

The fact that the air to be liquefied need not be compressed makes this unconventional air liquefier very simple and easy to handle. Fig. 3 is a photograph of the complete installation (with hydrogen or helium as working fluid), producing 5.5 litres/hr. liquid air and designed for unattended use. The efficiency of this liquefier compares favourably with that of conventional types; particulars are given in literature quoted. Fig. 4 gives the refrigerating capacity, the power consumption and the figure of

merit of this machine at different temperatures. It is clear from this graph that the air liquefier is only one application of the gas refrigerating machine, and that we may expect many more applications, in particular, in the temperature-range between  $-80^{\circ}$  C. and  $-200^{\circ}$  C.

<sup>1</sup> Köhler, J. W. L., and Jonkers, C. O., *Philips Tech. Rev.*, **16**, 69, 105 (1954).

<sup>2</sup> *Min. Proc. Inst. Civ. Eng.*, **37**, 244 (1873-74).

<sup>3</sup> The theory of regenerators has been developed, among others, by Hausen, H., *Z. angew. Math. Mech.*, **9**, 173 (1929).

## INTERNATIONAL ASTRONOMICAL UNION

### GENERAL ASSEMBLY IN DUBLIN

**M**ORE than six hundred astronomers, from forty-one countries, attended the meetings in Dublin during August 29-September 3 of the International Astronomical Union, under the presidency of Prof. Otto Struve (Berkeley, California). The largest national delegation came from the United States, and there were also large groups from France, Germany and Great Britain. Among other representatives were about twenty from the U.S.S.R., the largest number of Russian astronomers yet to attend a meeting of the Union.

The International Astronomical Union was founded in 1920, holding its first meetings in Rome in 1922, and can claim to be one of the oldest and most successful of the international scientific unions. It was born amid political difficulties created by the First World War, and since then has had to contend with the growing tensions of the 1930's, the disasters of the 1940's, and the ill-feeling of the early 1950's. Despite these troubles, astronomers have held steadily to the belief that full and effective international co-operation is essential for the well-being of their science. In consequence, the Union has managed to survive and grow; it has a record of substantial achievement, and the recent meeting was attended by more astronomers, and was perhaps marked by more general cordiality, than any previous one.

Since 1920 astronomy has developed enormously. Perhaps it may be recalled that at that time the structure of the Milky Way system was mostly unknown, the extragalactic character of the spiral nebulae was not universally accepted, interstellar matter was regarded as quite negligible, and the theoretical basis of present-day astrophysics was only just beginning to come into existence. It is not entirely surprising that the original organization of commissions, each dealing with its own special branch of the subject, which has worked tolerably well for thirty-five years, is now requiring reform. At the beginning there were about thirty commissions, each a fairly compact group of about a dozen members. This year there were forty commissions, with an average membership of about forty, as well as fifteen sub-commissions. Some commissions have become much too large to be effective and a great deal of their work has in recent years been done by the sub-commissions. To meet this difficulty of unregulated growth, the General Assembly has taken the important decision that in future the International Astronomical Union shall consist of a main body of ordinary members and a comparatively small body of commission members. The details of the transition from the present arrangements have still to be worked out.

In his address at the inaugural ceremony this year, Prof. Struve reminded his audience of the speech of his predecessor Prof. W. W. Campbell, in 1925, in which it was pointed out that the Union was not to be an international society to provide the opportunity for the reading of papers describing work already done and results already obtained, this function being well taken care of by existing national societies, but should have other and broader aims, especially "(1) To facilitate the relations between astronomers of different countries where international co-operation is necessary or useful; (2) To promote the study of astronomy in all its departments". At recent meetings there has been a tendency to forget these early ideals and to devote too much time to the reading of formal papers in rapid succession, a procedure calculated to give early intellectual indigestion to the great majority of hearers. Prof. Struve's remarks were welcomed by the growing body of members who have deplored this tendency, and who have themselves generally found greater profit in informal discussions, both within commissions and without, with colleagues from distant countries whom they rarely see except at these meetings.

In the commissions dealing with solar and terrestrial matters, considerable attention was given to plans for the International Geophysical Year of 1957-58. Some members raised doubts as to the practicability of completing with the available labour force all the ambitious and comprehensive series of observations proposed, still less the subsequent reductions and computations. On one hand, astronomical problems are greatly increasing in number and complexity and demand an ever-increasing number of workers; on the other, some countries are now facing a famine in young scientists having a basic training in mathematics or physics, and this is already causing serious concern to the directors of observatories and other astronomical institutions. This growing difficulty affects not only the coming International Geophysical Year but also nearly all branches of observational astronomy, especially those involving long series of observations or measurements.

A number of joint meetings and symposia were held, for the most part well organized and with plenty of time for discussion. The subjects included non-stable stars, the large-scale structure of the galactic system, solar flares, photoelectric image tubes, turbulence in stellar atmospheres, and fundamental stars. The discussions showed generally a commendable restraint in the interpretation of new observations and discoveries, with the emphasis more on the bewildering complexity of astronomical

phenomena than on our progress in understanding them. There were no signs of the pseudo-omniscience which often colours popular writing in astronomy and which does the subject no little harm with critical readers.

