varnish-making country of the world and the industry enjoyed great prosperity. The eighteenth century was the period of transition. Up to then varnish was mainly associated with artists, and its making was part of their scheme of work. After then the uses of varnish became more widespread and various, and varnish-making gradually became a specialized industry. So one could travel backwards through the materials of medieval painting almost to the beginning of civilization and find much of interest relating to varnishes of one kind or another.

There is no doubt that this book will be appreciated, for even if Dr. Chatfield has not concerned himself with historical matters, he has collected a mass of useful and very up-to-date information about materials and their processing, which the worker in this field will find extremely useful. More and more of the products of chemical industry, particularly that part of the chemical industry associated with plastics, are being proved suitable as raw materials for varnish, in such variety as to force increased specialization and to develop a serious divergence in thought among technologists as to what is happening to the industry and what its future course will be. At the moment the varnish industry is certainly a case of chemical indigestion—much too much has been and is still being put upon the plate. Probably most of the technologists and scientific men concerned are trying to form, or maybe have formed, a working hypothesis to guide their actions; but it is doubtful whether many of them are wholly satisfied with their mental picture. This book will help to clarify some of the issues and may perhaps result in better co-ordination between the views of leading technologists. It will—and this is more important—help individuals who have only sketched in the barest outline of their mental picture of varnish-making in the post-war period.

In the author's preface, he says that, having felt the need personally for collected information about the properties of available raw materials and their manner of use, he has attempted to review the more important developments of recent years and to fit them into a complete whole. Unquestionably he has done what he set out to do and has done it extremely well. The review method be has adopted, however, has weaknesses, because so many references to patents and to other reported experimental procedures are inevitably included which are of no particular value and are sometimes misleading. In general, the reader is left to form his own judgment as to the value of the record given, but what is wanted is a weighted appreciation of all the evidence presented; indeed, in those sections of the work with which the author is clearly more at home he has done this to some extent in spite of his disclaimer that: "I have presumed to dogmatise and criticise as little as possible but rather to present the intelligent reader with the evidence from which his own conclusions may be drawn". The reader will surely form his own conclusions when he can, but he cannot always do so, and in any event he will like to have the professional's, that is the author's, conclusions as well.

As to the actual contents of the book, it is implied in what has already been said that the subject has been treated as on a broad canvas, with many items, some treated in fair detail, others less so, according to importance and the inclination of the author. There are no sections or aspects of varnish-making and varnish-making materials to which some reference will not be found. L. A. JORDAN.

RADIO WAVES AND THE IONOSPHERE

Radio Waves and the Ionosphere

By T. W. Bennington. Pp. vi+81. (London: Iliffe and Sons, Ltd., 1944.) 6s. net.

A VAST number of people are nowadays interested in one or other of the aspects of radio communication, and they are necessarily concerned with the manner in which radio waves are propagated around the earth's surface and to distances beyond the horizon. These and older students of the subject have become aware of the fact that such propagation is possible as a result of the existence of the ionosphere—those regions of the earth's atmosphere which become electrically conducting by ionization chiefly under the influence of ultra-violet radiation from the sun. It does not, however, require much delving into the subject to discover that the ionosphere is not simply equivalent to a metallic electrically conducting sheet in the same position at all times and seasons. It is rather in the nature of a series of partially conducting layers, one above the other, each varying in height and conductivity with time, and the lower layers sometimes shielding the upper ones from radio waves transmitted upwards from the earth's surface. Whether or no such upgoing waves are deflected back to earth from the ionosphere depends upon solar conditions, time of day, season of year, position on the earth's surface, and upon the frequency of the radio waves and the angle at which they are projected upwards from the earth.

While there is an extensive scientific literature giving the results of original investigations into this somewhat complicated subject, it has not hitherto been easy for the 'man-in-the-street' and the general scientific student to gain a clear view of the salient points in this field. In his recently published little book, details of which are given above, Mr. T. W. Bennington has filled this gap in an admirable manner; and he appears to have achieved his desire to provide a very lucid account of this subject for the benefit particularly of those whose knowledge is confined to school physics and the elements of radio communication.

The scope of the book is well defined on the comprehensive contents page, which has rendered an index unnecessary. After drawing a distinction between ground and sky waves, descriptions are given of the main properties of the ionosphere and the radio methods by which these are explored. The variations in heights of the various regions and their critical frequencies as determined by the density of ionization are described in some detail with the aid of well-selected samples of data obtained in Great Britain and in America. Later chapters deal with the part played by the ionosphere in long-distance radio transmission, and with the influence of the above variations and of ionosphere disturbances and other abnormalities on the effectiveness of the resulting communication. In addition to being written in an interesting manner, the book is scientifically accurate; and altogether the following comment given by Sir Edward Appleton in his foreword is well deserved: "Although it is primarily written for the professional radio technician who wishes to understand more about his own subject, I recommend it as a friendly and well-informed guide to anyone interested in long-distance radio communication."