

ster" in the theory of chemical reaction rates. Most workers in the field accepted that in principle it could exist, but while some researchers enthusiastically invoked its presence at the slightest twitch of an Arrhenius plot, equally ardent skeptics worked to debunk their proofs by devising alternative explanations. Because of these controversies and because of its attraction as a macroscopically observable manifestation of a purely quantal phenomenon, this topic historically assumed quite a high profile in studies of chemical kinetics, in spite of the relatively meager experimental evidence for it.

Ronald P. Bell, now at the University of Leeds, has been a central and prolific contributor to this field throughout almost the whole half century of its existence. His latest book summarizes the state of this problem as he sees it. It is a slim volume that addresses no particular slot in a teaching curriculum, but rather sets out to summarize the available evidence regarding tunneling in a wide variety of contexts and to describe the main features of the traditional theory. As such, it will be a good sourcebook for students of kinetics who wish to attain some perspective of this phenomenon, and it will of course be an essential touchstone for the many aficionados (including the present writer) of tunneling phenomena in chemical and physical processes.

The book is well written and should be readily accessible to students of kinetics at all stages, as it assumes only a basic undergraduate familiarity with quantum mechanics, kinetics and statistical mechanics. My only criticisms are that analytic results for special potential barriers seem to claim an undue fraction of Bell's attention and that he devotes perhaps too much space to the various methods of performing permeability calculations. Moreover, while he mentions the marked qualitative difference between the results for the symmetric and asymmetric double-minimum potential, it is disappointing that he has not pursued its implications further.

Bell's book appears at a time when the focus of attention in this area is changing. Over most of the past 50 years, discussions of tunneling in chemical kinetics have focused on bimolecular gas-phase or solution reactions at room temperature and above. Under those conditions, tunneling typically provides only a small contribution to the observed reaction rate, and it has taken major experimental and theoretical efforts to ascertain its presence unambiguously. In the last few years, however, attention has shifted to reactions occurring in solid matrices at temperatures as low as 4 K. Under these conditions the thermally averaged tunneling factors can be as large

as 10^{50} to 10^{100} . While the theories for these latter situations are still evolving, Bell's book spans both these worlds and provides a nice overview of both a venerable old subject and its intriguingly different modern directions.

ROBERT J. LE ROY
University of Waterloo

The Evolution of Mechanics

P. M. M. Duhem

235 pp. Sijthoff & Noordhoff, The Netherlands, 1980. \$47.50

Although P. M. M. Duhem was one of the most influential writers and thinkers in the history and philosophy of science, practically none of his works are available in English. Within the last few years his *Aim and Structure of Physical Theory*, his most general book, and a specialized work, *To Save The Phenomena*, have appeared in English. Duhem's important historical monographs, on mixtures in chemistry, the work of J. Willard Gibbs and other aspects of the development of modern science, are not only unavailable in English but have long been out of print in the original French versions.

The present work, first published in 1905, deals with mechanics in relation to the general theory of thermodynamics. The book has two parts, the first of which is devoted to "mechanical explanations" and the second to "thermodynamical theories." It was Duhem's aim to set forth in a critical manner the general principles of mechanics so that he could then demonstrate that his own more abstract general thermodynamic theory (sometimes called the theory of energetics) is as useful a part of physical science as the classical mechanical sciences.

In the course of this exposition, Duhem presents an exciting, though brief, history of the main ideas of classical mechanics and thermodynamics. This small book should, therefore, be welcome to every thoughtful physicist and to all who are interested in the development and significance of the central concepts of physics prior to quantum theory.

While the translation appears to be well done, one wishes that the publisher had provided, for instance, an index of names and a more detailed subject index. Furthermore, the references have not been brought up to date. One footnote refers the reader to the original German edition of Heinrich Hertz's book on mechanics, without even mentioning the English translation and the current Dover reprint of it. In some cases works written in French are referred to in German translations because when Duhem was writing these were the only editions in print. Equally unhelpful to today's readers is the

reference to a book by Ruggiero Bosovich in the rare original Latin editions of 1758 and 1763, when there is a splendid edition in Latin and English, the English part of which was reprinted by the MIT Press.

The introduction by G. A. E. Oravas is an uncritical biographical account of Duhem, written with enthusiasm. Unfortunately it fails to indicate the nature of the book being translated and its relation to the debates within physics at the time it was written. After all, the year of publication was 1905, the year in which Einstein published his first paper on special relativity and his paper on the quantum theory of light and the photoelectric effect.

I. BERNARD COHEN
Harvard University

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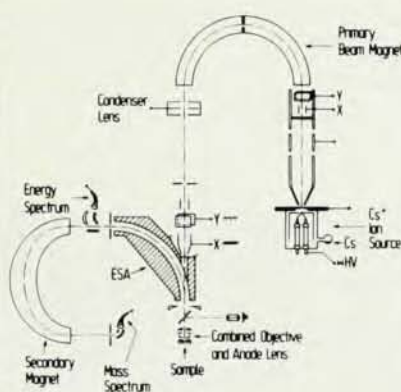
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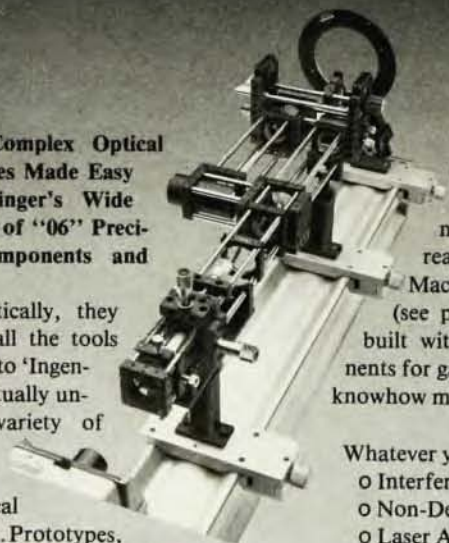
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