

and their distances, thus leading to our knowledge of the distribution of stars in space, and finally to the structure of the universe.

At the present time, however, data are most lacking regarding stellar radial velocities, and any attempt to increase our knowledge in this respect deserves particular attention. It is, therefore, very satisfactory to know that, when planning the equipment of the Dominion Astrophysical Observatory of Victoria, B.C., the first consideration was given to its suitability for this class of work, which it is proposed to make the great feature of the new institution. Quite recently the first volume of measures has been published, and this comprises the determination of the radial velocities of 594 stars between the fifth and eighth magnitudes, the velocities of which have not been measured before.

The work was commenced in May 1918 by the Director of the Observatory, Dr. J. S. Plaskett, and Dr. R. K. Young. In the following year Mr. W. E. Harper and Mr. H. H. Plaskett joined the staff, so that this volume is the outcome of the endeavours of these four observers, who together made the observations, the measurements and the reductions of the spectrograms, as no computing assistance was available.

The introduction to the volume describes briefly the telescope, the spectrograph, the observing arrangements, measuring machines, wave-lengths of spectral lines employed, etc. The telescope was the large 72-inch reflector, and the spectroscope was used with the Cassegrain combination of the telescope. The regulation and control of the temperature in the spectrograph was at first attained by the use of a mercury contact thermometer actuating a special relay, but this was replaced later by the installation of a Callendar recorder. Considerable attention was devoted to the wave-lengths of the lines employed in the reduction of the spectrograms, and the system eventually adopted was one developed by Dr. Young, which is to some extent a compromise of different methods and systems used by various observers. Tables showing the standard wave-lengths employed are given, and they indicate the wave-lengths used for B-type stars and for A- to F-type stars, together with a list of iron comparison lines.

The work accomplished may be briefly summarised by referring to the results of the measures which are brought together in various tables. The first contains the mean velocities, with their probable errors,

of all stars, 537 in number, assigned to be of constant velocity, including their positions, magnitudes, spectral types, etc. Next follows a summary table of the velocities of the systems of all spectroscopic binaries, the orbits of which have been determined at the Victoria Observatory. Table IV. gives complete information as regards the details of all the 3287 radial velocity plates of the 537 constant velocity stars, an average of 6.1 plates per star. This information is concise, compact, and in a convenient form, and will be valuable for detail reference when required. Similar detailed information is given in Table V. with respect to 206 plates of 35 probably binary stars.

It is interesting to make a short reference to the accuracy of the determinations of the radial velocities, because this accuracy depends to a very great extent on the definition of the lines in the star's spectrum under examination. Thus, some spectra have clean-cut lines which render their measurement easy, while others exhibit fuzzy lines, making measurements difficult. The authors have, therefore, divided the probable errors into three classes. The first includes stars of spectral types between Fo and M (excluding some early F stars) which give the most trustworthy values; the probable errors for these range between ± 0.1 and ± 1.0 kms. for the mean velocity obtained from all plates, and between ± 0.2 and ± 2.5 kms. for a single plate. The second main class includes about one-fourth of the A-type, about two-thirds of the B-type, and the early F-type mentioned above. The probable errors for this group are given as ranging from ± 0.5 to ± 1.5 kms. for the mean velocity, and from ± 1.2 to ± 3.5 kms. for a single plate.

The last group embraces mostly A-type stars with the addition of a few B- and O-type, the lines of which are diffuse, broad, and frequently weak. For these the probable errors range from ± 1.0 to ± 3.8 kms. for the mean and from ± 2.5 to ± 10.0 kms. for a single plate.

The original programme as to the number of photographs of the spectrum of each star to be secured, namely, six plates for each star with well-defined lines and eight or ten plates with poor lines, was almost carried out; the whole system of velocities here deduced is therefore homogeneous and a high grade of accuracy has been maintained. The radial velocity values are the result of a great amount of painstaking care, and their early publication is evidence of the industry that has been displayed in all stages of the research.

Geology of Antarctic Lands.

A USEFUL reference to recent summaries of the geological features of Antarctica occurs in the Proceedings of the first Pacific Conference, part iii. p. 644 (1921). It is unfortunate that the various researches based on the results of different British expeditions have not been carried out in a common clearing-house and published as an interlocking series. At present three sets of quarto publications are appearing in our libraries, two of them under the auspices of the Royal Society of Edinburgh, and one under those of the Trustees of the British Museum. Mr. J. M. Wordie's observations on the Weddell Sea area (Shackleton expedition, 1914-17) have been already noticed (NATURE, vol. 109, p. 218). The geological results of the expedition from the Falkland Islands in 1913, financed by Messrs. Salvesen of Leith, are now described by the leader, Mr. D. Ferguson ("Geological Observations in the South Shetlands, the Palmer Archipelago, and Graham Land," Trans. Roy. Soc. Edin., vol. liii, p. 29, 1921).

The unrest in the earth's crust in Oligocene and Miocene times is illustrated by great outpourings of basalt in the South Shetland Islands. The later lavas of the series are notably columnar, and are correlated with similar rocks in Patagonia. Volcanic activity continued almost down to recent times; and there is a series of andesitic tuffs and lavas that go back to Jurassic or early Cretaceous age. The photographic landscapes in this memoir are of unusual excellence. The rocks collected abundantly by its author are described by G. W. Tyrrell in a separate memoir (*ibid.* p. 57). They include the varied intrusive masses of Graham Land and its group of islands, and the red adamellite of Mount Theodore, "the most imposing natural feature" of the district. Mr. Tyrrell regards these older igneous rocks as distinctly Andean in type.

