

## Heat Transfer

**Heat Transfer, Thermodynamics and Education. Boelter Anniversary Volume.** Edited by H. A. Johnson. McGraw-Hill Book Company, Inc., New York, N. Y., 1964. Cloth,  $8\frac{1}{2} \times 11\frac{1}{2}$  in., 472 pp. \$15.

REVIEWED BY R. D. CESS<sup>1</sup>

THIS is a volume honoring Dean L. M. K. Boelter of UCLA on the occasion of his sixty-fifth birthday, and it consists of thirty-four technical papers authored by his students, colleagues, and associates. In view of the number of papers involved, it is obvious that no attempt toward individual review can be made here. Basically, the papers are divided into four categories: (a) Heat-mass transfer and thermodynamics; (b) Materials, mechanics, and design; (c) Engineering education; and (d) City planning.

The major portion of the volume is devoted to the first category, with twenty-four papers comprising this section. On the whole, the papers cover an enormous range of interests. For example, the first category includes such areas as atmospheric turbulence, radiation heat transfer, desalinization, unsteady forced convection, and forest fire modeling, to name but a few.

## Elasticity

**Three-Dimensional Problems of Elasticity.** By A. L. Lur'e. Translated by D. B. McVean. Edited by J. R. M. Radok. Interscience Publishers, New York and London, 1964. Cloth,  $6 \times 9$  in., xii and 493 pp. \$16.

A translation of the original Russian text of 1955.—Ed.

## Kinematics

**Kinematic Synthesis of Linkages.** By R. S. Hartenberg and J. Denavit. McGraw-Hill Book Company, Inc., New York, N. Y., 1964. Cloth,  $6 \times 9\frac{1}{2}$  in., xi and 435 pp. \$13.75.

REVIEWED BY F. FREUDENSTEIN<sup>2</sup>

WITHIN recent years the ideas of modern kinematic synthesis have been introduced in universities, especially on the graduate level. This text fills a real need in this regard by presenting a concise treatment of the major ideas of kinematic synthesis in a lucid and logical fashion. Beginning with a historical outline, the authors discuss kinematic models and classical analysis and then proceed directly to type, number and dimensional synthesis, four-bar coupler curves, curvature, geometric and algebraic methods of dimensional synthesis involving precision points, complex-number techniques, and spatial kinematics. There is a judicious balance between geometric and analytical methods, with emphasis on computer techniques and modern viewpoints. Especially noteworthy is the chapter on three-dimensional kinematics, which reflects the authors' research contributions in this area.

An additional, though nontechnical, feature of the text is its graceful style, a gift with which engineering authors are not always overabundantly blessed. As a minor observation it is noted that the examples have been put at the back of the book;

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this reviewer's preference would have been to put them right in the chapters which contain the corresponding theory.

Altogether, the text represents an outstanding synthesis of modern kinematic synthesis and is recommended to all engineers, students, and educators concerned with the 20th-century developments of the subject.

## Inequalities

**Differential- und Integral-Ungleichungen.** By Wolfgang Walter. Springer Verlag, Berlin, 1964. Cloth,  $6 \times 9$  in., xiii and 269 pp. \$14.75.

REVIEWED BY RICHARD BELLMAN<sup>3</sup>

THE MATHEMATICIAN soon realizes that existence and uniqueness theorems, stability theory, and approximation techniques require a systematic study of functional inequalities. Up to now there has been no book specifically devoted to the study of inequalities of the form

$$x' \leq g(x, t), \quad u_{xy} \leq g(u, u_x, u_y, x, y), \quad u_t \leq g(u, u_x, u_x, u, x, t).$$

This volume fills this serious gap. All three types of inequalities are discussed in careful detail, including the interconnections with stability theory. Numerous references are given.

The origins of this new field are to be found in the work of many mathematicians: Caplygin, Haar, Perron, Collatz, and many others. Unfortunately, the author does not seem to be aware of the work of Caplygin (S. A. Caplygin, *New methods in the approximate integration of differential equations* (Russian), Gosudarstv. Izdat. Tech.-Teoret. Lit., Moscow, 1950). This work has stimulated an enormous amount of Russian effort in this area.

Nor does he mention the paper by Kalaba (R. Kalaba, "On nonlinear differential equations, the maximum operation, and monotone convergence," *J. Math. and Mech.*, vol. 8, 1959, pp. 519-574), where quasi-linearization techniques are discussed, together with their relations to dynamic programming.

For those interested in corresponding results for equations with two-point boundary-value conditions and for elliptic equations, we refer to: E. F. Beckenbach and R. Bellman, *Inequalities*, Springer-Verlag, Berlin, 1961.

For those interested in the applications of differential inequalities to computational results, we refer to: R. Bellman and R. Kalaba, *Quasilinearization and boundary-value problems*, American Elsevier Publishing Company, New York, to appear.

## Rheology

**Elastic Liquids.** By A. S. Lodge. Academic Press, London and New York, 1964. Cloth,  $6 \times 9$  in., xii and 389 pp. \$10.50.

REVIEWED BY E. H. DILL<sup>4</sup>

The character of the book is accurately described by the subtitle: An introductory vector treatment of finite strain polymer rheology. The majority of the book is a self-contained treatment of uniform (that is, homogeneous) strain of a continuum, illustrating the formulation of various special rheological constitutive equations. Other chapters describe the theoretical interpretation of some experimental methods related to shearing flow of

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