

illusions can be reduced; perhaps he might have gone further in showing still additional relations. The discussion in the chapter on the Setting Sun and Moon Illusions and The Moon in Art are probably more extended than necessary for the scientist. Among other very minor blemishes are some poorly drawn illustrations (figures 40, 42, 47). Lines which should be parallel are not; this detracts from the validity of the illusions. One or two obvious typographical errors were noted. The application to Laue patterns of the star-pattern illusions seems somewhat forced. But the reviewer agrees completely with the suggestion that we must not guess, we must measure when optical illusions may be present.

It is to be hoped that this little treatise by a physical scientist will inspire attention to a neglected field. The reviewer feels that there must be good psychological reasons, expressible in mathematical terms, for the crossing-bar and weak-wing illusions; simple experiments might be used to produce empirical theory. The professional psychologist could well be stimulated by this book; the professional physicist would certainly enjoy reading it.

Solar Energy. By Hans Rau. Transl. from German by M. Schur. 171 pp. Macmillan, New York, 1964. \$6.00.
Reviewed by R. B. Lindsay, *Brown University*.

Since practically all activity on earth, including that of human beings, depends on energy transformations, the availability of fundamental sources of this energy is becoming an ever more pressing problem for the human race. It is appropriate that from time to time a searching look be taken at the most fundamental source of all, namely the sun. This is the aim of the present volume, which is a translation of a German work published in 1958, but with numerous changes and additions to bring the American edition up to date.

The average rate of flow of solar radiation reaching the earth's surface is estimated to be of the order of 10^{14} kilowatts. It is this power supply which, integrated over vast eons of geological time, has accumulated those fossil fuels

that we are dissipating at such an alarming rate, and which currently of course provides an income energy supply in the shape of the production of food and the effects of wind and flowing water. But only an infinitesimal amount of this current energy flow is actually utilized by man. The natural question arises: why cannot we vastly increase this use and so cut down our dependence on capital energy resources? This is the problem which is discussed in Mr. Rau's book, which is by no means a technical treatise but a rather chatty, popular account of the subject.

The author begins with a brief survey of the energy needs of the earth's population and emphasizes that if only three percent of the solar energy striking one-tenth of the earth's land surface could be utilized effectively, it would provide for the power requirements of 6×10^9 people or twice the present population. The big problem, of course, is how to use this energy. A review is provided of the various attempts made in the past to focus solar radiation by means of mirrors and lenses and so employ it for terrestrial heating and cooking. The story is brought down to the present time with accounts of successful practical uses of solar energy in such applications as the desalting of sea water, house heating and air-conditioning, the cooking of food, metallurgical processing, and large-scale solar power plants. There is ample discussion of the problems posed by the intermittent availability of sunlight at all installations and the need for solar heat storage facilities.

The solar battery based on the photo-voltaic effect has already proved its usefulness in rockets and satellites, and as space exploration continues to expand, further uses of solar energy in this new field may be expected.

The significance of sunlight in the production of food is not neglected, and the author has a chapter on photosynthesis, in which relatively recent theoretical developments are presented in popular form. There is much about the culture of algae and a suggestion that this may well go a long way toward solving the future food requirements for an expanding world population.

Written in an attractive, breezy style, this book may serve a useful purpose in drawing the attention of the general public to a problem of immense technological and sociological importance.

Astrophysics and Space Science: An Integration of Sciences. By Allen J. McMahon. 444 pp. Prentice-Hall, Englewood Cliffs, N.J., 1965. \$15.00.

Reviewed by Robert L. Weber, *The Pennsylvania State University*.

Most of the other, some 30, books in the Prentice-Hall International Series in Space Technology treat aspects of manned space exploration. McMahon's book abstracts and correlates the published data, contemporary theories, and models in the realm of astrophysics, as selected from some 300 articles. It is essential that the reader have a college-level understanding of physics and mathematics.

The author envisions growth toward unity among "the several space sciences and the science of astrophysics." He attempts to communicate his own excitement and pleasure in a "sort of journalistic account of these ideas and results". The Epilogue is a good place to start reading, for orientation.

The interdisciplinary nature of these studies is displayed in the organization of the book. It begins with a description of solar flare processes, solar radio emissions, and solar cosmic rays. Next supernova explosions are described with especial attention to an enormous eruption in the galaxy M-82. Formation of the solar system, the stars, and the chemical elements is then considered. The last part discusses intriguingly the treatment of meteorites as natural space probes and, in discussing the influence of our sun on the interplanetary region, returns the reader to our local region in space.

Although the title is *An Integration of Sciences*, McMahon's book might equally well be said to be an exhibit of divergent thought. Principles in the more established branches of science are extended in the models and speculations of astrophysics.

The very wealth of empirical data presented requires effort on the part of the reader, but gives him an introduction to a wide range of tech-