Dr. H. H. Thomas (*ibid.* p. 81) deals with the rocks and minerals collected from islands of the same region by Mr. Innes Wilson, of the Falkland Islands, in

1916-17, including a high-grade copper ore from a boulder near Port Lockroy on the Neumayer Channel. The description of the varied lavas of Deception Island in both this and Mr. Tyrrell's paper is surely an argument in favour of collation and co-operation.

The reports of the British Antarctic ("Terra Nova") Expedition of 1910, published by the British Museum, are concerned, however, with another quadrant of the antarctic region. In the geological series, Nos. 3 and 4, recent and older sedimentary deposits are described by Mr. F. Debenham, from

his personal observations as geologist to the expedition. Metamorphic rocks are dealt with in No. 5; but their relationships in the field are as yet but little known. Dr. A. Smith Woodward's account (No. 2) of "Fish remains from the Upper Old Red Sandstone of Granite Harbour," including *Bothriolepis*, provides more definite information. The remoteness and perils of the district excuse the uncorrelated nature of the results, and no doubt also explain the handsome method of their presentation in the year 1921-22. G. A. J. C.

Durability of Optical Glass.

By Dr. JAMES WEIR FRENCH.

IT is the custom of optical glass manufacturers to issue long lists of types characterised by their optical constants, without much regard to their qualities of durability, which are only occasionally indicated. To the practical computer these lengthy lists are not imposing. Experience has taught him that the number of sufficiently trustworthy types is really very limited, and that only in exceptional circumstances, that fortunately do not frequently arise, may an extension of his list be justified. But while the possibility remains that glass of an unstable kind may be used in the construction of his instruments, the optician has cause for anxiety in the knowledge that his reputation as well as the glass may become tarnished.

The British Scientific Instrument Research Association, the function of which is to provide for the industry the leaven of science, has been charged with the investigation of the durability of glass. According to the admirable report¹ that has recently been issued, "the object of the Research was to determine how far it was possible to establish simple tests by which the durability of different types and varieties of optical glass could be quickly ascertained without awaiting the results of experience by actual use over an extended period." To what extent this object has been attained may be realised from the frank confession at the conclusion of the report, that "it is not possible to recommend any simple test by which the durability of an optical glass can be determined, with such reliability as to avoid the chance of misleading users of the glass in some one or other application of it." With this pessimistic conclusion it is difficult to agree, as the object has already been attained in the workshop, if it is agreed that it is the reflecting or transmitting qualities of the surface with which the optician is concerned.

From the report it appears that numerous tests of Continental and British types of optical glass have

¹ Report of an Investigation on the Determination of the Durability of Optical Glass carried out by T. Haigh. Pp. 51 + 10 plates. (British Scientific Instrument Research Association, 26 Russell Square, W.C.1.) 7s. 6d.

been examined by the iodoosin test of Mylius, the autoclave water and steam tests at four and two atmospheres of pressure, and the "dimming" test evolved by the Royal Arsenal Directorate of Chemical Inspection, which co-operated in the research. This dimming test is really an elaboration of the Zschimmer test. The three tests as applied indicate merely to what extent alkali can be dissolved from the surface, and, as is to be expected, the flint glass types appear more durable than the crown types—a conclusion that is misleading, as the report rightly indicates. Our industrial atmosphere unfortunately contains sulphuretted hydrogen, and if in the dimming test an atmosphere more representative of reality had been employed, the flint types would have been placed more nearly in the order accorded to them by Faraday.

The report confirms the interesting fact, already known in the workshop, that in the glass-polishing process alkali is dissolved from the surface layer, which, with a few exceptions, becomes more durable. Workshop experience shows that a new cloth polisher tested with litmus will usually be found to be slightly acid; after a few hours of working it will be neutral; and thereafter it becomes strongly alkaline. A pitch polisher reacts similarly, but it does not retain the dissolved alkali to the same extent.

The optician is concerned in practice not so much with those so-called optical glasses that are visually affected by the tests referred to, as with those that are labelled as being durable and unaffected. If a well-polished specimen of the most durable crown glass be boiled in water at atmospheric pressure for two hours and its reflecting power be then tested by means of a multi-reflection photometer, a loss of $\frac{1}{4}$ per cent. per reflection may be detected. After boiling for eight hours, the loss will be about 2 per cent., but thereafter the rate diminishes.

The drastic autoclave tests adopted in the research are not necessary to demonstrate how many of the types included in the optical glass-makers' lists are vitreous substances of but little value and a source of danger to the unwary.

Volcanic Activity in Nigeria.

REPORTS have been received by the Governor from Mr. A. A. Reading, of the Bibundi Estate, of a recent volcanic eruption in the Cameroons Mountain, near the coast of Nigeria. Repeated earthquake shocks commencing on February 3 last were followed by an eruption at an altitude of about 4000 feet on the north-west side of the mountain, giving rise to a lava stream which flowed down in the direction of the Bibundi Estate, and entered the plantation area on March 3. The lava extended, roughly, one-third of a mile out to sea, and huge

columns of steam were continually ascending. Attempts to photograph the scene failed on account of the dense smoke and ashes. The centre of the group of craters was estimated to be distant 9900 yards from the house at Bibundi Beach on a magnetic bearing of 128°, and the height above sea-level was believed to be about 4150 feet.

In May the northern stream was still advancing, and threatened to reach the sea along the water-courses on each side of Dollmanshohe. Sometimes there was a loud noise resembling that of a blast