

This issue represents a compilation of papers contributed by former students, colleagues, and collaborators of Professor Wolfgang Knauss, Theodore von Karman Professor of Aeronautics and Applied Mechanics at the California Institute of Technology on the occasion of his 70th birthday. Most of these papers were presented at the symposium “Current Trends in Mechanics,” held on November 15–16, 2004 at the Graduate Aeronautical Laboratories of the California Institute of Technology (GALCIT), to commemorate this milestone.

Wolfgang Gustav Knauss was born in Mandel/Bad Kreuznach, Germany, on December 12, 1933. After graduating with honors from the Helmholtz Realgymnasium, Heidelberg, Germany in 1954, Wolfgang moved to Pasadena and made it his home over the last five decades, first as a student at the California Institute of Technology, getting his Ph.D. in Aeronautics in 1963, and since then as a member of the faculty at Caltech. Currently, he is an Emeritus Professor of Aeronautics and Applied Mechanics. In addition to his academic accomplishments, he has used his expertise in addressing practical problems, as a consultant to a number of aerospace companies such as Lockheed, Rocketdyne, Aerojet-General, Hercules, General Dynamics, and GE Space Division, as well as many producers and consumers of polymer products such as DuPont and Firestone.

Wolfgang has served on numerous advisory boards, most notably, the U.S. Highway Research Board’s Committee on Strength and Deformation; the Executive Committee of the Adhesion Society; Chairman of the National Panel on Foreign Technology Assessment in Fracture Mechanics; Chairman of the U.S. National Committee on Theoretical and Applied Mechanics; and Chairman of the Subcommittee on Failure, Structural Integrity Committee of the Interagency Chemical Propulsion Group for the Joint Army, Navy, and Air Force Technical Advisory Committee. His service to the applied mechanics community includes initiation of a journal devoted to *Mechanics of Time-Dependent Materials*.

In recognition of his significant contributions to the literature and the community, Wolfgang has received many honors and awards for his work over the years, too numerous to list; here are some of the highlights. He was awarded a lectureship by the USSR Academy of Sciences in 1977, which enabled him to travel to different Soviet era academic and research institutions and get acquainted with Soviet research in time-dependent failure of polymeric materials. He was awarded the Alexander von Humboldt Senior U.S. Scientist fellowship in 1986–1987, during which tenure, he spent some time at the University of Kassel and the University of Karlsruhe in Germany. He received the Murray Medal from the Society for Experimental Mechanics (1995), the Kapitsa Medal of the Russian Academy of Sciences (1997), and the Koiter Medal from the American Society of Mechanical Engineers (2001). He was elected a foreign member of the Russian Academy of Natural Sciences in 1997. The impact of his research contributions can be gauged by his inclusion in the list of Highly Cited Researchers by ISI. His election to the National Academy of Engineering in 1998 for contributions to time-dependent fracture of polymers, at interfaces, and under dynamic loading was a fitting

recognition of an illustrious career marked by high-quality, original work, and for significant service to the applied mechanics community.

Wolfgang is well known for his work in viscoelasticity, dynamic fracture, composites, and interface fracture. These interests have been bolstered in recent years by his emphasis on making measurements at ever smaller scales; the first seven papers in this issue fall in this category. Ioannis Chasiotis—Wolfgang’s last Ph.D. student—describes work on fracture of free-standing MEMS films, and Wolfgang’s colleagues Ares Rosakis and Ravichandran present work on the characterization of the geometrical imperfections and mechanical characteristics of thin film materials. Hongbing Lu describes work on modeling carbon nanotube/polyelectrolyte multilayer composites; this is followed by Tony Waas’ innovative application of micro-Raman spectroscopy to the measurement of biaxial stresses in silicon.

Several papers were presented on the behavior of polymers, polymer composites, and nanocomposites. The paper by Igor Emri looks at multi-scale interactions in polymer structure formation. On the nanoscale, Cate Brinson provides an evaluation of interphases in nanocomposites and Ken Liechti examines self-assembled monolayers through experiments with the Interfacial Force Microscope.

The area of fracture mechanics is well represented in this issue by many contributions. Jimmy Liu, a long-time collaborator, and colleague Ravichandran describe the influence of confining pressure on crack growth in a highly filled elastomer. John Lambros and Phillippe Guebelle use cohesive zone modeling to examine quasi-static fracture in functionally graded polymers. Jay Walton provides an analysis of dynamic crack propagation in linearly viscoelastic materials. An application of fracture mechanics to the problem of truck tire durability is explored by Allan Zhong.

Response of different classes of materials are considered in four papers in this collection. Stelios Kyriakides looks into the crushing response of low density foams, Brian Moran develops a constitutive model with fiber matrix interactions for the human annulus fibrosus, and Dick Christensen presents an evaluation of different failure theories for fiber-reinforced composites. Sia Nemat Nasser describes an experimental evaluation of the dynamic collapse behavior of shape memory alloys.

Finally, we have an acknowledgement of GALCIT’s historical involvement in structures with papers by former students Herzl Chai and Ravi-Chandar. Herzl’s paper is about the crash worthiness of laterally constrained thin plate members under axial compression, while Ravi takes a look at the nonlinear dynamics of strings and rods, adding a biomechanical twist to the problem.

In addition to the papers presented in this volume, there were interesting oral presentations at the symposium from Kyung-Suk Kim, Albert Kobayashi, Gordon Williams, Phillippe Guebelle, Wei Tong, and Sandeep Sane.

K. Ravi-Chandar
Kenneth Liechti
Stelios Kyriakides
 Guest Editors