

of someone else's views; it is heartily to be recommended, not only as a work on soap films, but also as an introduction to other related subjects in which great advances in our knowledge have recently been made.

N. K. A.

*Air Ministry: Meteorological Office. Réseau Mondial 1922: Monthly and Annual Summaries of Pressure, Temperature and Precipitation based on a World-wide Network of Observing Stations.* Published by the Authority of the Meteorological Committee. (M.O. No. 314.) Pp. xvi + 115. (London: H.M. Stationery Office, 1929.) 25s. net.

THE Meteorological Office publication dealing with the year 1922, known as the "Réseau Mondial", has recently been issued from the Air Ministry. It contains monthly and annual summaries of atmospheric pressure, temperature, and precipitation for 1922 for a world-wide network of stations arranged according to a definite plan on the lines of the earlier numbers, which start with the volume for the year 1911.

The system of representation adopted involves primarily the division of the globe into zones extending over ten degrees of latitude, and these are in each case further divided into thirty-six 'squares' covering ten degrees of both latitude and longitude, generally with two representative stations, but sometimes more. This formidable mass of statistics is unaccompanied by any brief summary of what may be revealed by them to the expert eye about the particular character of the year under consideration, as compared with other years, and the casual student of meteorology will therefore gain little from its perusal, but one of the many uses to which such a work may be turned by the expert is shown by recent papers on the radiation of the earth and its atmosphere by Dr. G. C. Simpson, Director of the Meteorological Office, in the series of memoirs of the Royal Meteorological Society. The kind of information given is clearly suitable also for studies of large scale meteorological anomalies such as the cold European and North American winters of 1928-29, and the recent run of wet years in the British Isles.

The volume under review does not differ greatly from earlier volumes, but is an advance over them in that the introduction of information from the oceans, made on a very limited scale in the volume for 1921, is here extended to include considerable areas in the North Atlantic and North Pacific Oceans.

*Handbuch der Experimentalphysik.* Herausgegeben von W. Wien und F. Harms. Unter Mitarbeit von H. Lenz. Band 9, Teil 1: *Hohe und tiefe Temperaturen*, von Prof. H. von Wartenberg; *Gasverflüssigung und ihre thermodynamischen Grundlagen*, von H. Lenz; *Wärmeleitung*, von Prof. Osc. Knoblauch und H. Reiher; *Wärmestrahlung*, von W. Wien und Dr. C. Müller. Pp. xiv + 484. (Leipzig: Akademische Verlagsgesellschaft m.b.H., 1929.) 44-60 gold marks.

THE first section of this book contains a practical and useful account of high-temperature ovens and enclosures and low-temperature baths, and of

methods of temperature measurement. The second section deals with the liquefaction of gases. It includes a summary of the most important experiments on the Joule-Kelvin effect, and a descriptive account of the methods used at Leyden and at the Reichsanstalt for the production of liquid hydrogen and liquid helium. Unfortunately, the proof-readers of this part have overlooked a considerable number of algebraical errors and inconsistencies.

The third section, on the transfer of heat, is written with an emphasis throughout on work which is of importance in technical applications. The experimental work on conduction in metals and solid 'insulators' is dealt with in detail. It may be noted that the accurate work of Hercus and Laby on the conductivity of air has been overlooked. A useful account of work on the loss of heat by convection is included.

In the first chapter of section four a brief sketch is given of the thermodynamical theory of radiation. The second chapter deals with the statistical theory and includes a short account of Saha's theory of the temperature radiation from gases. The third chapter includes an account of instruments for the measurement of heat radiation; also of standard sources of radiation, and of the measurement of the pressure of radiation. The fourth chapter deals with the measurement of Stefan's constant, and the fifth with the experimental determination of the distribution of energy in the spectrum of a black body. The third, fourth, and fifth chapters form a useful and interesting summary of the experimental work.

J. K. R.

*Der vierdimensionale Raum.* Von Prof. Dr. Roland Weitzenböck. (Die Wissenschaft, Sammlung von Einzeldarstellungen aus den Gebieten der Naturwissenschaft und der Technik, herausgegeben von Prof. Dr. Wilhelm Westphal, Band 80.) Pp. viii + 142. (Braunschweig: Friedr. Vieweg und Sohn A.-G., 1929.) 9 gold marks.

PROF. WEITZENBÖCK'S little book deals with the fourth dimension from many points of view, including those of geometry, physics, religion, spiritualism, metaphysics, mysticism, and phantastic fiction, and ends with an extensive bibliography. The greater part of the discussion, intended for the general reader, will be found easy and even amusing, but the author insists that a mathematical foundation is necessary, and some parts of this will be found rather difficult.

In abstract geometry, regarded as a set of logical deductions from certain axioms which are merely unproved statements concerning certain undefined terms, the number of dimensions may be any we please. Some geometers, following up Geiser's discussion of the bitangents of a plane quartic curve by means of an associated cubic surface, have found it advantageous to use four-dimensional loci in order to obtain properties of three-dimensional ones. These properties cannot be regarded merely as abstractions, for they can be verified, to a high degree of approximation, by constructing models. By the aid of analogy and analytical geometry,