

article by W. R. Bennett, *Applied Optics Supplement*; "Optical Masers," pages 24-61, 1962, figs. 8 and 14, respectively. As it is, the article is listed under bibliography for additional reading. Similar remarks apply to a direct quotation near the top of page 17, taken from page 4 of William A. Shurcliff's *Polarized Light* (Oxford Press, 1962).

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The reviewer is a physicist at Bell Telephone Laboratories and supervises a group in holography.

Administering science to society

FORMULATION OF RESEARCH POLICIES. Conf. proc. (Santa Barbara, Calif., Jan.-Feb. 1966) Bruce S. Old, Lawrence W. Bass, eds. 218 pp. American Association for the Advancement of Science, Washington, D. C., 1967. \$7.75, \$6.75 for AAAS members

by David Z. Robinson

A great deal has been written about national science policy as if there exists some magic, single formula or system that can guide decision makers and ensure the wisdom of their actions. The situation looks very different to people involved in the process. The organizers of a 1966 Gordon Research Conference on Formulation of Research Policies brought together people involved in science management in Western Europe, Canada and the US with students of science management and industrial research scientists to see if information exchange in the field would be useful. This collection of papers from that conference indicates not only the absence of magic formulas but the perplexity and universality of problems that must be faced.

The book is divided into three sections. The first includes papers describing national science policies in eight countries: Belgium, Canada, Denmark, France, West Germany, Ireland, England and the Netherlands. It concludes with a useful summary by Frederick Seitz. The second group of papers attempts some comparative analysis, particularly of international and cooperative research programs. The final section deals with research policies of individual organizations: two large European companies (Philips and Montecatini), a government

agency (Air Force Office of Scientific Research) and a discussion of research management in industrial companies by the organizers of the conference, Lawrence Bass and Bruce Old.

There are major differences between the US and other participating countries with regard both to conception and goals of national science management. The US has in the last ten years established an Office of Science and Technology in the Executive Office of the President. The office deals not only with "all" federal technological activity but with the effect of federal actions on nongovernment science activities. In none of the other countries is there a similar overview. The government agencies dealing with science as part of their mission—particularly those concerned with national defense—run their own show. There is little systematic interaction between the government, university and industrial communities.

The goals of national science policies in these seven European countries and Canada center on economic growth and economic return for scientific expenditure. In the US tradition and antitrust have kept government and industry apart except, of course, for defense, atomic energy and space research.

Problems facing countries with ten to 50 million people are also different from problems that face a nation of 200 million. Until recently in the US, Americans had to make few difficult choices. They could afford to do everything. Such is not the case for a small country or an individual firm. International collaboration becomes a necessity rather than a pleasant mechanism for doing research.

Despite those differences in goals and needs between various countries, there are surprising similarities in outlook.

How can state-sponsored research be made to succeed in the marketplace? How can cooperative research be made responsive to the needs of the cooperators? After all, how do we nurture good science? Again and again the same questions come up from different areas and from different people.

The papers on international cooperation provide a most interesting picture of the operation of the Organization for Economic Cooperation and Development (OECD). OECD has been doing fine work in comparative studies of its member nations (West-

ern Europe, Canada, US and Japan). Hopefully it can be a forum for defusing some of the explosive issues now confronting these nations such as the brain drain and the technology gap.

We can be grateful to the Gordon Research Conference trustees for making this exception to their usual policy forbidding publication. No similar material exists on how a number of countries and organizations are trying to "administer" science in a technological society. The frankness of the speakers, particularly Pierre Pigagnol from France and Sir Harry Melville from England, gives us an unusual glimpse into the minds of the policy-makers faced with this demanding task.

