high temperatures in the upper atmosphere were first indicated by a study of meteors, and it has recently been shown that the absorption of solar energy in the ozone layer (centre of gravity about 45-50 km.) is responsible for their maintenance. This explanation, supported as it is by evidence from two independent sources, seems likely to remain as the most important in the field.

The experimental investigation of conditions in the upper air is full of difficulty, and one of the most fruitful and powerful methods seems to be by the use of these low frequency sound waves. The institution of consistent and systematic explosions to be observed by registering instruments in groups of two as above, spaced, say, 10 km. apart so as to cover the whole abnormal zone on a suitably chosen diameter (with the addition, if feasible, of a radius at right angles), could give much information about the seasonal and possible diurnal variation of the radius of the inner edge. Perhaps a simpler method of getting information about the upper winds would be the grouping of three instruments in a triangle, a few hundred metres apart, enabling both the vertical and horizontal angles to be measured. A most important step is to have work of this sort undertaken at representative and suitable parts of the world. Increases in our knowledge of the physics of the upper air are almost certain to result from the co-operation of workers in various countries, once the highly important problem of defraying the cost is solved.

Obituary.

Dr. W. G. Duffield.

IT is but a few weeks ago that we were giving a welcome to the first publication (*Memoirs*, vol. i. No. 1), issued from the Solar Observatory of the Australian Commonwealth, at Canberra; and now to our deep regret comes the news of the death, on Aug. 1 after a brief illness, of Dr. Walter Geoffrey Duffield, the Director of the Observatory.

Dr. Duffield was the son of the late Mr. W. Duffield of Adelaide, and a grandson of Senator Walter Duffield, one of the first members of the South Australian Parliament. He graduated first at the University of Adelaide in 1900, and then at Cambridge, where he passed out in the Mechanical Sciences Tripos in 1903. He married Miss Doris Boult, of Adelaide. Later, at the University of Manchester, from which he received the degree of D.Sc. in 1908, he became an honorary research fellow, and worked at the subject of the effect of pressure upon arc spectra. He held a Mackinnon Studentship awarded by the Royal Society in the years 1906 and 1907, and under the stimulating influence of Sir Arthur Schuster he communicated four memoirs on the subject named above to the *Transactions* of the Royal Society in the years 1907–15, extending thereby the work of Humphreys and Mohler, especially in relation to the metals iron, copper, silver, gold, and nickel, and studying the arc spectra of those metals at pressures ranging from 1 atmosphere to 101 atmospheres.

In 1911, Duffield was appointed to the professorship of physics at University College, Reading, a post which he held until 1923. Though the claims on his time and energies were considerable, both as professor and as dean of the Faculty of Science, he found time for research work and for encouraging such work amongst his post-graduate students. Among other subjects he studied the electric carbon arc from the point of view of the consumption of carbon under varied conditions of current strength and length of arc, and their influence on the luminosity of the arc. Papers on the subject were published in the *Proceedings* of the Royal Society, vol. 92.

In 1912, Duffield had discovered the existence of minute repulsion between the poles of an electric carbon arc. Seven years later he carried out, with the assistance of two of his post-graduate students, a beautiful set of experiments designed to eliminate all extraneous disturbing forces. He succeeded in measuring the outstanding force of repulsion though it was only of the order of a dyne, and showed that it was due to the recoil consequent upon the projection of electrons from the poles (*Trans. Roy. Soc.*, A, vol. 220). A year later he had extended the observations to the case of metal arcs.

During the War Duffield served, despite ill health, as captain in the Royal Air Force.

Another piece of Duffield's research work may be mentioned here, namely, his attempt to determine the value of gravity over the ocean, on a voyage to Australia and back, in 1914. His results were published in the *Proceedings* of the Royal Society, vol. 92. A vivid account of the preparations for the work and the difficulties experienced was given in the report of three pages in the British Association Report for 1915, p. 48. The main object of the research was to obtain results bearing on the theory of isostasy. Duffield showed undaunted perseverance in discovering and remedying leaks in the four barometers which were involved in his operations in the refrigerators of the s.s. *Ascanius*. The whole-hearted assistance which he evoked from all those with whom he came in contact in his enthusiastic efforts was a splendid testimonial to the fervour of his devotion.

When the British Association in 1908 appointed a committee with Sir David Gill as chairman to aid the work of establishing a solar observatory in Australia, Dr. Duffield was chosen as secretary. The matter was one requiring considerable tact and perseverance in addition to a knowledge of local politics and local conditions. The first report of the committee was published in the British Association Report for 1909, and contains a statement of the history of the movement. It sets forth the grounds on which the committee urged the participation of Australia in the international co-operation in solar research then in full activity. Dr. Duffield made three voyages to Australia with such good results that in 1914, when the Associa-

tion met in Australia, the committee, reinforced by new members, was received by the Prime Minister and was assured of favourable consideration, so far as was possible at the outbreak of the War.

