Book Reviews

Low Temperature Techniques

Cryogenics. Marshall Sittig. Van Nostrand, Princeton, N.J., 1963. x + 221 pp. Illus. $6.75.

Cryogenic Engineering. J. H. Bell, Jr. Prentice-Hall, Englewood Cliffs, N.J., 1963. xiv + 411 pp. Illus. $16.

These books are intended by their authors to fill two quite different functions in the literature that deals with the rapidly expanding application of low temperature techniques in industry and technology. *Cryogenics*, by Sittig, ". . . is directed to the biologist, the chemist, the electrical engineer or just the inquiring reader who finds here a connection with his or her interests and is tempted to explore the cold frontier." *Cryogenic Engineering*, by Bell, ". . . has been prepared for students who are taking courses in Cryogenic Engineering, and also as a working source book for practicing cryogenic engineers."

Sittig's *Cryogenics* is divided into 19 chapters. The first eight ("The really new frontier," "How cold is produced," "The great names in cold," "Where cold is studied," "How cold is measured," and so on) constitute a descriptive survey of the history and techniques of low temperature technology. The remainder is an uncritical survey of areas in industry and technology where low temperatures are applied directly, or of areas where some material that has been produced through cryogenic techniques is used. The book is written at the level of a popular science magazine and is quite readable. A considerable amount of statistical information related to the production and to the consumption of products is presented (data which may well soon be obsolete, for this is a rapidly developing area of technology).

With respect to its stated objective, the work suffers from the inadequacy (frequently the total lack) of its explanation of the fundamental principles involved in various apparatuses or processes for which illustrations or diagrams are given. Even more objectionable are the errors of fact and the misimpressions that are created. The "inquiring reader" might well conclude that the Joule-Thomson liquefier was in use shortly after 1853 (the experiments of Joule and Thomson), whereas more than 40 years elapsed before von Linde *discovered* the practical significance of the Joule-Thomson effect *when combined with the counter flow heat exchanger* for the production of low temperatures. Debye and Giauque did not share a Nobel Prize. Debye's was awarded in 1936, Giauque's in 1949. In each case the award was made for many other fundamental contributions in addition to their work on the principles of adiabatic demagnetization. Liquid hydrogen is approximately 1/14, not approximately 1/4, as dense as water. Helium ions formed in the field emission microscope are *not* ". . . accelerated by the magnetic field. . . ." And there are many more. Unfortunately, there is no bibliography to which the reader can refer for authoritative discussion of a particular topic.

I hope the author and publisher will correct the errors, for an authoritative survey written at this level is certainly needed. As it stands, Sittig's book can be recommended only to the "inquiring reader" who is satisfied with an uncritical general survey and who does not require a volume that is accurate in detail.

Although *Cryogenic Engineering*, by Bell, was prepared as a textbook for students and as a sourcebook for practicing cryogenic engineers its treatment of the underlying fundamentals of cryogenics is elementary and very superficial. Bell suggests that the book's use ". . . should be preceded, paralleled or followed by good courses in thermodynamics or heat transfer." It is doubtful that a student in a good course in thermodynamics or heat transfer will find any use for a book which contains statements like the following: "The Joule-Thomson cooling phenomenon that occurs when a gas is expanded at constant entropy gradually lowers the temperature until liquid begins to form in the receiver," and ". . . ortho hydrogen at 200 atmospheres will convert to para hydrogen in about 24 hours at room temperature." The utility of the various examples and problems is seriously impaired by the prevalence of arithmetical (or typographical) errors in the solutions and by the very extensive use of unidentified outside sources of information.

The extensive technical data given in the text and in appendixes A, B, and C have a high potential value, but this is compromised by Bell's failure to include units (and even captions) for the coordinates of some graphs, by grossly erroneous entries and garbled table headings, and by the failure to identify the original sources of the data. Extreme examples are Figs. 4.15, 6.2, and A-21 where families of 8, 6, and 8 curves, respectively, are presented without the values of the parameters that characterize the individual curves being given at any place in the text or on the figures. It is difficult to identify an audience to whom this work can be recommended without serious reservations.

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Nuclear Models

Contemporary Models of the Atomic Nucleus. P. E. Nemirovskii. Translated from the Russian edition (Moscow, 1960) by S. Nikolic and M. Nikolic. Bernard T. Feld, Ed. Pergamon, London; Macmillan, New York, 1963. xii + 332 pp. Illus. $15.

There are several useful purposes for a book on nuclear models, and it is probably not possible to satisfy all of them in one book. There could be a book for those who are on the fringe of the subject but would like to know more about recent developments. Another could outline the formal theoretical treatment and the way in which approximations are made. A third could serve as a text for those in the field of nuclear physics. This book serves the first of these purposes; it may also partially serve the third, but I am no longer in the field of nuclear physics and cannot easily tell.

There has been a great advance in