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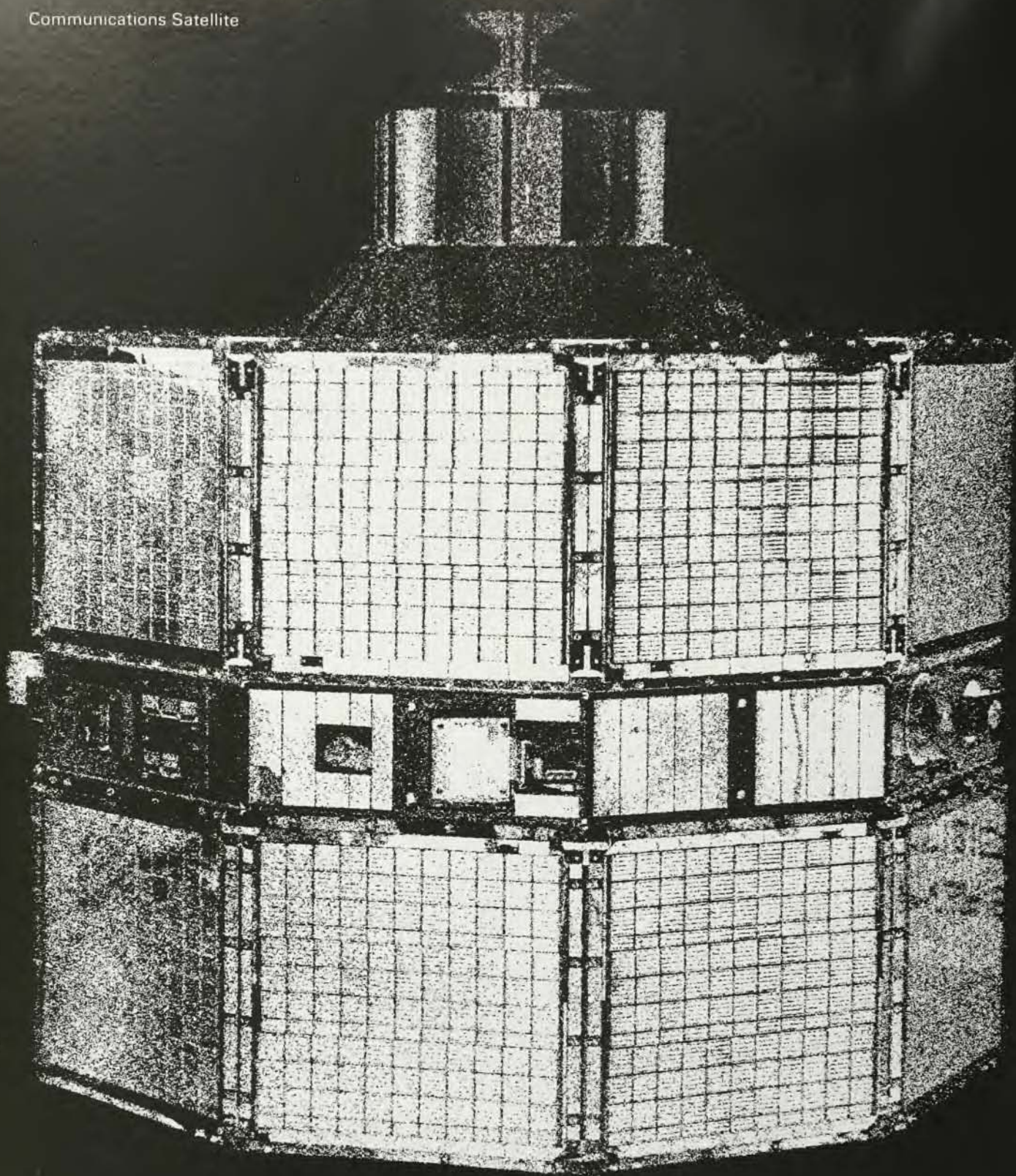
Mathematical virtuosity

MIXED BOUNDARY VALUE PROBLEMS IN POTENTIAL THEORY. By I. N. Sneddon. 282 pp. North-Holland, Amsterdam (Interscience, New York), 1967. \$12.75

by Joseph Gillis

Mixed boundary problems in which the different types of boundary conditions hold on distinct parts of the boundary, separable from one another in terms of a convenient coordinate system, go back at least to Poisson and Fourier. The essence of the problems discussed in this book is that different conditions hold in different regions of the same geometrical part of the boundary.

A number of classical problems of this type are described in the first chapter, including the potential due to an electrified disc, some punch problems in elasticity, and aperture-flow problems in hydrodynamics. In chapter 2 the author has collected a few mathematical tools needed later in the book (some Bessel-function formulas, a little about integral equations, fractional integration and Hankel transforms, Jacob polynomials). Much of this is applied immediately in chapter 3 to a thorough-going discussion of the electrified disc, beginning with Weber's and Beltrami's classical solutions of this problem. The method of oblate spheroidal coordinates, which effectively reduces the problem to one of the simpler type mentioned at the beginning of this review, is also pre-



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sented. This is followed by Copson's solution, comparatively simple and of much wider application, and the chapter ends with an elementary discussion of the dual integral equations that arise from the Beltrami method.

