

Exhaustive checks were made to confirm that the integrated noise counts in the eight range channels showed statistical fluctuations which agreed with theory, and that no systematic errors were introduced by, for example, the operation of the transmitter or the telescope. Such systematic errors were unlikely because the transmitter and receiver operated alternately for 5–6 min. intervals.

A total of 58½ hr. useful operating time was obtained before the range of Venus had increased to a point where further work was not considered worth while. The addition of all the periods of observation is presented as a histogram (Fig. 1) where one of the eight range-intervals shows an excess count of 2½ times the standard deviation. The addition of many samples of noise by the integrating equipment gives a Gaussian distribution of counts, hence there is an 8 per cent chance that noise alone will produce a count 2½ standard deviations greater than the mean in one of eight channels. If the high count is caused by the planetary echo, then the range observed gives a value for the solar parallax of 8.8020 ± 0.0005 sec. of arc. This value is in agreement with that obtained by Price *et al.*¹ using the Millstone Hill Radar Station operated by Lincoln Laboratory of the Massachusetts Institute of Technology (8.8022 ± 0.0001 sec. of arc). The likelihood that, by coincidence, a high count should appear in the range interval predicted by the Millstone Hill result is 1 per cent.

The signal-to-noise ratio required to produce an excess count of 2½ standard deviations has been estimated by applying to the receiver signals which

are weaker than the noise by a known amount, and is -23 ± 2 db. This is within 6 ± 2 db. of that expected on the basis of a model for Venus in which it was assumed that the scattering is similar to that observed for the Moon² and that the period of rotation is of the order of 20 days. However, the result is not in agreement with the work reported by Price, which suggested that the radar cross-section of Venus was equal to the physical area presented by its disk. If this were the case a signal-to-noise ratio of about -5 db. should have been observed. This discrepancy of 18 db. in signal strength might be accounted for in two ways: (a) if the rotation period of Venus is much faster than once every 20 days the Doppler broadening of the echo will cause some of the received power to fall outside the 60 c.p.s. bandwidth limit of the receiver; (b) if the echo is subject to large rapid changes in intensity then because a square law detection system was employed at Millstone Hill, a false estimate of the average signal-to-noise ratio would be obtained. Such fading could not have been caused by Faraday rotation in the Earth's ionosphere because circularly polarized radio waves were used in both experiments.

We are indebted to our colleagues at Millstone Hill for their interest and co-operation, particularly in producing for us predictions of the range and Doppler corrections which were applied to select the received signal.

¹ Price, R., Green, P. E., jun., Gobllick, T. J., Kingston, R. H., Kraft, L. G., jun., Pettengill, G. H., Silver, R., and Smith, W. B., *Science*, **129**, 751 (1959).

² Evans, J. V., *Proc. Phys. Soc.*, B, **70**, 1105 (1957).

OBITUARIES

Prof. M. Caffrey

THROUGH the death of Prof. M. Caffrey, which occurred on September 17 at the age of seventy, Ireland has lost an outstanding personality in the field of agricultural science and one who took an active part in the Faculty of Agriculture in the National University of Ireland.

Michael Caffrey was born at Lughill, near Monasterevan, Co. Kildare. He received his early education at the local national school and at the Christian Brothers' School, Monasterevan. He entered the Albert Agricultural College, Glasnevin, in 1908, and in the following year was awarded an agricultural scholarship into the Royal College of Science, Dublin. After a distinguished undergraduate course, he gained the diploma of the latter institution in 1912, and was appointed as assistant to Dr. H. Hunter in the Plant Breeding Section of the Department of Agriculture, Dublin. The studies and work he then undertook under the able guidance of Dr. Hunter formed the basis of his later successful career in plant breeding, lecturing and teaching. When Dr. Hunter resigned after the First World War, Caffrey became head of the Plant Breeding Section of the Department of Agriculture, and when a Faculty of Agriculture was established in the National University of Ireland in 1927, the University made him lecturer in plant breeding, and afterwards in 1938 appointed him to fill the newly established chair of plant breeding, a post which he occupied until his death.

Throughout his career, Prof. Caffrey remained in close contact with the Department of Agriculture, which he kept supplied with nucleus stocks of leading

cereals and grasses. These in turn became available to the various county committees of agriculture, by which they were tested and reported on in due course. Prof. Caffrey was also in close contact with plant breeding stations abroad, and he introduced many foreign cultivars of wheat, oats and barley. They were tested against cultivars commonly grown in Ireland and numerous crosses made with the most promising sorts. During four decades he produced not only varieties of wheat suitable to local soil and climatic conditions, but also improved varieties of oats and grasses. In crossing and breeding, Prof. Caffrey was particularly interested in the reaction of the hybrids to disease resistance, and one outstanding case of his work on this aspect may be quoted here. At Glasnevin, year after year, the most common and serious disease of wheat has been yellow rust (*Puccinia glumarum*). To combat this, Caffrey produced the cultivar Glasnevin Rosa, a wheat which was immune to yellow rust for seven years, a period which is about usual for varieties bred immune or resistant to rust diseases before they become attacked by new strains of the pathogen which develop in the meantime.

Close co-operation always existed between the Plant Breeding Division and the Plant Pathological Division at Glasnevin; and down the years the latter Division has been indebted to Prof. Caffrey on many occasions for directing attention to outbreaks of disease and to the appearance of new pathogens on cereal crops.

