Growth of Knowledge of the Ionosphere

IT is now well known that all long-distance radio communication takes place by the propagation of electric waves through the upper regions of the atmosphere which are embraced by the modern term 'ionosphere'. Although a conducting upper atmosphere was postulated in 1902, direct experimental evidence of its existence was not obtained until 1924. Since the latter date, a vast and increasing amount of research has been devoted to the ionosphere as a branch of theoretical and applied physics. While the major portion of this work has been conducted in Great Britain and in the United States, the fascination of the subject has attracted a number of research workers in other countries. The results of this work are generally recorded in the various scientific publications of the world. These publications are so numerous and so widespread, however, that the industrious worker in the subject is faced with a strenuous task if he is to study them all. Those whose main interest lies in other fields find it increasingly difficult to maintain an up-to-date knowledge on the ionosphere, and particularly to keep a clear perspective view of the progress which has been achieved and of its bearing on other fields such as meteorology and geophysics.

It is here that Prof. S. K. Mitra has come to our rescue with his "Report on the Present State of our Knowledge of the Ionosphere", which was prepared for the opening of a symposium organised by the National Institute of Sciences of India in 1935, and is now reprinted from the *Proceedings* of that body. This report presents in a connected and concise form the main results of both theoretical and experimental investigations on the ionosphere during the past twelve years. The work has been treated from a fundamental point of view, and it is not concerned with the science or practice of radio communication except in so far as radio methods are nowadays employed as a tool for the exploration of the upper atmosphere.

The first large section of the paper gives in a clear and concise manner the theory of the propagation of electric waves through an ionised gaseous medium, introducing in sequence the effects of the earth's magnetic field and of energy dissipation by collisions. The results of the theoretical treatment are illustrated by typical dispersion curves showing the effects of these quantities upon the refractive index and absorbing powers of the medium and on the polarisation of the transmitted waves.

Next, an outline is given of the three main experimental methods which have been developed for the study of the properties of the ionosphere. The two of these most widely used involve the emission of a radio signal with special characteristics impressed upon it, and the study of the echo signal upon its return from the ionosphere to earth. A description is given of the methods by which information is obtained, from such records, on the equivalent height of the ionosphere, and the density and gradient of ionisation. Indeed modern research based on a study of such records of received signals is providing us with a detailed knowledge of the structure of the atmosphere at heights above about 80 km.; such knowledge is at present unobtainable in any other way. Throughout the paper, typical results of this research are presented in graphical form, and an appendix provides a bibliography, which has the merit of being obviously selected on a critical basis rather than of being entirely comprehensive.

Prof. Mitra appears to have succeeded admirably in compressing a large volume of matter into a small space, and in a subject which is progressing as rapidly as that under discussion, this has necessarily involved omitting reference to many investigations, which although helpful in the general progress of the work, are of lesser fundamental importance. The report should prove of great use to those studying or carrying out research in this most fascinating subject.

Bacteriological Grading of Milk in Great Britain

GRADING of milk was introduced in Great Britain in 1923. Producers who conformed to certain rules and attained certain standards for the milk they supplied were given the right to apply certain statutory names to their products. It was expected that both the public and the producers would benefit, the former by obtaining a more hygienic milk supply, the latter by an increased commercial return—hopes not altogether realised. After consideration and consultation respecting the working of the Order during the past seven years, the Minister of Health has decided to institute a new "Milk (Special Designations) Order, 1936"[1], which came into operation on June 1.

The new Order has two main objects—to transfer from the Minister to local authorities the duty of granting licences to producers of certain graded milks, and to improve and simplify the special designations of milk. The present designations are 'Certified', 'Grade A. (Tuberculin Tested)', 'Grade A' and 'Pasteurised'. It is considered that so many grades create confusion, and the designations of some do not give a clear indication of their nature. Accordingly it is proposed to reduce the number of grades to three—'Tuberculin Tested', 'Accredited' and 'Pasteurised'. 'Tuberculin Tested' is raw milk from tuberculin tested cows and will replace the existing designations 'Certified' and 'Grade A. (Tuberculin Tested)'; it may also be pasteurised. 'Accredited' milk will replace the present 'Grade A' milk, and like the latter will be raw milk from cows regularly inspected by a veterinary surgeon, but not tuberculin tested. 'Pasteurised' milk will, as at present, be milk which has been held at a temperature of 145°–150° F.