The last subject is taken up more actively in chapter 4. Indeed this chapter, with the next one on dual series equations, really forms the kernel of the book, and one has the impression that the physical problems were introduced to illustrate the use of the dual equations rather than the opposite. The very full discussion of these techniques in chapters 4 and 5 is rounded off by chapter 6, on triple equations. And the book ends with several applications of the mathematical methods thus developed to various problems of electrostatics.

Mixed boundary problems have tended to be ignored in standard textbooks of applied mathematics, possibly because one has to explain so much before even starting to expound them. One notable exception is the short discussion of the subject in the same author's earlier book on Fourier transforms. The book under review therefore merits a particular welcome in that it fills a real gap in the literature. Moreover the large range of mathematical techniques presented will make it useful quite apart from the specific class of problems to which it is directed. As in his previous textbooks the author has combined his characteristic forthright style with mathematical virtuosity and with a wide knowledge of the interesting problems of physics.

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Statistics of the stars

INTRODUCTION TO STELLAR STATISTICS. By Rudolf Kurth. 175 pp. Pergamon Press, Oxford, 1967. \$8.00

by George Weiss

There are two potential audiences for which this book might have been intended: astronomers interested in the applications of statistics to celestial phenomena, or statisticians wishing to acquire a feeling for the uses of statistics in astronomy. Both of these audiences are very likely to be disap-



pointed in Rudolph Kurth's monograph.

There is a single, long chapter on probability and statistics. Compression of all of the important facts into one chapter must inevitably lead to the exclusion of many important ideas, as indeed is the result here. The reader can only conclude that the theory of statistics is limited to the classic parameters related to the normal distribution. There is no hint of distribution-free tests, sequential analysis or any work more recent than the early 1930's. Furthermore there are no examples anywhere in the book discussed in sufficient detail to allow the reader to see what issues are to be settled in real estimation problems, what sort of data there are to describe the issues, and what are other possible techniques for describing the data. Like the author, I have doubts as to the validity of recent work by Neyman and his collaborators, but the ideas that they introduce are not entirely implausible and deserve some discussion.

If one approaches the monograph from the point of view of the statistician interested in astronomy, one is also likely to be fairly uninformed after reading it. The author writes in a telegraphic style that does not allow anyone not acquainted with astronomy to acquire a clear picture of the problems that are of real interest. Again, the lack of real data is a very serious defect in the exposition. I was also disappointed that there is no mention of the role of stochastic processes in astronomy, particularly of the work of Chandrasekhar, Ambarzumian and Münch. Surely, these constitute a real contribution to theoretical astronomy and deserve mention in a monograph on stellar statistics.

The subject matter treated here is potentially a fascinating field in itself. Unfortunately, the author has not suc-

ceeded in conveying the interest or excitement of the field to the reader.

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Landau's general physics

GENERAL PHYSICS: MECHANICS AND MOLECULAR PHYSICS. By L. D. Landau, A. I. Akhiezer, E. M. Lifshitz. 372 pp. Trans. from Russian. Pergamon Press, Oxford, 1967. \$8.00

by H. H. Barschall

The Course of Theoretical Physics by Lev Landau and Eugene Lifshitz is generally regarded as an outstanding series of texts on the graduate level. Less well known is Landau's *General Physics*. In 1937 he prepared a manuscript for an introductory text but did not publish it. Notes were published, however, in 1948, based on lectures in general physics that Landau gave in the applied physics department at Moscow University.

The volume under review is based on the 1937 manuscript and the 1948 notes, and was prepared by A. I. Akhiezer and Lifshitz. Although the book was published before Landau's death, it was written after his tragic automobile accident so that he could not contribute to its preparation himself.

The subtitle of this volume is *Mechanics and Molecular Physics*. The book begins with a discussion of the basic concepts of mechanics, such as velocity, acceleration, and force. These concepts are treated clearly and simply without the confusing attempts at rigor that one finds in some of the widely used introductory texts. The