tent, for which interactions with surroundings may be assumed to be negligible. In the present volume, Ralph J. Tykodi, who until recently was a member of the chemistry department at the Illinois Institute of Technology and is currently associate professor of chemistry at Southeastern Massachusetts Technological Institute, addresses himself to the general problem of the interaction of nonequilibrium systems with their surroundings, that is, the apparatus dependence of steady-state thermodynamic quantities.

This book is primarily a consolidation and extension of the author's prior published investigations into various aspects of the *theory* of nonequilibrium thermodynamics. However, despite an emphasis upon theoretical matters, experimental applications are foremost in the author's mind, and data are analyzed in a number of specific examples; I think such viewpoint to be an outstanding attribute of this work.

The book is not easy to read. Tykodi stresses that he has a unique view of the subject of nonequilibrium thermodynamics. He feels that problems in which he is interested necessitate reformulation of the theoretical foundation of the latter, and he has devoted considerable effort to this task. The principal characteristics of his theory seems to be: (1) utilization of the operational technique of always defining a system large enough so that only heat and work may be exchanged with its surroundings; (2) the assumption that such a system can always be divided into "terminal parts" and "gradient parts," the whole system being capable of sustaining steady-state operations; and (3) the imposition of an extended, global theory of minimum entropy production. An advantage of presenting original research in monograph form is that space can be given to a comparison of the author's work with alternative points of view, and I wish such had been done to a greater extent in the present volume. Also, in a number of respects the organization is uneven, and the notation and terminology are unfamiliar, compounding the difficulties one has when trying to understand the author's main arguments. Consequently, it might be useful to read the author's original papers before undertaking the monograph.

Both the author and publisher suggest that the book is suitable as a text for graduate students in chemistry, physics and engineering. However, despite the fact that problems are suggested and a wide number of applications indicated, due to the specialized nature of the subject and the unusual nature of the presentation I think that the book would better serve as an auxiliary reference. On the other hand, a scientist actively working in this field might find a number of interesting points to take under consideration.

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Masterful biography

JOSEPH PRIESTLEY: REVOLUTIONS OF THE EIGHTEENTH CENTURY. By F. W. Gibbs. 258 pp. Doubleday, New York, 1967. $6.00

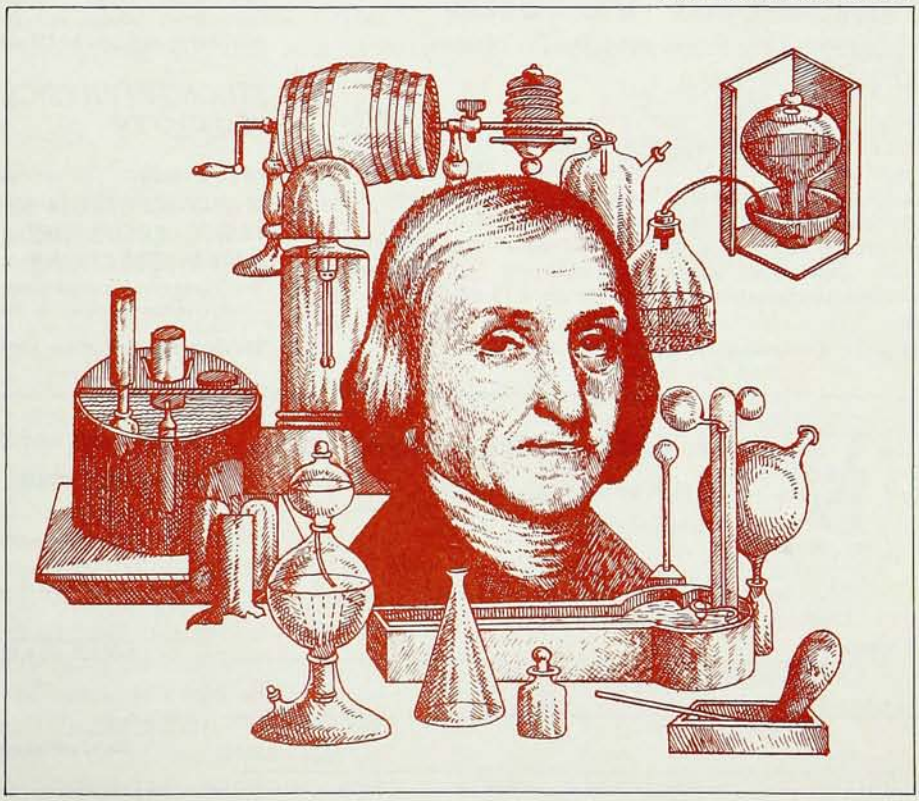
by Sanborn C. Brown

There is a growing number of teachers who are becoming convinced that teaching science in a historical perspective, particularly for the nonscientists, is good pedagogical technique. One of the difficulties in this approach is the lack of adequately authoritative case studies of particular men. Many biographies of scientists tend to separate their science from their life and environment, and hence lose value as a reference text in the teaching of science through the historical approach.

