided as chairmen of the symposium and are editors of this publication.

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