Classical Thermodynamics

In **Thermodynamics** (Prentice-Hall, Englewood Cliffs, N.J., 1966. 256 pp., illus. $7.95), J. T. Vanderslice, H. W. Schamp, Jr., and E. A. Mason present basic principles and applications of classical thermodynamics in a well-organized and concise manner. The concept of heat is treated on the mechanical basis. The presentation of the second law follows essentially the classical Clausius-Kelvin approach. The law is stated in terms of what cannot be done with a single heat reservoir. The law is logically developed by elimination of those processes that violate it when a single reservoir is involved. The novelty of presentation has the appeal of logical elegance, although some may feel that it is an unnecessary luxury.

On pages 174 and 175 it is stated that "an isolated system is in equilibrium if and only if $\Delta S<0$" and that this follows from the Clausius inequality. The "only if" part has not been shown and, in fact, cannot be shown to follow from the Clausius inequality. The Clausius-Kelvin statement of the second law tells us only what will not happen (decrease of entropy of isolated systems); it does not tell us what will happen spontaneously (increase of entropy). That maximum entropy (compatible with specified constraints) is a necessary condition of equilibrium must be postulated independently of and in addition to the Clausius-Kelvin statement, as has been done by Gibbs. Kramers, T. Ehrenfest, and Belinfante considered this additional postulate as the third independent part of the second law. Many texts are vague on the need of additional assumption here, which is poor authorship. The difficulty originates from the historical development of thermodynamics, which began as a theory of heat and heat engines, for which the Clausius-Kelvin statement is sufficient. It later developed into a more general theory concerning the physical phenomena of equilibrium, the laws of which go beyond those of the heat engine, and an additional basic principle must be introduced. The need for an additional postulate is the major shortcoming of the classical approach, though the issue is eclipsed by the successful development of statistical thermodynamics. In their recent attempts to reformulate the second law, Landau and Lifshitz, Tisza, Callen, Fong, and Belinfante try to overcome this difficulty by presenting classical thermodynamics as a macroscopic theory of equilibrium, the laws of which are more general and include the laws of heat engine as a special case. The classical approach of Clausius and Kelvin is interesting, useful, and historically important, and it is perfectly justifiable to present thermodynamics according to this approach in an unsophisticated first course, provided its limitations and the additional postulate are stated clearly. In this case the concept of heat might as well have been treated from the calorimetric point of view; the sophistication of the mechanical treatment seems a bit out of balance.

A variety of applications to physical and chemical systems are discussed. The most important topics for a one-semester course are all covered. These include electric, magnetic, radiation, and surface systems, in addition to the more basic physical and chemical systems. Enough variety is provided to demonstrate the generality of the thermodynamic methods. One would wish that the discussion of the radiation field had included the Wien displacement law as a preparation for discussion of Planck's law of black-body radiation; such a discussion would be useful to students and is usually not found in other courses.

PETER FONG
Lawrence Radiation Laboratory, University of California, Berkeley

New Books

General

American Intellectual Histories and Historians. Robert Allen Skotheim. Princeton Univ. Press, Princeton, N.J., 1966. 338 pp. $6.95.

An Annotated Bibliography of Mexican Ferns. George Neville Jones. Univ. of Illinois Press, Urbana, 1966. 331 pp. $5.

Checklist of Palaearctic and Indian Mammals, 1758 to 1946. J. R. Ellerman and T. C. S. Morrison-Scott. British Museum (Natural History), London, ed. 2, 1966. 818 pp. £6 6s.

Domebo: A Paleo-Indian Mammoth Kill in the Prairie-Plains. Frank C. Leonhardy, Ed. Great Plains Historical Assoc., Lawton, Okla., 1966. 63 pp. Illus. Paper, $2.50.

Directory of Electronic Circuits: With a Glossary of Terms. Matthew Mandl. Prentice-Hall, Englewood Cliffs, N.J., 1966. 240 pp. Illus. $10.

Elections and the Political Order. Angus Campbell, Philip E. Converse, Warren E. Miller, and Donald E. Stokes. Wiley, New York, 1966. 395 pp. Illus. $8.75.

The Engineer. C. C. Furnas, Joe McCarthy, and the Editors of *Life*. Time Inc., New York, 1966. 200 pp. Illus. $3.95. Life Science Library.

Essential Works of Pavlov. Edited and with an introduction by Michael Kaplan. Bantam Books, New York, 1966. 406 pp. Illus. Paper, $1.25.

The Geography of Northwestern Europe. F. J. Monkhouse. Praeger, New York, 1966. 544 pp. Illus. $9.50.

Gravimetric and Celestial Geodesy. A glossary of terms. Ivan I. Mueller and John D. Rockie. Ungar, New York, 1966. 141 pp. Illus. $5.

Human Ecology. Jack B. Bresler, Ed. Addison-Wesley, Reading, Mass., 1966. 480 pp. Illus. $9.75. Reprints of 36 papers from various journals and published between 1953 and 1964.

Inland Fisheries Management. Alex Calhoun, Ed. Dept. of Fish and Game, Resources Agency, Sacramento, Calif., 1966. 552 pp. Illus. Paper, $3.84. There are 76 papers.

Instructional Media and Creativity. Proceedings of the Sixth Utah Creativity Research Conference (La Jolla, Calif.), August 1964. Calvin W. Taylor and Frank E. Williams, Eds. Wiley, New York, 1966. 421 pp. Illus. Paper, $3.95; cloth, $8.95. There are 13 papers.

Irrigation. Josef D. Zimmerman. Wiley, New York, 1966. 534 pp. Illus. $12.50.

Magnetohydrodynamics. Alan Jeffrey. Oliver and Boyd, Edinburgh; Interscience (Wiley), New York, 1966. 260 pp. Illus. $3.50.

Megalopolis Unbound: The Supercity and the Transportation of Tomorrow. Claiborne Pell. Praeger, New York, 1966. 243 pp. Illus. $5.95.

Modern Masterpieces of Science Fiction. Sam Moskowitz, Ed. World, Cleveland, Ohio, 1965. 528 pp. $5.95. Twenty-one short stories, dating from 1935 to 1962.

The Moon. V. A. Firsoff. New American Library, New York, 1966. 127 pp. Illus. Paper, 60¢.

The Nerves of Government: Models of Political Communication and Control. Karl W. Deutsch. Free Press, New York, 1966. 352 pp. Paper, $2.95.

October the First Is Too Late. Fred Hoyle. Harper and Row, New York, 1966. 206 pp. $3.95. Science Fiction.

Organic Reaction Mechanisms, 1965. An annual survey covering the literature dated December 1964 through November 1965. B. Capon, M. J. Perkins, and C. W. Rees. Interscience (Wiley), New York, 1966. 360 pp. Illus. $9.50.

Origins of Mendelism. Robert C. Olby. Schocken, New York, 1966. 204 pp. Illus. $6.95.

The Peyote Religion among the Navaho. David F. Aberle. Aldine, Chicago, 1966. 480 pp. Illus. $10.

Phenomenology and Physical Science. An introduction to the philosophy of physical science. Joseph J. Kockelmans. Duquesne Univ. Press, Pittsburgh, Pa., 1966. 208 pp. Illus. Paper, $6.20; cloth, $6.95. Duquesne Studies, Philosophical Series, No. 21.

Political Development and Social Change. Jason L. Finkle and Richard W. Gable, Eds. Wiley, New York, 1966. 613 pp. Illus. $8.95. There are 45 papers.

Population Studies of Birds. David Lack. Oxford Univ. Press, New York, 1966. 347 pp. Illus. $10.10.