cases is at variancé with the results obtained by these methods. This tendency to consider the microscope as an independent tool of research is reflected by the fact that the thousand or so references are concerned exclusively with electron microscopy. The reader will have to refer to these references for further details of specimen preparations, although, to the reviewer's knowledge, Dr. Wyckoff has never described his methods in as great detail as he does in this book. It should, therefore, find a place in the library of every electron microscopist.

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Freeze-Drying: Drying by Sublimation. Earl W. Flosdorf. New York: Reinhold, 1949. 280 pp. $5.00.

This timely little book is written for those who use and study the technique of drying from the frozen state as applied to a variety of experimental fields—micropathology, immunology, histology, pharmacology, and engineering. The author foresees that "probably few will read the book from cover to cover," but it is equally certain that many will find a wealth of information in it.

Particularly instructive is the chapter on "Basic Principles," with its good review of the bibliography. In "Applications" the author covers thoroughly the various aspects of the art, especially as applied to medicine. "Equipment for Food" is a very stimulating chapter, as it opens a hopeful view of things to come. Various portions of the historical review may appear somewhat one-sided, but the chapter dealing with equipment for medical products is a very clear and complete catalogue.

The competence of the author makes the publication a most desirable and practical reference book, completed as it is by an excellent index.

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Oscillations of the Earth's Atmosphere. M. V. Wilkes. New York: Cambridge Univ. Press, 1949. 76 pp. $2.50.

This book deals with the lunar and solar atmospheric tides. It summarizes observational facts and theory, and discusses the implications tidal theory has for the exploration of the high atmosphere. The semidiurnal solar tide was discovered not very long after the invention of the barometer, when the first observations were made at tropical latitudes; whereas lunar tidal effects, which are considerably smaller, were first found about the middle of the 19th century. It was early recognized that the smallness of the lunar tide as compared with the solar tide requires some special explanation because the tide-generating gravitational force of the moon is more than twice as large as that of the sun. Such an explanation was advanced by Lord Kelvin's "resonance" theory, according to which the semidiurnal variation of the air pressure is caused by the diurnal temperature variation. In the latter the diurnal term is, of course, much larger than the semidiurnal, but Kelvin suggested that the atmosphere has a free period in the vicinity of 12 hours so that even with small amplitude of the generating force the semidiurnal term in the pressure oscillation becomes much larger than the diurnal term. Early investigations by Pièrre de Laplace and later ones by Max Margules, Horace Lamb, and V. Bjerknes indicated that an autobarotropic atmosphere—that is, an atmosphere in which the law of compression and the actual density distribution are such that a displaced fluid particle assumes always the density of the environment—has a free period in close proximity to that required by the resonance theory, and that such oscillations can be discussed in terms of those of an equivalent ocean whose depth determines the length of the period of oscillation. However, since the atmosphere is not autobarotropic, it appeared that the "equivalent depth" of the atmosphere is too large and the period therefore too long to give the degree of resonance postulated by Kelvin, until Chaim Pekeris showed, following G. I. Taylor's work, that an atmosphere in which the temperature agreed with the observations up to 40 miles and did not contradict the indirect evidence then available for higher levels has a period of the required length. This work of Pekeris and subsequent investigations by the author of the book together with K. Weeks are dealt with at length in the book under review. An analogy to the theory of the propagation of electromagnetic waves permits an easy discussion of the possible trapping of energy when different types of vertical temperature distributions, analogous to different types of distribution of the refractive index in electromagnetic theory, are assumed. Such considerations of the trapping of the energy give valuable hints concerning the nature of the actual vertical temperature distribution that point toward oscillations with the period required by the resonance theory. The actual calculation of various temperature profiles gave free periods of a length required by the resonance theory. Thus this theory would seem well established, although there are still some minor problems and difficulties to be resolved, as discussed in the last chapter of the book.

Shortly after the appearance of the book, however, considerable doubt was thrown on these favorable results by two reports on research projects sponsored by the National Advisory Committee for Aeronautics—demonstrating again, if such demonstration is needed, the very rapid development of upper-air research. Z. Kopal, L. G. Jacchia and Pièrre Carrus at Massachusetts Institute of Technology have shown in a preliminary report that the resonance magnification becomes too small to support the resonance theory when more recently adopted vertical temperature profiles, such as that adopted by NACA or that based on V-2 flights, are substituted for the profiles used by Wilkes. Pekeris found that the equivalent depth increases indefinitely with the period in an atmosphere in whose top layer the temperature increases linearly with height. The reason for this is that in such a layer the energy continues to spread to higher elevations as the period is lengthened. Tides in an atmosphere with a top layer of vertically increasing temperature may thus differ markedly from tides in an atmosphere with an inversion or decreasing temperature at the top, which latter tides are analogous to those in an ocean of equivalent depth.