Books

Atomic Energy. A Survey. Edited by J. Rotblat. 72 pp. Taylor & Francis, Ltd., London, England, 1954. Clothbound 6/6; paperbound 4/6. *Reviewed by P. Morrison, Cornell University.*

In the first months of 1954 the Atomic Scientists' Association, British counterpart of our Federation of American Scientists, sponsored a series of public lectures at the University of London. This short book represents the texts. These lectures treated systematically but popularly the status of atomic energy; they progressed from an account of Harwell by its director, Sir John Cockcroft, through an explanation of the general nature of the bomb by O. R. Frisch, to an exposition of the prospects for atomic power, of radiation hazards in general, of the medical applications of isotopes, ending in a kind of debate on the moral issues arising from atomic energy, presented in two brief papers by Professor Kathleen Lonsdale, Quaker and pacifist, and Sir George Thomson, well-known for his physics in war as in peace. The quality of the talks is up to the expected standard, generally higher in Britain than in the United States, and particularly so in the longest piece, that of Professor Simon. It is this talk which will be of highest interest to physicists, though the book as a whole, with an interesting glossary of a hundred items, can be recommended as a good brief survey for their seriously interested but technically untrained friends.

Professor Simon is soberly optimistic about stationary nuclear power. He forecasts the use of uranium in the British power economy beginning with prototypes in the next three years, through several generations of development reactors, until in about twenty years, half the new installations of central stations in Britain will be of nuclear reactors. On this basis nuclear power generation would equal the present size of British power sources by the nineteen nineties, when total power would be four or five times more than now installed. So coal will still be king in Britain. But for underdeveloped countries, for smaller coal-poor lands even in Europe, and for heat by-product use in clammy British winters, he plumps for the reactor of modest size as a British export and speciality. In the long run, he thinks (and this reviewer shares the faith) the thermonuclear reactions will replace fission as the ultimate power source.

The Lonsdale-Thomson discussion will interest American readers. A carefully argued and earnest pacifist position is possible in American controversy still; but Sir George's worldly and conservative arguments that "we ought not to bomb cities" by any sort of bomb, even though this is a "mode of war which (probably) favors the West", will come as a surprise to Americans used to the atmosphere of what is permissible to thoughtful people in the "very bomb-conscious U. S".

The Atomic Scientists' Association is to be congratulated on the organization of the talks, and upon finding a publisher able to put out a little hard-cover book so promptly (six weeks after the close of the lectures) and cheaply. These things are managed so well in Britain.

The Challenge of Man's Future. By Harrison Brown. 290 pp. The Viking Press, New York, 1954. $3.75. *Reviewed by Alan M. Thorndike, Brookhaven National Laboratory.*

While *The Challenge of Man's Future* has nothing to do with physics as such, it is of great significance for physicists as well as other people who are actively interested in the well-being of Homo sapiens (so-called). It is a vigorously written book which should evoke a strong reaction from almost any reader. This reviewer found himself in over-all agreement with Brown's thesis, but it seems likely that there will be many readers who do not.

Man's future is a big subject, and the author obviously could not cover all aspects of it. He is interested in the next ten thousand years or so, and is willing to postpone worrying about the inevitable extinction of life on earth some billions of years later. Similarly he passes quickly over the day-to-day problems in the conduct of human affairs: the avoidance of war, economic depression, social intolerance, and other causes of human suffering. He supposes that we have no major disasters this year, next year, and the next. . . . Even so, he concludes, there are great problems that confront us.

The problem which he proceeds to analyze in some detail is that of providing a high standard of living, in the American style, for as many of the world's inhabitants as possible during the period discussed. He is not concerned with evaluating the advantages or disadvantages of our materialist culture, but simply acknowledges that it has become well-nigh universally accepted. In this world, where we all seek salvation through industrialization and a higher level of productivity and consumption, Brown asks: Where is this leading us? To be specific, what is the future of the Industrial Revolution?

This question is one which involves a vast complexity of detail, more than one book can include or one man know. The author sees two main threats to man's future living conditions, the first being population pressure, the second depletion of natural resources. Concerning the first he is a follower of Malthus. "In practically all times in practically all places," he writes, "some human beings have lived on a marginal subsistence basis and, either rapidly or slowly, they have starved." With food inadequate over most of the globe, and the supply increasing less rapidly than the population, the present is

an exception only in the U. S. and a few other highly industrialized countries with low population density and low birth rate. Concerning the second he shows that the most accessible sources of coal, oil, ores, and minerals are being consumed and not replaced. The situation is spelled out in some detail. Take sulphur as an example: "The end of inexpensive sulphur production by the Frasch process is now in sight. . . . By the end of another two decades it is likely that the greater part of our own supply will be derived from pyrites and from smelter fumes. Long before another century has passed it is likely that a large fraction of the world's sulphur requirement will be met by extracting the element from calcium sulfate, large deposits of which are widely distributed throughout the world. Costs in terms of money and in terms of energy will be considerably higher than at present. But the basic raw material will last indefinitely."

