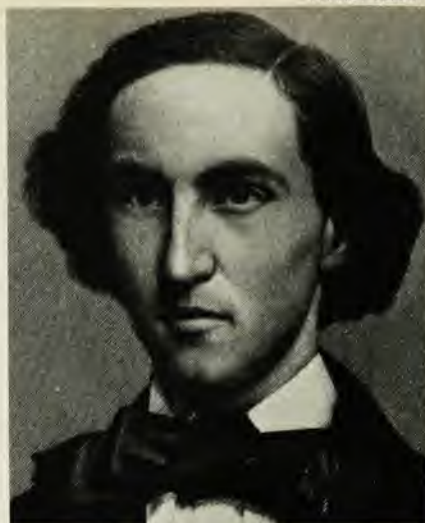


sion in this book. The quantitative theory of simple liquid mixtures is likely to progress quickly, now that the potentials are being separately determined; this again is too recent.

There remains the difficult question, what will the market for this book be? From the subject matter and the level of presentation, it could be a useful reference for a wide variety of workers interested in the properties of condensed phases. One could get a good start on a topic by looking in this book. Pricing seems to put it in the library rather than on one's private bookshelf and then it suffers in competition with specialized monographs and the *Handbuch der Physik*. I recommend it as an addition for libraries.

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GIBBS

summarized in Gibbs's own abstract and in carefully arranged excerpts. The selections are judicious, although I would have preferred the paper on thermodynamic surfaces to the longer one on graphical methods.

A paper on the theory of light supplements the picture by showing a less known and less influential aspect of Gibbs's work.

The mathematical papers make fascinating reading. These are the only ones where a personal note comes through loud and clear, and motivations are explained for selecting among "multiple algebras," such as the quaternions of W. R. Hamilton, the general vector formalism of Hermann Grassmann, Gibbs's own dyadics and his elementary vector concept now in general use.

With all these positive aspects, one cannot help but express disappointment over the fact that the very short notes introducing the papers dwell mostly on generalities, and little effort is made to interpret characteristic Gibbsian ideas.

Matters are not helped by misprints, which often disfigure formulas (as on pages 95, 96, 162). However, I found no misprints in the reproduction of the papers.

The selections are introduced by Gibbs's obituary of Rudolf J. E. Clausius. This is an interesting choice, but even experts will be puzzled by the term "disgregation" used without explanation. While this term is now utterly out of use, the issue behind it is most timely: the extension of thermodynamics in the microscopic direction. It might have been helpful to refer to J. M. Klein's paper in *Historical Studies in the Physical Sciences*, 1970, pages 127-149, where the matter is clarified, along with other background material concerning priority between Clausius and William Thomson (Lord Kelvin).

It will be years before such an analysis in depth will be performed on

Gibbs's *oeuvre*, and at present we can welcome this volume for what it offers.

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Crystal Physics— Macroscopic Physics of Anisotropic Solids

H. J. Juretschke

220 pp. Addison-Wesley, Reading, Mass., 1974. \$19.50 hardcover, \$12.50 paperback

Crystal physics is an old field but one whose importance has grown with each decade. New interactions and effects of anisotropy continue to be discovered and used. There is thus a need for elementary textbooks to introduce undergraduate students to the field at the macroscopic level of understanding and act as a base of information for more advanced treatments of the microscopic physics. *Crystal Physics—Macroscopic Physics of Anisotropic Solids* by Hellmut J. Juretschke, whose research has ranged over metals, surface physics and elasticity, serves such a purpose. It considers the simple physics of various interactions, their crystal symmetry, and simple applications of them that emphasize the anisotropy. The topics considered include polarization, magnetization, electric conduction, thermoelectricity, piezoelectricity, elasticity and crystal optics. These are almost exactly the topics considered in several other well known textbooks on crystal physics by W. A. Wooster, Wooster and A. Breton, J. F. Nye, and Warren P. Mason. The level and length of Juretschke's book is comparable to that of Wooster's books but shorter and less detailed than those of Nye and Mason. One's preference in this comparison, rather than the small difference in subjects covered, will probably determine from which of these books one teaches.

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The Classical Dynamics of Particles

R. A. Mann

299 pp. Academic, New York, 1974. \$19.50

The dynamics of particles is taught usually as part of classical mechanics in the nonrelativistic case, and as part of a course on relativity or electrodynamics if treated relativistically. To have a

Men of Physics: Josiah Willard Gibbs

R. J. Seeger

290 pp. Pergamon, New York, 1974. \$18.00

This volume is part of the Series *Men of Physics*, in which innovative papers of outstanding physicists are reprinted with a brief introduction and commentary that places them in the context of present-day physics. The aim is to counteract the tendency toward depersonalization that is evident both in modern texts and in team research.

Few men could serve as a better antidote to a loss of individual identity than Gibbs, the lonely American theoretical physicist and chemist whose ideas were ahead of his time but are now in the public domain. Whereas quantum mechanics weakened many of the principles of classical physics, it helped to sharpen the Gibbsian ideas in thermodynamics and statistical mechanics and enabled us to remove obscurities that reflected incomplete empirical knowledge.