Although Prof. Caffrey's entire professional career was devoted to plant breeding, he had a wide interest in all agricultural subjects. He was a founder Council

member of the Irish Grassland Association; a member of the Agricultural Commission appointed by the Government to examine agricultural development in the late 'thirties; and in general he identified himself with many agricultural developments. He was equally at home with students and scientific audiences, and as a lecturer on behalf of the Royal Dublin Society he became intimately acquainted with and highly appreciated by a wide range of farmers all over the country.

Prof. Caffrey's outspoken manner, genial personality and hearty laugh will long be remembered by all who knew him. He was predeceased by his wife some years ago, and he is survived by three sons and three daughters, for whom the greatest sympathy is felt.

R. MCKAY

Dr. E. J. Holmyard

ERIC JOHN HOLMYARD was born on July 11, 1891, at Midsomer Norton, Somerset, and all his life he was a faithful man of Somerset. He was a scholar of Sidney Sussex College, Cambridge, and after graduation he served as a sixth-form science master at Marlborough College during 1917-19. He then became head of the Science Department at Clifton College, an appointment which he filled with signal success for the twenty years 1920-40. It was at Clifton that his best work was done. In 1941 he became editor of *Endeavour*, retiring in 1954 to live at Clevedon, Somerset. Among his other activities, he was chairman of the Society for the Study of Alchemy and Early Chemistry and co-editor of a "History of Technology" in five volumes.

Holmyard, as a teacher, well knew the capacities of young pupils at school, and his books on inorganic and organic chemistry of this standard have deservedly been very popular. They are written in a lucid and attractive style and many readers of this notice must owe their introduction to chemistry to them. In collaboration with F. A. Philbrick, he wrote a more advanced book on theoretical and inorganic chemistry which has also been very successful. All these books present the basic facts of chemistry as an experimental science, relating them to general principles in a way which gives them significance and interest; but the theory is kept in proper proportion, so that those who gained their knowledge from them in the past will now have very little to unlearn.

Dr. Holmyard, who was a member of the Royal Asiatic Society, will probably be best remembered for

his profound studies of Muslim chemistry. He was well equipped with a knowledge of Arabic, and in this field he was a recognized authority. He made a special study of Jābir ibn Ḥayyān and the writings attributed to him. He published some Arabic texts, brought to light some little-known works of Jabir, and re-interpreted some which had previously been studied. More recent research has shown that the problem of Jābir is very difficult and much remains to be cleared up, but Holmyard's pioneering work has a permanent value. He showed that the theory which dominated alchemy and early chemistry, that metals are composed of mercury and sulphur, was taught by Jābir, who derived it from a statement in the "Meteorology" of Aristotle.

In collaboration with his pupil at Clifton, Mandeville, Holmyard published the Arabic text and a translation of a work known in Latin as by Avicenna and showed that it is, in fact, part of the genuine *Shifā'* of Ibn Sīnā. This text, which denies the transmutability of species and stigmatizes alchemical gold as fraudulent, was a puzzle in the Middle Ages, when it was thought to be part of the "Meteorology" of Aristotle. Holmyard also edited and translated an alchemical text of Abu'l Qāsim al 'Irāqī. In all these studies he made much use of the writings of Jildaki, available only in manuscripts, and established their value as a source of information on Muslim alchemy. The work in this field by Holmyard completely changed the outlook on Muslim chemistry which prevailed when he began.

Holmyard wrote some excellent small books on the history of chemistry, the best known being his "Makers of Chemistry" and his recently published "Alchemy". These are accurate and authoritative, and it is to be regretted that he did not write a general survey of Muslim chemistry which he was so well qualified to undertake.

Holmyard was modest and unassuming, ready to put his knowledge at the disposal of those who asked it, with a cool and critical outlook in scholarship, expressing himself concisely and avoiding polemics. His learning sat lightly upon him, and for all he cared it could remain unknown in circles incapable of understanding it. He was open and friendly and in whatever company he found himself his quiet charm and delicate sense of humour, wholly free from malice, endeared him. He was a member of Clevedon Golf Club. He died at Clevedon on October 13, and among those who valued his knowledge and friendship his death leaves a vacant place which it will be hard to fill.

J. R. PARTINGTON

NEWS and VIEWS

Royal Society: Award of Royal Medals

H.M. THE QUEEN has been graciously pleased to approve recommendations made by the Council of the Royal Society for the award of the two Royal Medals for the current year as follows: to Prof. R. E. Peierls, professor of mathematical physics in the University of Birmingham, for his distinguished work on the theoretical foundations of high energy and nuclear physics; to Prof. P. B. Medawar, Jodrell professor of zoology and comparative anatomy at University College, University of London, for his distinguished contributions in the field of tissue transplantation immunity and acquired tolerance.

Geological Society of London: Foreign Members

The Geological Society of London has elected to foreign membership the following distinguished geologists: Academician V. V. Belousov, of the Academy of Sciences, Moscow, in recognition of his studies on sedimentation and geotectonics; Prof. J. A. Broggi, of Lima, Peru, for his work in the advancement of geological science in Peru and his contributions to Peruvian geology; Academician D. V. Nalivkin, of the Academy of Sciences, Moscow, in recognition of his contributions to the geology of the Soviet Union and especially of his part in the preparation of the recently published geological map