

disappearance can hardly be conceived.

The editor for this sixth edition of the volume on thermodynamics is A. Kastler, professor at the University of Paris. This latest updating unites the qualities of the classical text by Bruhat and the completeness of a really modern treatise. It ranks among the most comprehensive thermodynamics texts available to students. It carries along a well balanced blend of basic principles and their experimental and historical justification, theoretical arguments and applications to engineering and to advanced contemporary physics. As is frequent in French books, the mathematical exposition is systematic and rigorous, but it is by no means overwhelming and the book remains primarily a physics book. It is a good clear treatise but does not have problems for students to solve. The exposition is above average regarding clarity.

The first 100 pages are devoted to a detailed analysis of the principles of thermodynamics and their formulation. The mathematical relationships are then developed, and direct application of the principles is made to important cases such as: perfect and real gases, real fluids, changes of state and Nernst-Planck postulate. This is followed by the application of thermodynamics to several physical phenomena (surface energy, electrostatics, thermoelectricity, voltaic cell and magnetism), and the general features of chemical thermodynamics. An elaborate presentation of statistical thermodynamics and its applications covers 250 pages. Moreover, a new chapter by J. Chanu gives a substantial introduction to the thermodynamics of irreversible processes.

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Plasma Diagnostics

W. Lochte-Holtgreven, ed.
928 pp. Interscience, New York, 1968.
\$38.50

"This book provides an up-to-date account of the major theoretical and practical aspects of the diagnostics of high-temperature plasmas with special emphasis on quantitative spectroscopic methods. The different chapters were written by specialists actively engaged in research in these fields."

So starts the jacket blurb, and I could not have said it any better. W. Lochte-Holtgreven, of the University of Kiel, has gathered together a dozen men (including himself) and has produced 15 chapters on diagnostics of hot plasmas.

The first six chapters concentrate more or less on various spectrographic methods. X rays, microwaves, lasers and mass-spectrographic methods each rate a chapter, and electric (Langmuir) probes occupy two chapters. The second of these covers the special conditions usually arising from hypersonic velocity and an ungrounded system, met with in space-vehicle mounting of these probes. A chapter is devoted to measurement of magnetic fields in pulsed-plasma systems (in dc systems, the magnetic fields are too uniform to give much information, says Böttcher, who wrote this chapter). This section also describes various probes, Zeeman methods and the Faraday effect. A chapter on collisions and transport cross-section measurements and one on transport properties end the book.

As befits a 928-page book, it says almost everything worth saying on the subject. After working in plasma physics for over ten years, I found a number of techniques in this book new to me, but I could not think of one, offhand, that was not at least mentioned and referenced.

From the depth of treatment of material, I would judge that the book was intended to teach a worker in the field about methods he may not know, and to teach him enough that he can intelligently choose a particular method to apply to his problem. But then I would suggest that the worker still go to the references given (there are 1695 of them) to learn enough details to apply the method. This is a reasonable way to organize such a book. To have added the contents of all those references would have put the book's covers too far apart.

For a multiauthored book, the chapters are relatively uniform in depth and treatment. References up to 1966 are cited by some authors, 1967 references are cited by others. Perhaps amusingly, Robert L. F. Boyd, writing on Langmuir probes on spacecraft, (probably the most avant-garde chapter), quotes references only to 1965. This could be, of course, because there was no 1966 references that Boyd found of interest; in many cases, years were completely

skipped by all of the 12 authors.

Why, in a book so beautifully organized, so admirably useful to nearly every working plasma physicist, so thoroughly referenced, (and so expensive), did Lochte-Holtgreven get tired at the end and put in a skimpy subject index? Was he trying to prove that nothing, not even his book, was perfect?

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Variational Principles In Dynamics and Quantum Theory

By Wolfgang Yourgrau,
Stanley Mandelstam
201 pp. Saunders, Philadelphia, 1968.
\$6.50

This is the third edition of a little volume, first published in 1952, that traces the uses of the variational principle in physical science all the way from Hero of Alexandria to Schwinger of Massachusetts. The occasion for the new edition is the addition of an essay by Laurence Mittag, Michael Stephen, and Wolfgang Yourgrau on the hydrodynamics of normal and superfluids, emphasizing variational formulations.

The book, however, is worth commenting on as a whole, for it has languished for 17 years in an undeserved obscurity. It offers concise and elegant formulations of the great variational principles of optics, mechanics, electrodynamics, quantum theory (old and new), and now, hydrodynamics. Although each topic is skillfully presented in analytic terms congenial to the modern reader, the historical background is almost always preserved. This is a luxury almost universally abandoned by authors of scientific books, and though the reasons for this are obvious, the loss is quite possibly greater than many of us think. It is not just that the subject is thereby dehumanized; the accompanying loss of perspective on our own efforts, both as physicists and as people, is equally to be regretted. A trivial example is the discussion of Hamilton-Jacobi theory (the concise presentation of which, by the way, is the best I have seen this side of Landau and Lifshitz) which treats us to the spectacle of Jacobi, unable to resist the needle, in pre-

senting his modest refinement of Hamilton's remarkable edifice (page 58): "I therefore do not know why Hamilton . . . requires the introduction of a function S of $6n + 1$ variables . . . while, as we have seen, it is completely sufficient to . . ." Does not that blend of pride and false innocence recall innumerable referee's reports, replies to referee's reports, and now *Physical Review* comments and countercomments that we have all read and (alas) written? Compare the dignity of Hamilton on Lagrange (page 44): "Lagrange has perhaps done more than any other analyst, to give extent and harmony to such deductive researches, by showing that the most varied consequences respecting the motions of systems of bodies may be derived from one radical formula; the beauty of the method so suiting the dignity of the results as to make his great work a kind of scientific poem."