Yet to offer the writing of Gibbs to widen our perspective constitutes an unusual challenge that is only partly met in this volume. There are undoubtedly serious students of thermodynamics and statistics who always wanted to read Gibbs, but were discouraged by the bulk and austerity of the *Collected Papers*. They will welcome this tidy, but representative, selection arranged in a reasonable order, provided with a general introduction on Gibbs's life and an introduction to each paper, which ensures some continuity. Most papers are reproduced in full, the two main works on heterogeneous equilibrium and statistical mechanics being

textbook devoted purely to this subject covering comparatively both the nonrelativistic and special relativistic forms is a good, although common, idea. As physics develops, the styles and emphases of the basic texts slowly change with it, even if the subject matter is old. I suppose that is one reason why there are so many textbooks; so it is also good to have a modern one. The level is that of advanced undergraduates or beginning graduate students. The conflict between generality and didactic simplicity appears right at the beginning when the equations for a free particle are derived from the unproved ("it can be shown that") geodesic equation with Christoffel symbols. Aside from this the level is appropriate to the intended audience and the main topics, Lagrangian, Hamiltonian formalisms and conservative laws are treated adequately and with many examples. In fact "solved examples" in each chapter is a novel feature of the book. An unexpected feature in the book is that the appendix has forty pages of material on group theory and tables of *finite* groups, and more is found in the text. This is clearly an example of the new style and emphasis that I mentioned, and another tribute to the power and appeal of group theory. Future generations of physicists will undoubtedly learn the subtleties of group theory much earlier than the present generation. There is, however, relatively little discussion on continuous groups, which are also being used increasingly in classical mechanics. All together, this is an interesting and innovative textbook.

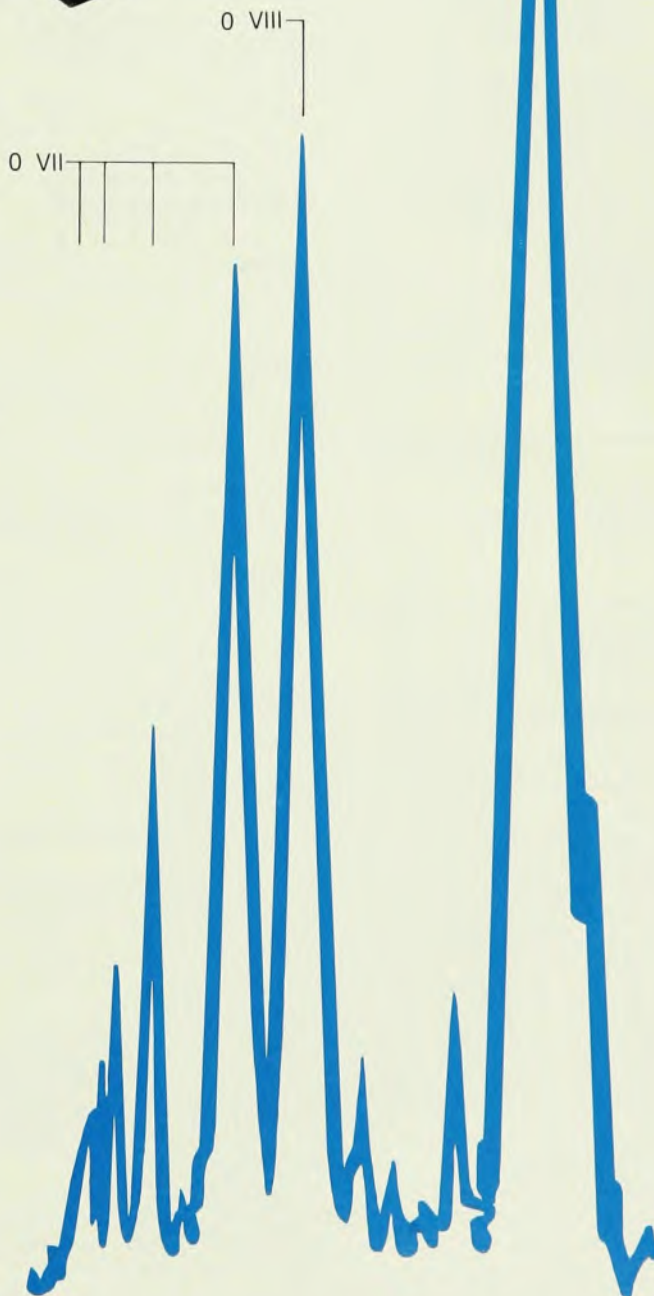
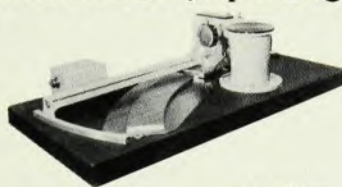
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Black Holes, Gravitational Waves and Cosmology: An Introduction to Current Research

M. Rees, R. Ruffini, J. A. Wheeler
410 pp. Gordon and Breach, New York, 1974. \$29.50; text edition (minimum 10 copies) \$19.50

The recent surge of interest in general relativity has led to some remarkable scientific developments. Of these, the most significant concern the topics that give this book its title, namely black holes, gravitational waves and cosmology. The sections that deal with the first two topics are based on a report written by Remo Ruffini and John Wheeler for a conference organised by the European Space Research Organization and published by them in 1971. So rapid has been the development of black-hole theory in the last few years

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