who worked at Delft about 1700, and who communicated regularly with the Royal Society. He has some claim to be considered the founder of the sciences of bacteriology and protozoology. Some of the simple microscopes which he constructed for himself survive and show a resolution of three or four microns. Compound microscopes were regularly constructed in the eighteenth century, and achromatic objectives began to appear about 1800

H. J. J. BRADDICK

# MATHEMATICS AND PROBABILITY

## Green's Function Methods in Probability Theory

By Julian Keilson. (Griffin's Statistical Monographs and Courses, No. 17.) Pp. viii+220. (London: Charles Griffin and Co., Ltd., 1965.) 40*s*. net.

THE formal identity between mass distribution and probability distribution is so exact that it is always surprising to see how independently the mathematical methodologies of the two fields have developed. The statistician who reflects on the stimulus the problem of moments gave to Karl Pearson's foundation of the modern theory of statistics is apt to wonder whether a second such stimulus is not imminent. This book is not it. Yet this project has been so thoroughly and effectively carried out that one is tempted to infer that the two fields have evolved beyond the point where hybridization remains fertile.

Dr Keilson gave the material of the book as lectures when he was visiting the University of Birmingham and some of us in other universities were able to read the cyclostyled course-notes. The published version has been heavily revised with the help of Dr D. M. G. Wishart so that not only is it extremely clear and easy to read but one may be sure that no possible application to probability of the Green's function methods discussed here will have been overlooked. The facts that (as earlier reviewers have noted) substantially no result has been obtained that is not already known to probabilists in the chosen field of application (Markov processes with associated boundary problems), and that on the whole the probabilists' methods are simpler, if more *ad hoc*, suggest that Green's function methods serve no function in probability theory.

D. E. BARTON

# HARDWARE AND SOFTWARE

## Computer Programming and Computer Systems

By Anthony Hassitt. (Academic Press Textbooks in the Computer Sciences edited by Anthony Ralston.) Pp. x+374. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1967.) 86*s*.

Now that we have sophisticated problem-oriented languages, writing a computer programme is easy. It is still difficult, however, to write a good programme because to do this we need to understand how the software interacts with the hardware, that is, how the systems programmes that convert the higher-level language into the machine-level language and control the job-sequence interact with each other and with the processor, the store and the peripheral devices. This book is a praiseworthy attempt to introduce these concepts to scientific programmers with a basic knowledge of Fortran or another compiler language, and to impart to them a "reading knowledge" of the language produced by the compiler. It is not intended to teach the student, still less to encourage him, to write programmes in machine-level languages; as the author states, the days are past when machine time could be taken as the sole index of efficiency in programming.

That this laudable object of getting the programmer to understand the backstage workings of the compiler is not likely to be wholly attained is not so much the fault of the author, who obviously has considerable relevant experience and expounds his material clearly, as of the time when the book was written—a time of great change in computers and the ways of using them. Much of the discussion is based on the 7090 and its monitor system and Fortran compiler, and so has to describe the surmounting of many difficulties that would not arise with a more modern computer system and a language better adapted for character and file handling. Although the current practice is described also, it would be much less confusing for the student if the historical tribulations were confined to the excellent introductory chapter.

The dual intention, of providing a textbook for the student of computer science and a reference book for the scientific research worker using the computer as a tool for solving his own problems, has caused the treatment of machine-level language to fall between two stools: it is rather too shallow for the former and too detailed for the latter, who might benefit more from a macroscopic flowchart approach to compilers than from the microscopic code approach. The book is arranged sensibly for use as a student text, with problems at the end of each chapter, but the organization of the material is not ideal for its potentially more valuable use as a reference book. The index in particular is not satisfactory, and one has to refer frequently to the contents list as a supplement: for example, although system 360 is discussed in detail in several chapters, the only index reference to it is to the explanation of virtual memory and time-sharing principles as exemplified in the 360/67. One of the most useful features is the excellent critical comparison of different implementations of Fortran, but the index entry "Fortran" gives ten references without stating which are general, which are to specific dialects and which are to the comparative discussions.

The book should be very useful to conscientious programmers using batch-processing techniques, despite the shortcomings mentioned. A second edition could be considerably improved by the inclusion of more information on disk-oriented systems, an introduction to the functioning of command-language systems for conversational working, and some drastic pruning of the discussion of obsolescent systems. An aesthetic improvement would be the upgrading of the printing of some tables which have been reproduced direct from line-printer output, an irritating design fault in an otherwise well-produced book.

JOHN HAWGOOD

# ADVANCES IN BASIC SCIENCE

## Some Recent Advances in the Basic Sciences

Edited by A. Gelbart. Vol. 1: 1962, 1963, 1964. (Belfer Graduate School of Science—Annual Science Conference Proceedings.) Pp. xii+228. (New York, N.Y.: Belfer Graduate School of Science, Yeshiva University, 1966. Distributed by Academic Press, New York and London.) 68*s*.

THE Belfer Graduate School of Science at Yeshiva University has sponsored annual conferences on "Some Recent Advances in the Basic Sciences" since 1962. This beautifully produced volume contains the proceedings of three such conferences.

Basic science here means mathematics and physics, with equal emphasis on both subjects. We are thus presented with fourteen discourses which cover the entire field of the exact sciences. The authors are, as one would expect, of impeccable standing in their subjects and they have interpreted their task in very varying ways. He would be a bold reviewer who attempted to do justice to this fare.

Starting with physics, two contributions, one by C. H. Townes, R. Y. Chiao and E. Garmire on "The Interaction of Intense Light Waves and Mechanical Motions in Extended Media", the other from W. A. Fowler, "A Quasar Model based on Relaxation Oscillations in Supermassive Stars"