

berg's book as to dismiss the serious and important issues that it raises.

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## The unity of mechanics

**THEORETISCHE MECHANIK: EINE EINHEITLICHE EINFÜHRUNG IN DIE GESAMTE MECHANIK.** By Georg Hamel. 798 pp. Springer-Verlag, Berlin, 1967. \$21.00

by Rolf Landshoff

The laws of mechanics can be formulated in a variety of ways. The most common approach is to focus on one branch of mechanics at a time, to formulate a set of concepts that is most suitable for dealing with this branch and to develop the appropriate laws. If one proceeds in this manner, the ties that connect the various branches of mechanics are peripheral and do not occupy a very important position.

Georg Hamel approaches mechanics with an entirely different philosophy. In the spirit of Lagrange he stresses the unity of this science and proposes a structure in which its various branches appear as special cases. The starting point of this method is a small set of axioms that make it possible to derive all the relevant laws in a mathematically rigorous way. The pillars of this axiomatic structure are the principle of virtual work, d'Alembert's principle and the principle of release (*Befreiungsprinzip*). The last of these is not found in other books. It is invoked if one wishes to calculate forces of constraint. If the connections responsible for the constraints are absolutely rigid, these forces cannot contribute to the virtual work. When applying the principle of release one thinks of the connections as not being entirely rigid but as giving a little. The reaction forces can now be interpreted as elastic ones that are indeed capable of doing work, and it becomes possible to calculate them by applying the principle of virtual work.

From the axioms the reader is led to the mechanics of mass points, rigid bodies, strings, ropes, membranes,

plates, elastic bodies and fluids. It is obviously not possible to cover much more than the basic laws of each one of these many applications. The one exception is the theory of the gyroscope that the author follows up in considerable depth.

The book also contains an extensive discussion of analytical mechanics, that is, the Hamiltonian formulation, the use of variational principles, transformation theory, the application of the theory of Lie groups, and so forth.

The serious student of mechanics will appreciate the approximately 260 pages of problems that form part two of the volume. As Hamel puts it in his forward: "Certainly thinking is more important than calculating. Nevertheless it is essential that one knows how to calculate as well and one can't learn it if one avoids it. Nothing is more dangerous than to think that a problem is solved when one knows the method for solving it."

The book developed out of the courses taught by Hamel during the 25 years he served as professor of mathematics and mechanics at the Institute of Technology (T.H.), Berlin. It appeared originally in 1949 and has now been reissued with minor corrections 13 years after the death of its author. Two other books of his deal with integral equations and continuum mechanics.

*Theoretische Mechanik* should probably not be used as a primary text for studying mechanics but it is, in my opinion, very valuable for anyone who wants to become thoroughly familiar with the field.

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## Perspectives of spectra

**ATOMIC SPECTRA.** W. R. Hindmarsh, ed. 368 pp. Pergamon Press, Oxford, 1967. Cloth \$7.50, paper \$6.00

by Harold Mendlowitz

Many reprint volumes containing classic papers in a given field are now on the market, and this book belongs in that general class. *Atomic Spectra* by William R. Hindmarsh is different from most, however. It contains about 100 pages of introduction and interpretation of some of the

most important papers on atomic spectra. The papers include the works of Balmer and Rydberg at the close of the 19th century and Hans Bethe's interpretation of the Lamb shift. Hindmarsh, a professor of atomic physics at the University of Newcastle upon Tyne, not only edited this volume but also contributed a substantial part as author of what might be called an introduction to atomic spectroscopy of one- and two-electron spectra. By design this portion is comparatively brief and telegraphic, but it treats in modern perspective the advances in our under-



standing of a field that was considered a closed subject about a decade after the invention of quantum mechanics.

With the newly revived interest in this field because of the current interest in plasma physics and astrophysics, this book should find a wide audience. It could serve as a basis for an honors course or a seminar on the senior undergraduate level or beginning graduate level.

The choice of papers in any reprint volume is a personal one. In this case I would agree with the majority of the choices made. The author-editor was extremely considerate of his audience in that he translated all the papers that were not published in English. He also took the trouble to cull from the reproduced papers those parts that are relevant to the subject treated here.

I think that Hindmarsh is to be commended for his effort and the result.

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