Energy sources are the crux of the natural resources problem, since with enough energy virtually any chemical process can be carried out. Our use of coal and oil is expanding rapidly, and all known reserves are apt to be consumed within a few hundred to a few thousand years. In principle atomic energy and solar energy could provide a great deal more power than is now being consumed for an indefinite period, but the technical problems involved in doing so are very great.

Brown concludes, however, that the technical problems could be overcome as he sums up in the following words: "In our survey of the situation in which man now finds himself we see that, although our high-grade resources are disappearing, we can live comfortably on low-grade resources. We see that, although a large fraction of the world's population is starving, all of humanity can, in principle, be nourished adequately. We see that, although world populations are increasing rapidly, those populations can, in principle, be stabilized. Indeed it is amply clear that, if man wills it, a world community can be created in which human beings can live comfortably and in peace with each other. But it is equally clear that the achievement of this condition will require the application of intelligence, imagination, courage, unselfish help, planning, and prodigious effort."

The alternatives which he presents to such a successful outcome are twofold. On the one hand poor management and the tremendous destruction of A- and H-warfare may erase the gains of the past three centuries, returning mankind to an agrarian culture at a low subsistence level. On the other hand the technical problems may be solved with the establishment of an absolute authoritarian technocracy in which personal freedoms are sacrificed in the interest of the common material well-being. No one will like Brown's assertion that relapse to an agrarian culture is the most probable, the development of an authoritarian technocracy the next, and the successful solution, while possible in principle, the least likely. This is the challenge which he presents, and no one can seriously deny that it is a very real one, deserving the most careful study and the most resolute action.

The Physics of the Stratosphere. By R. M. Goody. 187 pp. Cambridge University Press, New York, 1954. $5.00. *Reviewed by R. B. Lindsay, Brown University.*

Recent rocket research has lent more than academic interest to investigations of the nature of the upper atmosphere of the earth. This volume, one in the valuable series of Cambridge Monographs on Physics, is particularly welcome for summarizing in brief but very readable form our present knowledge of that region of the atmosphere now known as the stratosphere, which extends from approximately 10 kilometers to 75 kilometers above the surface. The author is a meteorological physicist well known for his interesting studies of the transfer of radiation through the atmosphere.

The book is intended not primarily for the professional geophysicist but rather for the general physicist who wishes better acquaintance with material outside his special field. The writer goes to some pains to point out the difficulties inherent in research in a domain in which controlled laboratory experiments are largely out of the question and in which even approximate measurements involve large scale techniques and considerable theorizing. In spite of this, it is made clear that the amount of useful and reliable information which has recently been gained about the upper atmosphere is gratifyingly large.

Main emphasis is laid on the stratospheric chemical composition, temperature distribution, dynamical structure and radiation balance. There is, to mention but a single example, an interesting comparison of the sound refraction method with high altitude rocket techniques in the measurement of temperature, with on the whole satisfactory agreement. With respect to composition, much attention is paid to the ozone problem, so important for atmospheric absorption. The author's own specialized interests are well-reflected in a thorough chapter on radiation. Rather briefer consideration is given to the hydrodynamics of the stratosphere (winds and turbulence).

The wide scope of physical techniques and concepts which enter into this important branch of geophysics should make the book attractive to all physicists.

Sommerfeld's Optics

A few years before his death in 1951 Arnold Sommerfeld completed work on the six volumes of his *Lectures on Theoretical Physics*, four of which have already been published in this country. Another volume, *Optics* (383 pp.; Academic Press, New York, 1954; $6.80), has now been translated by Otto Laporte and Peter A. Moldauer. As in the case of the earlier volumes, it should find its greatest employment at the first-year graduate student level. The topics covered are reflection and refraction of light from the viewpoint of electromagnetic theory, the optics of moving media and sources, the theory of dispersion, crystal optics, and an extended treatment of diffraction. A final chapter deals with the design of various optical instruments, Cerenkov radiation, and further material on the theory of diffraction.