It was not until 1923 that the decision to found an observatory at Canberra was ultimately reached, and a not unnatural sequel to the multifarious activities of Dr. Duffield was that he was elected to be the first Director, but it is within the knowledge of the present writer that it needed considerable persuasion to induce him to accept the post, so convinced was he that his own tastes and studies could not be regarded as any qualification for the post of astrophysicist. It was a difficult task that he undertook, and we are scarcely in a position yet to estimate the degree of success that he had in carrying out his aims for the equipment and initiation of the work at the observatory on Mount Stromlo. He has many friends who will deeply deplore his premature death, and will think with warm sympathy of his wife and children. H. F. N.

WE regret to announce the following deaths:

Mr. Arthur Berry, O.B.E., vice-provost of King's College, Cambridge, author of a "Short History of Astronomy" and of many mathematical papers, on Aug. 15, aged sixty-six years.

Mr. Anthony Collett, author of "The Heart of a Bird" and other natural history books, and a member of the staff of the *Times*, on Aug. 22, aged fifty-two years.

Mr. Walter Heape, F.R.S., a distinguished worker on embryology and on the comparative physiology of the generative system, on Sept. 10, aged seventy-four years.

Mr. Montague Hill, C.I.E., formerly chief conservator of forests in the Central Provinces, India, on Aug. 12.

M. Auguste Lebeuf, director of the Observatory of Besançon, known for his work on chronometry and celestial mechanics, aged seventy years.

Sir Seymour Sharkey, consulting physician to St. Thomas's Hospital and president in 1904 of the Neurological Society, on Sept. 6, aged eighty-two years.

Sir Edward Maunde Thompson, G.C.B., director and principal librarian of the British Museum from 1888 until 1909 and author of "Introduction to Greek and Latin Palæography," on Sept. 14, aged eighty-nine years.

Dr. Naomasa Yamasaki, professor of geography in the Imperial University of Tokyo, member of the Imperial Academy, chairman of the National Committee on Oceanography of the Pacific, and chairman of the Division of Geology and Geography of the National Research Council of Japan, on July 26, aged fifty-nine years.

News and Views.

DR. BONHOEFFER'S discovery that it is possible to separate out two distinct kinds of molecules from ordinary hydrogen, to which reference was made in NATURE of April 20 (p. 621), would appear, from Press reports of the Minneapolis meeting of the American Chemical Society on Sept. 10, to have formed the subject of a further communication there by Dr. Bonhoeffer himself. Dr. Bonhoeffer has not attempted to split up the proton, the nucleus of the hydrogen atom (H), but has simply subjected hydrogen gas (H_2), as usually prepared, to treatment similar to that employed in many other physico-chemical processes. It appears that he has not only shown that it consists of two molecular species—each, however, with the same formula, H_2—but has also been able to prepare at least one form in a practically pure state, and to find a number of its physical constants, which are not the same as those of the mixture which is ordinary hydrogen.

THESE experiments with hydrogen have been inspired by the new mechanics, by means of which it was predicted that two protons and two electrons could link together to form a normal hydrogen molecule in two quite different ways. Other evidence for this admittedly revolutionary idea comes from the analysis of the multilinear secondary—band—spectrum of hydrogen, in which two types of terms have been found, analogous to two types found in the corresponding line spectrum of helium, which may be looked upon in one sense as a hydrogen molecule with the two nuclei coincident: the names 'para-hydrogen' and 'orthohydrogen' have been coined by reason of this analogy with 'parhelium' and 'orthohelium'. Whether or not it will prove possible to analyse other diatomic—or more complicated—gases in the same way can scarcely be stated at this stage. Dr. Bonhoeffer's work, apart from its intrinsic value, is of considerable importance in that it is likely to attract more general attention to the many contributions to chemical theory which have already been made by the new mechanics.

AN association such as the British Broadcasting Corporation, which has a vast audience almost at its mercy, obviously stands in a very critical position. It speaks well for the judgment and sanity with which its affairs are managed that notwithstanding the frequent comment, not always favourable, which appears in the Press, the total volume of criticism is relatively small when the range of the Corporation's activities is taken into account. It must have occurred to many when listening-in first became almost universal a few years ago that the real danger lay, not in the possibilities that the programmes arranged for the public might be too frivolous in character, but rather that they might be too academic. An educational instrument of such unbounded possibilities was scarcely likely to escape the attention of the over eager enthusiast. This danger has been successfully avoided. The educational section of the Corporation, which is assisted by a subsidy from the Trustees of the Carnegie Foundation, has proceeded with admirable caution. Having due consideration for the weaker brethren, it has on the whole avoided at any rate the appearance of the academic and the abstruse by exercising a judicious selection in its choice of lecturers and in censoring their titles.