Would that we were all in dread of being remembered as much for our prose as our theories and experiments; it might well benefit all three.

Not the least of the pleasures offered by Mandelstam and Yourgrau is the abundance of nuggets like the two cited above. A few more examples:

Whittaker on Hilbert's variational formulation of Einstein's law of gravitation: "Gravitation simply represents a continual effort of the universe to straighten itself out."

Poisson on the principle of least action (1837): "... only a useless rule."

Planck on the principle of least action (1915): "... that [general law] which . . . may claim to come nearest to that ideal final aim of theoretical research."

My complaints are few. Several philosophical axes are ground at regular intervals throughout the text, which process I personally found of little interest. Furthermore (and I offer this comment with the greatest reluctance in this day when scientific prose has completed its evolution into a medium with the vibrancy and resilience of wet cotton) I was continually disconcerted by a prose style I can only describe as baroque (Example: "Almost overbearingly did he postulate . . .") and a staggering lack of humor. Two examples of the latter:

Could not Planck have been joking when he viewed "as a variational principle Leibniz's maxim that our world is the best of all possible worlds!"

Could Voltaire (of all people), speaking of Maupertuis, not have been joking when he "dubbed him 'Sir Isaac Maupertuis,' so elevating him to the lofty rank of Newton," especially in view of the fact that he "later inveighed against his former idol with uncontrolled invective."

If not, your reviewer stands convicted of a most unseemly frivolity and irreverence. Be that as it may. The book as a whole should be a delight to the-educated and a most valuable supplementary text for the student.

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The Tides: Pulse of the Earth

By Edward P. Clancy

228 pp. Doubleday, New York, 1968. \$4.95

Written in a colloquial style, with rhetorical digressions into poetical and surrealistic imprecision, this book can be read as a novel without expecting too much hard factual information. It is said to be directed to students as well as to the general public, but to the former it will hardly be very useful except if they are familiar with the subject.

Even the general reader will be often disappointed by the author's failure to offer simple figures or explanations, for he covers them up by verbiage like this: (about the output of volcanoes) "... you may object that . . . volcanoes spew forth little material. But ask a geologist to make a rough estimate. . . . Double the figure he gives. . . . Multiply the result by 4.5 billion years." and so forth. Yet the figure is not given, so that the reader is unable to perform the calculation. It would have been simpler to say that the present output of volcanoes is about one km^3 per year and omit all the empty rhetoric. Cases like this are numberless and characteristic of the entire book.

Serious misstatements also abound. On page 199 the author remakes celestial mechanics by saying that "the moon's revolution about the earth is becoming faster and faster." Later, it is maintained that "If the moon is speeding up in its orbit, it is gaining kinetic energy" and then that "the

earth's loss of rotational kinetic energy goes . . . partly into increased kinetic and potential energy associated with the moon's orbit." Actually, in the tidal transfer of momentum, the kinetic energy of the moon decreases, and only the potential energy and angular momentum are increasing. Nowhere is it mentioned that tidal interaction leads to a steady increase in the moon's distance, accompanied by a lengthening of the month or slowing down of its orbital revolution. This complete misunderstanding of tidal evolution annuls whatever the author, in so much verbiage, is subsequently saying about the history of the earth-moon system and the paleontological clues (corals) to the variation in the length of the day.

The illustrations are below standard and noninformative. Any reader is supposed to be able to read a map; yet the two maps of Passamaquoddy Bay, in their surrealistic presentation, are all but an insult to his intelligence. Everything else is similarly distorted.

If much of the meaningless verbiage were cut out and substituted by elementary factual information, still retaining the poetry, the book's value could be greatly increased. In my recent experience, I have repeatedly concluded that too many books are too lightly published nowadays: The present book is no exception.

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Reflexionsspektroskopie

By Gustav Kortüm

378 pp. Springer-Verlag, New York, 1969. \$21.50

In recent years methods of reflection spectroscopy have been extensively refined and developed and physical data not accessible to standard spectroscopic analysis are now being made available. Such data are optical constants (index of refraction and dielectric constant), parameters of crystal powders, properties of pigments, molecular structure, adsorption, catalysis on surfaces, kinetics of surface reactions, ligand structure and surface-photochemical processes.

This book's purpose is to indicate the capabilities of the two major reflection-spectroscopic approaches, namely diffuse reflection and attenuated total internal reflection. The lat-