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

treated appear deceptively simple, the contributions by the publisher leave much to be desired. When a publisher undertakes the presentation of a work by a distinguished author, whose native tongue, moreover, is not English, he must bear the responsibility for careful editing and proof reading, and the book falls down in these respects. The typography of the mathematical expressions suffers from the use of identical fonts for principal symbols and for superscripts and subscripts (with the exception of numerics), resulting in unsightliness everywhere and in confusion in some places. Finally the index includes a grand total of 50 entries and is next to useless. Lichnerowicz's beautiful lectures deserve more care than that.

Regardless of these shortcomings, Lichnerowicz's lectures will be a valuable addition to the bookshelves of those who are concerned with the fundamental aspects of the systems of equations of relativistic theories.

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Will they ever learn?

FUNDAMENTALS OF MATHEMATICAL PHYSICS. By Edgar A. Kraut. 464 pp. McGraw-Hill, New York, 1967. $11.00

by Garrison Sposito

If one argues that a course on mathematical physics at the undergraduate level should contain nothing the physics major has seen in depth before but everything he is likely to meet in advanced theoretical courses, the problem of writing the appropriate textbook simplifies considerably. For it follows in the most direct manner from this premise that the textbook must contain expositions of vector calculus, matrix algebra, the theory of functions of a complex variable, Fourier series and transforms, and linear differential equations. The book most certainly will *not* contain anything on distributions, integral equations, Hilbert spaces, or groups and their representations. These subjects would appear to be of small value in teaching electromagnetic theory and quantum physics at the undergraduate level; they belong to an ethereal world too devoid of pertinent application and too replete with abstract formalism to support the edifice of basic physics. Or so the myth goes.

Fundamentals of Mathematical Physics is here to compound the myth since it represents still another version of the *Compendium of Hard Analysis.* It is written for the customary one-semester course at the junior level although enough material has been put in, purposefully, for a year of study. The language of the book is, in general, careful and clear, and the exposition is quasi-rigorous, as it should be. Each chapter displays a number of examples relevant to physics and offers many problems at all levels of difficulty.

The first three chapters deal with vectors in three-space and with matrices. The presentation of the former, admittedly a tiresome task, has a little of the color of linear algebra but relegates the Levi-Civita symbol (under an unusual alias) to a problem, thereby forsaking the chance to derive rather than merely verify the vector identities. Needless to say, the latter are thrown out with an admonition to memorize them, a practice instantly reduced by the use of the Levi-Civita symbol to the status of the proverbial lactic glands on the male swine. The chapter on matrices is well written and extends to a discussion of the eigenvalue problem and some of the vicissitudes of tensor algebra.

Two chapters then follow on analytic functions and Fourier transforms. The discussion of the former subject is characterized by an interesting historical slant, in that the methods of Cauchy and Riemann are considered quite separately. Unusually much is made of the notion of Riemann surface, and the residue theorem is stressed as a means for evaluating integrals. The chapter on transforms is introduced in the vernacular of Fourrier series. The analogy between these and the decomposition of a vector in three-space is made, but not to the extent that orthogonal functions are called basis vectors or said to span a Hilbert space. There is a remark on the square integrability of orthogonal functions, but its physical significance is erroneously claimed to be that it leads to strictly finite energy eigenvalues.

The last part of the book deals with the subject of linear differential equations. Special functions, Sturm-Liouville equations, Green's functions and the methods of solution involving transform techniques are considered meticulously and completely. The