International Geophysics Series: Upper Atmosphere

The Upper Atmosphere: Meteorology and Physics. Richard A. Craig. Academic Press, New York, 1965. xii + 509 pp. Illus. $12.50.

As the author states in his preface, the primary aim of this book is to introduce to the meteorologist the present state of knowledge of the atmosphere above 30 km. It is an admirable survey, up-to-date and sufficiently thorough for its intended purpose. It will also interest many people who have already specialized in upper-atmosphere work, because it covers topics previously neglected in their literature. The most obvious of these relate to various kinds of motion: circulation, winds, tides, turbulence, gravity waves, and the like. The treatment of photochemical processes is excellent, especially with respect to ozone production and distribution. The chapter on the structure of the thermosphere is noteworthy for its clear, balanced treatment of a difficult region. Solar radiation and radiative transport within the atmosphere are discussed. A brief but useful introduction is given to the specialized topics of geomagnetism, ionosphere, airglow, and aurora. There is also an introduction to atomic and molecular spectra, which I should have thought unnecessary, but no doubt the author's experience has suggested otherwise.

My only criticism is that, because rather too much background in lower-atmosphere meteorology has been assumed, the book is not an ideal source for the aeronomer who seeks to extend his view downward. Despite an excellent introduction to the basic equations governing the hydrostatic equilibrium of an atmosphere, no comparable introduction is given to atmospheric dynamics. Terms such as *potential temperature, barotropic, baroclinic*, and *geostrophic* are used without definition or reference to a source. This is a small defect indeed, but good basic introductions are given to so many other topics that this one is made obvious by its omission. Generous references to original and review literature are provided. I heartily recommend the book to meteorologists and aeronomers, including graduate students.

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Alloy Structures: A Comprehensive Review

The Theory of Order-Disorder in Alloys. M. A. Krivoglaz and A. A. Smirnov. Translated from the Russian edition (Moscow, 1958) by Scripta Technica. Bruce Chalmers, Translation Ed. xii + 427 pp. Illus. $16.

The subject of order-disorder in alloys dates from the early experimental observations made in the 1920's and the major theoretical development of Bragg and Williams in 1934. The years between 1934 and the present have witnessed a steady unfolding and development in the best scientific tradition. The pace of progress has been such that, with sufficient effort, a participant in the field could possibly manage to stay abreast of developments. For the novitiate, the task is more difficult. (By comparison, the pace in order-disorder must seem relaxed to the harassed investigator of masers or superconductors.) Clearly, a reasonably thorough review of the subject is valuable, and *Theory of Order-Disorder in Alloys*, by Krivoglaz and Smirnov, is of sufficiently wide scope to be of value to beginner and master alike. Its content ranges more widely than that usually found in treatises on order-disorder. Its depth is variable, depending on the topic being discussed.

The authors begin with the definition of long-range and short-range order parameters. With these definitions in hand, the remainder of the first chapter is devoted to "general information concerning the order of alloys"—largely a collection of empirical observations touching on such diverse topics as x-ray studies and neutron diffraction, specific heat and electrical resistivity, the influence of radiation and the kinetics of ordering, and mechanical and magnetic effects. The somewhat separate discussion accorded each category follows a short elementary explanation of the effect of ordering on the particular property. The result is a simple, but hardly an exhaustive, review of ordering phenomena. The remainder of the book, approximately 80 percent of the total, is devoted to theoretical development, with little attempt to relate theory to observation. Chapters 2 through 4 are clearly the most important portion; each development is presented in greater depth than any previous or subsequent topics.

Chapter 3, the longest, with the exception of the first, chapter presents "the statistical theory of order-disorder phenomena." The development here is straightforward and thorough and compares favorably with similar reviews.

By way of contrast, it should be noted that chapter 2 presents a development only infrequently encountered in the Western literature—the "thermodynamic theory of order-disorder transition." The original development of this area is the almost exclusive achievement of Landau and Lifshits, who are among the most eminent contemporary Soviet theoreticians. Krivoglaz and Smirnov's book would be significant even if it were limited to this sole contribution. Similarly, chapter 4 reviews an area seldom treated in any detail—"the theory of diffusion in ordered alloys." Its development is a second important feature of the book.

Most of the remainder of the book is composed of a less systematic exposition on "the theory of scattering of different types of waves by the crystal of lattice of an ordered alloy." Accordingly, the theories of x-ray and neutron diffraction are presented along with residual electrical resistivity. The book closes with a minimal theoretic discussion of several other properties —mechanical, magnetic, and optical. This section is disappointing in comparison with the previous one, but it serves a valuable function in bringing most aspects of order-disorder theory together in one volume.

It is always possible to find fault with a book that attempts to review a wide range of topics. For example, the omission of a discussion of the kinetics of ordering is regrettable. The inclusion of alphabetic author and subject indices would be valuable. But such criticism is little more than quibbling. Krivoglaz and Smirnov's book should be valuable reading for anyone who would seek a firm footing in order-disorder theory and a point of departure for further exploration.

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