Among recent results announced at the meetings a few call for special mention. Photographs of the solar spectrum showing extremely clearly the variation of line shifts and line profiles over the coarse granulation have been made at the McMath Observatory with a new large grating spectrograph giving a resolving power greater than 500,000. Remarkable films of solar flares, also photographed at the McMath Observatory, aroused much interest. Recent rocket flights in the United States have provided photographs of the solar spectrum into the ultra-violet beyond  $L\beta$ . The rotation of the Large Magellanic Cloud has been measured at the Radcliffe Observatory, Pretoria. Evidence for the very recent formation of certain stars has been found by workers at the Lick Observatory. Photometric measures made at Mount Wilson of the old nova, *DQ Herculis*, now an eclipsing binary, have shown at some phases a remarkable regular pulsation with a period of a little more than one minute.

A few resolutions of more general interest may be mentioned out of the many submitted by commissions and approved by the General Assembly. With regard to notation,  $\text{Å}$  is to be preferred to  $\text{Å}$  as an abbreviation for the angstrom unit; 'kayser' is rejected in favour of  $\text{cm}^{-1}$ . Two proposals of the International Committee on Weights and Measures were endorsed, one relating to a re-definition of the metre in terms of the wave-length of the red cadmium line, the other (which may very soon be made obsolete by recent work with caesium resonators) defining the second as  $1/31\,556\,925\cdot975$  of the tropical year for 1900.0. A number of recommendations were made concerning secondary wave-length standards of iron, neon, and argon. Strong support was given to the efforts of the International Scientific Radio Union to obtain frequency-bands for the use of radio astronomers, free of interfering radio transmissions.

The recognition that photoelectric image tubes may ultimately give considerably greater speed for faint sources than the ordinary photographic process, and that they promise to be of the greatest importance to astronomers, has led to the formation of a new sub-commission to encourage developments in this field. Other new sub-commissions have been formed on 'seeing', on meteorites, on variable stars in globular clusters, on the determination of the galactic pole and the zero of galactic longitude. Two commissions and four sub-commissions have been abolished.

The new president of the Union is to be Dr. A. Danjon, director of the Paris Observatory. He will hold office until the 1958 meetings, which on the invitation of the National Academy of Sciences of the U.S.S.R. will be held in Moscow. The U.S. National Committee has issued an invitation to hold the 1961 meetings in Pasadena.

At the concluding session of the General Assembly, warm appreciation was expressed of the hospitality of the Irish Government, of University College, the Institute for Advanced Studies, the Dunsink Observatory, and other institutions in Dublin. That the meetings were so successful and enjoyable was due in large part to the efforts of the Dublin organizers and their helpers, efficiently and energetically led by Prof. and Mrs. H. A. Brück. R. O. REDMAN

## OBITUARIES

### Prof. V. A. Dogiel

PROF. VALENTINE ALEXANDROVITCH DOGIEL, who died on June 1, was the most outstanding Russian protozoologist of our times. Born in Kazan on March 10, 1882, he was the son of the eminent histologist, Prof. A. S. Dogiel, whose investigations on the minute structure of the nervous system are known throughout the world. V. A. Dogiel received his training in protozoology from V. T. Schewiakoff, whom he succeeded in 1913 as professor of invertebrate zoology in the University of St. Petersburg (now Leningrad), a post which he occupied until the end of his days. On his election as corresponding member of the Academy of Sciences of the U.S.S.R. in 1939, Dogiel also took charge of the protistological laboratory of its Zoological Institute.

Among Dogiel's earlier works (1916-23), those dealing with the parasitic flagellates of termites are noteworthy; but his most important contributions concern the systematics, morphology, and evolution of the Ophryoscolecoid ciliates of ruminants. Dogiel's protozoological work culminated in the publication of a remarkable treatise on "General Protistology" (1951), providing a comprehensive, critical account of the fundamental principles and problems of protozoology.

From 1930 onwards Dogiel's researches were directed to the ecological aspects of parasitology, especially the effect upon the parasitic fauna of changes in the environment and physiology of their hosts. In 1941 he produced a "Textbook of General Parasitology", a second edition of which appeared in 1947. This book, which is devoted to the biology of parasites, is an outstanding contribution to parasitological literature, unique in conception and masterly in presentation. Dogiel was also the author of a "Textbook of Invertebrate Zoology" (four editions, 1934-47) and of a "Handbook of Comparative Anatomy of the Invertebrates" (1938-40), both of which are standard university text-books in the U.S.S.R. Finally, a year before his death (1954) he published a book on "Oligomerization of Homologous Organs: One of the Main Paths of Animal Evolution", in which he develops the idea that various groups of Metazoa have evolved by a gradual diminution, or oligomerization, in the number of homologous and homodynamic organs which were present in their ancestors.

During the forty-two years of his tenure of the chair of zoology in Leningrad, Dogiel built up a school of protozoology and parasitology, to which numerous students (including the present writer) owe their training in these subjects.

C. A. HOARE

### Prof. C. F. W. McClure

PROF. C. F. W. MCCLURE, the distinguished American comparative anatomist and embryologist, whose death has recently been announced in his ninetieth year, was born in Cambridge, Massachusetts, in 1865. After an undergraduate career in Princeton, he studied at Columbia University in New York and in Berlin, Kiel and Würzburg. His academic career, however, was essentially linked with Princeton, where he was successively instructor in biology and assistant professor. In 1901 he was appointed to the chair of comparative anatomy in Princeton,