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BOOK REVIEWS

Laser Velocimetry and Particle Sizing. H. DOYLE THOMPSON and WARREN H. STEVENSON, eds., Hemisphere, U.S.A., 556pp.

THIS BOOK reports the proceedings of the third international workshop on laser velocimetry held at Purdue University, July 1978. Unfortunately this fact is not made clear in the title. The papers are concerned with the use of laser scattering to measure velocity and particle size.

Since its inception in 1964, the technique of laser velocimetry has gone through considerable development and is now a mature method for the measurement of flow velocity. In contrast, the measurement of particle size using laser scattering is at a relatively early stage of development. As might be expected, the balance of papers in the volume reflects the relative state of development of the two fields with many more successful applications of laser anemometry described than there are of particle sizing.

The papers on laser velocimetry show that the technique can now be fairly readily applied to a wide range of measurements including studies of combustion processes. However, there are still areas yet to be covered, as is shown in the session on internal combustion engines where no measurements are reported of flow in running engines.

The papers on particle diagnostics describe several different approaches to the problem of measuring particle size using laser scattering. The principal emphasis in the papers is on the development of instrumentation rather than its application.

In general, the papers provide a fair picture of the state of the art in laser velocimetry and particle sizing at the time of the meeting. As such, the book can be recommended to those active in the field and to those interested in the application of the techniques described. However, as is the nature of the proceedings of workshops, the volume will be of very limited use to those unfamiliar with the fundamentals of the area.

P. HUTCHINSON

CHANG L. TIEN and JOHN H. LIENHARD, **Statistical Thermodynamics.** Revised printing, Hemisphere–McGraw-Hill (1979). xvi + 397 pp.

THIS is a new printing of a textbook which first appeared in 1971 and which enjoyed a measure of success at the time. In the absence of indications to the contrary, it appears that this printing contains no changes compared with the first edition.

The book first appeared towards the end of an era in engineering education, though it must have been written near its climax. This was the time of expansive space exploration when the West believed in unlimited economic growth through the medium of a science-based technology and an increasingly science-oriented industry. The sequence of development appeared incontestable: scientific research followed by discovery, inevitably resulting, via development and demonstration, in new technologies and products.

At that time, statistical thermodynamics was percolating from theoretical physics to graduate and advanced undergraduate curricula in engineering. Tien and Lienhard's book was conceived as a vehicle for that progression and did it well: it takes the student in easy steps from macroscopic concepts through kinetic theory à la Sir James Jeans and classical statistics of independent particles to quantum mechanics. The book contains the standard applications and ends with a chapter on Boltzmann's equation and its solution. The emphasis is on doing, though some space is devoted to 'philosophy', in particular to a discussion of ergodicity in which, quite rightly at this level, the subtleties of the various 'paradoxes' are underplayed.

Since the beginning of this decade, times have changed and curricula emphasize 'energy', 'nuts and bolts' and similar aspects of the more classical topics of thermodynamics. How many universities still include courses in statistical thermodynamics in their *engineering* curricula, I do not know. The ones that do ought to take a look at this book.

JOSEPH KESTIN

LEROY S. FLETCHER (editor), **Heat Transfer and Thermal Control Systems.** Vol. 60, Progress in Astronautics and Aeronautics. AIAA (1978). 382 pp.

THIS book has been published simultaneously with its companion "Aerodynamic Heating and Thermal Protection Systems", Vol. 59, in this series. This book is concerned with: (1) Heat pipes, (2) Complex situations heat transfer and (3) Thermal Control systems. Thermal control systems deals primarily with the heating and cooling problems of space vehicles and their components. More recently, thermophysics has expanded to include, for example, energy collection, conversion and storage, resource assessment by satellite, thermal protection of space vehicles and detection of air and water pollution. The fundamentals of thermophysics are extremely important in the development of new and better thermal control components and systems.

Uniform temperature environment for instruments in the space missions must have precision thermal control. Heat pipes are a widely used but rather intricate means for internal temperature control, and the usefulness and effectiveness of these devices seem to increase each year. In this book basic transport processes and mathematical models in heat pipes are presented. Details on heat pipe geometry, shut-off performance and diode-reversal performance are presented.

A paper summarizes the state-of-the-art of axially grooved heat pipes. Recent developments in the analysis, design and fabrication of axially grooved hardware are discussed. A mathematical model that predicts the hydrodynamic behavior and accounts for liquid recession and liquid–vapor shear interaction is presented. A simplified closed-form solution that accounts for gravity effects, self-priming and composite pumping by the grooves is discussed.

Another paper describes theoretical and experimental results of a re-entrant groove heat pipe with 20 grooves of 0.8 mm dia channel and a 0.2 mm wide passageway.

Performance of a gravity-assisted heat pipe operated at small tilt angle is investigated theoretically, including the effect of vapor shear. The vapor shear creates a backflow region at the surface of the puddle and thereby degrades the