nical terms supplements it. A very satisfactory bibliography appropriate to the material is included. The diagrams and plates are excellent.—*A. J. Crowshaw*

Evaporation and Droplet Growth in Gaseous Media. By N. A. Fuchs. (Translated from the Russian by J. M. Pratt and edited by R. S. Bradley.) New York, Pergamon Press, 1959. 72 pages. $5.50.

This compact little volume of exactly six dozen pages covers with surprising thoroughness a large number of topics fundamental to diffusional growth and evaporation of droplets. Students of cloud physics will find Fuchs' treatment a very useful reference on many problems not ordinarily treated in conventional texts.

Roughly the first half of the book deals with quasi-steady-state evaporation and growth of droplets *at rest* relative to the medium; then the quasi-steady-state case of droplets *moving* relative to the medium is considered; finally a brief but useful treatment of non-steady evaporation and growth is presented. In all three sections, Fuchs gives critical attention to both theory and experiment, systematically stressing areas wherein further work is badly needed. Of the author's 88 bibliographical entries, 25 are Russian, 23 American, 17 British, and 10 of the remainder German, whence one may see that Fuchs has sought to synthesize the findings of workers all around the world.

The book, though rather too concise to function as a textbook even in its limited subject area, should prove very useful as a source of collateral readings in cloud physics courses, especially to settle numerous questions on fine points of theory that often bother students confronting standard treatments of diffusional processes. In addition, Fuchs' critical discussions of problems that can arise in laboratory contexts (effects of droplet supports, role of vessel walls, etc.) should prove useful to experimentalists. His attention to historical details is laudable. In his first two sentences he clarifies a point which this reviewer had pursued at length through the literature recently—namely the question of who was the real pioneer in vapor-diffusion theory. Fuchs' conclusion and the reviewer's are identical: Maxwell should be credited with laying the foundations of diffusion theory (having done so, interestingly enough, in an analysis of a meteorological instrument, the wet-bulb psychrometer).

A single technical blemish must be noted: All mathematical symbols were apparently set in linotype, printed separately, photographically reduced in size, and then inserted onto pasteups of typewritten pages of text, prior to photocopying for the final offset plates. The net degree of reduction of those symbols is so great that the reader often has difficulty making out the squiggles. I found on page 6, by direct measurement with a micrometer, exponents only one-fiftieth of an inch high! Any translation as useful as this one is welcome despite the high page-price, and despite the makeup involving photo-offset from typed copy. But there seems no excuse at all

for such extreme reduction of all mathematical symbolism as the publishers used in this volume.—*J. E. McDonald*

Satellite Environment Handbook. Edited by Francis S. Johnson. Stanford, Calif., Stanford University Press, 1961. 155 pages. $5.50.

Some meteorologists are thinking about the problems of forecasting the "weather" on Mars during the eventual landing of man on that planet. Still others are preparing to forecast the variable environment in space for the increasing number of man's ventures into the vastness beyond the earth. It is, therefore, useful to have an up-to-date summary of the various radiations, particles and fields, which characterize the outer limits of the earth's atmosphere and the regions beyond. The *Satellite Environment Handbook* furnishes a summary of such information as of early 1961. This booklet contains eight chapters written by five authors. Some chapters are fairly comprehensive; others, are rather superficial.

The first chapter involves the structure of the upper atmosphere, and it is interesting to note, in view of the expanding interests of meteorologists, that the editor considers the "region of meteorological interest" to lie in the troposphere, denying even the stratosphere as a "region of meteorological interest." Nevertheless, the temperature structure, given in graphical form, reaches from the earth's surface up to 500 km. The main recent result, however, is the marked influence in daytime introduced by the variations during the sunspot cycle. For example, at 300 km, the temperature is shown to be near 1000K during sunspot minimum but reaches about 1400K during sunspot maximum. Other factors such as the density and the composition of the atmosphere are considered. In the case of the latter, one notes that helium is omitted from the diagrams describing the concentration of the various gases, although in more recent studies helium appears as a constituent at elevation near 1000 km above the earth's surface. Finally E. S. Barrett's pole-to-pole cross-section of the E–W component of the winds up to 100 km is shown.

The next chapter discusses the ionosphere, showing its diurnal and seasonal variation and includes a discussion of the protonosphere which is considered to lie above 1300 km. This is the region where the predominant ionic constituent changes from atomic oxygen ions to protons.

The penetrating radiations, which characterize the Van Allen Belt for example, are discussed in a third chapter. The spatial distributions of flux in the inner Van Allen Belt (due to protons) and also in the outer belt, which is supposed to be due to electrons, are shown. Variation of penetrating radiation with solar flares is mentioned briefly, and the composition and variation of cosmic rays is shown as a function of the sunspot cycle and various other parameters. A useful table summarizing the various penetrating radiations giving the numbers of particles, the particle energies, and some comments regarding their origins, together with references, serves as a valuable summary to that chapter.

The radiation from the sun is discussed in a brief chapter giving the spectral distribution based on surface and available rocket measurements. Some of the main lines in the solar ultraviolet portion of the spectrum, and the spectral distribution of x-ray irradiance, are shown. The solar wind, which is the flow of protons and electrons from the sun, is mentioned. It is pointed out that the last sunspot cycle has been among the most intense as measured by sunspot number.

Micro-meteorites are of course of interest to any space traveler, or forecaster of the environment for a space traveler, and the next chapter on micro-meteorites naturally finds its place in this volume. A summary of the measurements made from various sources, such as those made from rockets and satellites, and those made by visual and radar observations from the ground, are discussed. The number flux of particles and their size and energy distribution are estimated from these measurements.

A chapter on radio noise describes the atmospheric and man-made noise as they effect radio signals. Cosmic noise, in regions of the spectrum which can penetrate the ionosphere, is illustrated by a map of the equivalent brightness temperature of the galaxy at 250 megocycles. Astronomical sources of radio noise are mentioned which include various galaxies and other astronomical configurations; and indeed the sun is one of the important radio emitters.

Chapter 7, on thermal radiation from the earth, is very brief and discusses not only the thermal radiation from the earth, but also the average solar energy reaching the earth's surface, and the amount absorbed. The airglow emissions, due to oxygen and OH, are briefly mentioned also. It is interesting to note that whereas most of the chapters have extensive bibliographies, including some of the most recent theories and measurements from satellites, from rockets, and from the ground, the author of Chapter 7 has preferred to rely on Baur and Phillips (1934–35) for thermal radiation estimates without reference to the extensive work which has occurred since then.

Finally the eighth and last chapter, one of the longest in the book, includes a discussion of the magnetic field due to the motions within the core of the earth and also to the motions of the upper atmosphere. The variations in the magnetic field are discussed; variations introduced by solar wind, tidal effects, the solar cycle, and others are listed.

Other good summaries which include space environment data exist, such as the AFGRD *Handbook of Geophysics* (1960). But the reader interested in the environment surrounding the earth will find a valuable summary in this book too. In almost every chapter one can find the statement that the body of scientific knowledge about space changes very rapidly, and that the concepts and data presented will soon need revision. This can be well understood in view of the rapid flow of information obtained from satellites and from rockets even within the last year. Thus we can expect (and look forward to) fairly frequent revisions of handbooks about space environment.—*Sigmund Fritz*