volves consideration of individual interactions between the various particles; several good texts have been written in this vein. The second, which is Professor Loeb's principal point of view here, is the consideration of the statistical result of these interactions in a gas, insofar as they involve simple measurable averages. The third point of view, which is not attempted here, involves the synthesis of all these processes simultaneously into the complex electrical discharges that are generally observed. Thus the book deals largely with mobility, diffusion, ionization and attachment coefficients, recombination, and secondary emission; each process is considered more or less separately, except for certain corona and streamer phenomena discussed in the last chapter. The book does not dwell much on some esoteric ramifications, such as diffusion tensors, magnetic field, or high-frequency effects.

In writing this source book, the author attempts, generally successfully, to describe the more significant experiments in the field, together with brief summaries of applicable theory, where it exists. The tendency to describe the investigations author by author makes for some lack of correlation, which is the principal fault. One does not find often enough concise summaries and comparisons, perhaps in tabular form, of the conflicting results of different authors, so that they may be discussed together. It is sometimes difficult to find all the references on a given subject. There is some confusing repetition, as for example where two related electron energy distribution theories are presented in succession, but independently and with different symbols. A few errors of fact creep in. One might wish that the author had considered Poisson's equation as a basic process and discussed space charge phenomena in one chapter, but the line must be drawn somewhere.

The virtues of the book easily outweigh these faults, particularly when one recalls that it is primarily a source book, rather than a text. There is a tremendous amount of valuable information contained in it; the reviewer has found several references to work in his own corner of the field, of which he was previously unaware. There is at present no other adequate text which covers the field in this way, and very few that cover it at all. For serious workers in gaseous electronics, the book will be necessary as a detailed reference. In order to appreciate the extent of the field, the worker would do well to read it from cover to cover. The task of preparing it must have been very considerable; the reviewer is reminded of a statement attributed to Anthony à Wood: "A painfull work it is I'll assure you, and more than difficult, wherein what toyle hath been taken, as no man thinketh, so no man believeth, but he that hath made the triall."

Solar Energy Research. Edited by Farrington Daniels and John A. Duffie. 290 pp. The University of Wisconsin Press, Madison, Wisc., 1955. $4.00. *Reviewed by S. F. Singer, University of Maryland.*

The book reports on the Symposium on the Utilization of Solar Energy which was held in Madison, Wisconsin, in September 1953, under National Science Foundation sponsorship. Contributions were made by about 30 meteorologists, engineers, chemists, and physicists, who are interested in this field. The papers are loosely organized into subheadings such as: Expected World Energy Demands, Space Heating and Domestic Uses of Solar Energy, Solar Evaporation, Conversion of Solar to Electrical Energy, Photosynthetic Utilization of Solar Energy, and many other aspects of solar energy. In a section dealing with the conversion to electrical energy, thermoelectric generators and photovoltaic cells are described in detail; unfortunately, the newly developed Bell Laboratories silicon battery was not discussed. While the latter seems the most efficient although rather expensive method of obtaining electric energy directly, many of the other applications of solar energy, particularly those which use solar energy for heating of water or seasoning of timber, distillation of salt brines, etc., are of tremendous economic importance. Of special interest to physicists may be the technique of the solar furnace, probably one of the best methods for achieving the highest possible temperatures for laboratory research, of the order of 3000° C.

Essentials of Biological and Medical Physics. By R. W. Stacy, D. T. Williams, R. E. Worden, and R. O. McMorris. 586 pp. McGraw-Hill Book Co., Inc., New York, 1955. $8.50. *Reviewed by E. R. Cohen, North American Aviation, Inc.*

This book is presented as the "first textbook on biophysics". Such a description may not be entirely true, but it does have a reasonably valid basis from which to maintain that position. Although several books on biophysics have appeared in the last fifteen years apparently none has been written primarily as a student text. Here at last is a textbook—two in fact; one is a freshman or sophomore text in physics, the other on a similar level in physiology. Unfortunately the attempt to combine two texts into a single volume has its disadvantages; the discussion tends to skim only the surface without going into detail. This is forced upon the authors (once they have chosen to cover the broad area available rather than to specialize on a few topics), in order that the book should not run to excessive length. However true this may be, it is still annoying to find that the chapter ends and a new topic begins just as the story gets interesting.

As an introductory text, either for the biologist or medical student interested in the physical aspects of biology or for the physicist interested in the biological applications of physics, the book will prove very useful. Its forty-three chapters are divided into ten parts covering the biological aspects of the major branches of classical physics—mechanics, heat, light, sound, and electricity. Two final sections are devoted to nuclear physics and a very short survey of theoretical biophysics.

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The text, from the viewpoint of a physicist, at least, could be improved by a more careful attention to detail and accuracy in the statement of physical principles. An example of this is the treatment given to "spin"; in Chap. 38, "Nucleonics for the Biologist", we find the statement "An additional property, *spin,* is the same for all [elementary particles], having the value ½". There are two objections to this sentence. The obvious one is its incorrectness. The other objection, which is perhaps the more important, is that this is the only mention made of the concept of spin. Such a meager reference only serves to confuse the student. It would have been much better, if space did not permit a fuller discussion, to have omitted any mention at all of the concept. Several other examples of this type of thing have been forced into the text by the attempt to include as much material as possible into a reasonable number of pages.

These shortcomings of the book mean only that a course based on it will require careful attention and additional amplification by the instructor. However, as a basic outline of a broad and increasingly important field the book should find a receptive and enthusiastic audience.

Mesons and Fields; Vol. 1: Fields. By S. S. Schweber, H. A. Bethe, and F. de Hoffmann. 449 pp. Row, Peterson and Co., Evanston, Ill., 1955. $8.00. *Reviewed by Freeman J. Dyson, The Institute for Advanced Study.*

I wish this book were as good as Volume 2, which the publishers, either by good luck or good judgment, put on the market first. In the blurb they say that Volume 1 "uses as the main basis Dyson's approach to field theory". So the unpleasant things I shall say about the book are aimed at myself as much as at the authors. When Einstein was asked his opinion of certain physicists who become too firmly attached to their own ideas, he answered with the German proverb "Eigener Dreck stinkt nicht", which may be translated, "Nobody minds the smell of his own dirt". These words state a general principle which is usually valid; but there are exceptions to it, and I am one of them.

As I read through the book I am overwhelmed with a feeling of monumental dullness. Why did the theory of fields, the dragon which we fought with such high hopes in 1947–49, end up as such a tame insipid beast? Is it true that field theory is a dull subject, or is it only dull writing that makes it seem so? These questions need an answer, and I shall try to answer them.

I believe, in spite of appearances, that the meson field theory has a vital part to play in the description of nature. I say in spite of appearances, because the theory is full of mathematical inconsistencies, and nobody yet has found a way to deduce from it any precise consequence which could be proved or disproved by experiment. Here lies the paradox, the unexpected and exciting twist; we have a theory which is basic to our whole way of thinking about mesons, and still we do not know