F. W. Gibbs has produced a masterfully written biography of Joseph Priestley which should be enthusiastically accepted by those interested in the development of chemistry during the 18th century as well as those whose natural curiosity is stimulated by the life of a man who so wholeheartedly entered into both the scientific and political revolutions of the day. His science is already legendary, and he challenged the authority of the Anglican church to a degree that sent mobs through the streets of Birmingham for days searching out and destroying everything they felt was associated with Unitarianism.

As is true of many 18th and 19th century scientists, a number of biographies have been written, and with Priestley the problem has always been the overwhelming amount of material that is available to those who want to write about him. As both a chemist

JACKET ILLUSTRATION BY RAY CRUZ



and a historian of science, Gibbs not only has succeeded in presenting an interesting and authoritative account of both Priestley's life and science, but also has instilled into his writing the violence and excitement of a political and theological radical who apparently courted destruction as a way of life.

Priestley's scientific work was carried on in very distinct periods of his life, so that it is possible to discuss most of his research in the middle chapters of the book. This will have the advantage, for those who do not want to follow in detail the trail of electricity, light, airs, acids and alkalies, that they can skip through this middle section of the book without loss of continuity in the story. On the other hand, this very section will be of the most value for those who would like to use the book in an elementary chemistry course, since it is both carefully and accurately done, and one is constantly reminded by the author not only of the specific nature of particular experiments, but where it fits into the general development of chemical theory and practice.

The only lack of emphasis that Priestley himself might have felt, if he could have read this short account of his tremendously busy life, would be the relative lack of attention with which his theology is treated and the sketchiness with which his unhappy life in America is handled after he had to flee England for his very life.

Although this appears to be an American edition of this book, it is part of a series entitled "British Men of Science," and I am sure that some American readers will be as puzzled by reference in the preface to "the opening of the M1" as were the British users of the second edition of N. H. Frank's textbook *Introduction to Mechanics and Heat* when a British reviewer said that his greatest puzzlement came from a problem involving a "pop fly." As far as his dictionary went, he could find housefly, tsetse fly, deer fly, and firefly, but he was unable to discover the entomological classification of a "pop fly."

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Mathematical foundations of magnetohydrodynamics

RELATIVISTIC HYDRODYNAMICS AND MAGNETOHYDRODYNAMICS: LECTURES ON THE EXISTENCE OF SOLUTIONS. By Andre Lichnerowicz. 196 pp. W. A. Benjamin, New York, 1967. Cloth $9.50, paper $4.95

by Peter G. Bergmann

The author of this monograph is one of the most distinguished mathematicians and differential geometers, and professor at the Collège de France at Paris. This monograph is the result of lectures given at the Southwest Center of Advanced Study at Dallas during the fall of 1965. Its primary concern is with the existence and classification of solutions of the equations of general relativity, of relativistic hydrodynamics, and of magnetohydrodynamics. More particularly, Lichnerowicz has examined the *local* existence of solutions if initial-value data (*Cauchy data*) are properly made available. Global questions are specifically excluded from consideration.

Anyone who has worked in this field knows that the mathematical analysis of the Cauchy problem is far from simple. It is complicated by the circumstances that the construction of a proper Cauchy problem is not straightforward, and that even if the data are correctly given the solution is formally nonunique because of the freedom of coördinate transformations away from the Cauchy hypersurface. The pioneering papers, which brought order into this chaos, are by Lichnerowicz and by his former student, Y. Choquet-Bruhat. The present exposition is systematic, clear, and requires a relatively modest amount of technological knowledge on the part of the reader. The treatment starts with the Cauchy problem of gravitation in empty space, then adds matter in the form of "cold dust" (called "pure matter" in this book), next adds fluids, goes on to charged fluids that are perfect insulators, to culminate in the treatment of conducting electrically charged fluids. The final chapter is concerned with the propagation and classification of so-called "shock waves," that is, fields in which some of the variables that characterize the field change their values discontinuously. Some of the theorems presented are new.

Whereas the presentation by the author is to be commended for its lucidity, which makes the problems