Book Reviews

Optical Methods in Dynamics of Fluids and Solids,
M. Pichal (editor), Springer-Verlag Inc., New York, 1985, 385 pp., $45.00.

This book reports on the Proceedings of an International Symposium, sponsored by the International Union of Theoretical and Applied Mechanics, and held at the Institute of Thermomechanics, Liblice, Czechoslovakia, November 17-21, 1984. The meeting dealt with applications of optical methods in fluid mechanics and solid mechanics, in an effort to bring together scientists using optical methods in all phases of dynamics. Emphasis in the book is placed on experimental fluid mechanics dealing with transition from laminar turbulent flow, compressible flow, and non-equilibrium phenomena, and the interaction of fluid flow with solid boundaries and bodies. Contributions in the areas of mechanics and solids focus on optical methods for measurement of wave propagation in shock loaded bodies, phenomena connected with fracture mechanics, non-stationary vibrations of elements, and non-stationary strains in structures.

Among the 47 technical papers presented in this volume, 14 papers are devoted to various areas of solid mechanics, including six on photoelasticity, six on various types of interferometric methods (holography, Moiré, LDV, micro-interferometry, and differential interferometry), and a paper each on x-ray tomography and the photoelastic methods. The areas of application include dynamic fracture, instrumentation for impact testing, elastic stress wave propagation, metal forming, data deformation analysis, and vibration analysis.

About two-thirds of the articles deal with measurements in fluid mechanics. They consider various means including holography, Raman scattering, laser Doppler velocimetry, laser dual focus velocimetry, particle size measurement from light scattering, x-ray diffraction measurements, speckle photography, flow visualization, color Schlieren technique, interferometric methods, tomography, photography, refraction by shocks, and flow-induced luminosity. These techniques are applied to measurements of bubbles, combustion flows, aerosols, cavitating flows, compressible flows with shock waves, fluidized beds, and metal castings.

Articles in this volume have been photo-reproduced and are relatively short contributions averaging five to seven pages. Several new ideas, many extensions of established methods, and some novel and clever techniques are described. Because of the brevity of each paper many of the articles are incomplete, and a number of them are still in the idea stage. Contents of the book primarily reflect current European, and particularly Czechoslovakian, research in the area of optical methods. Current optical methods in the dynamic of solids and fluids, such as the optical method of caustics, laser speckle interferometry, some types of interferometry for dynamic plasticity, high speed photography, and particle image velocimetry would have made this book more balanced.

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Dynamics: Theory and Applications, by T. R. Kane and D. A. Levinson,
McGraw-Hill Book Company, New York, 1985, 379 pp., $49.95.

As a text intended for a first-year graduate course on general classical dynamics, this book is unusual in at least four fundamental respects: 1) Its emphasis is almost exclusively on rigid-body mechanics. There is little on single-particle dynamics. 2) From the outset, frames of reference (regarded as massless rigid bodies) are emphasized together with a special notation. 3) There is a unified point-of-view in that all phenomena and problems are to be considered as based on a particular general set of equations, valid for nonholonomic, as well as holonomic, constraints. 4) Instead of, e.g., the customary Lagrange equations (with multipliers), the fundamental equations in (3) are taken to be "Kane's equations," which express a balance of "generalized active forces" and "generalized inertia forces." These involve, for example, generalized speeds and partial velocities. The equations are, in general, a set of coupled first-order ordinary differential equations in the generalized coordinates and generalized speeds.

The authors state that their main purpose is to present comparatively simple procedures for formulating the equations of motion in the kind of complex systems such as might occur in modern-day problems in industry, e.g., multibody spacecraft. (A book on this latter subject by the authors, with P. W. Likins, has recently been published.)* Thus, out of the seven chapters, the first six essentially cover methods of formulation. They are:

*See review of *Spacecraft Dynamics*, *AIAA Journal*, Vol. 21, June 1983, p. 928.