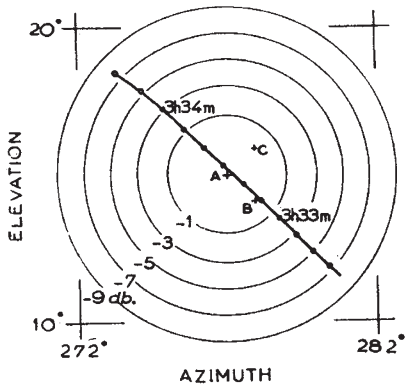

Fig. 5. Crossing of the antenna beam by *Echo* I (points every 10 sec.). *A* is the theoretical beam axis; *B* is the beam axis giving the best agreement with the experimental amplitude record. (The great circles are to be shifted in the same manner)

Fig. 5 also shows that, if we had had a receiving antenna with a beam width of 1° (as for the transmitting antenna at Holmdel), an error of tracking of ½° in angle, or of 5s. in time, would have given a loss of 3 db. (Losses of 5 db., because of lack of tracking accuracy, were found by another observer[5].)

Conclusion

This experiment, among many others, has proved the success of the *Echo* I project; in particular, it showed that the reflectivity of the coating is good, and that the received signals are free from rapid fading.

We have also seen the necessity of a big steerable antenna, in order not only to have better gain (say, 10 db. more), but also to avail oneself of the low temperature of the sky. But the beam-width of the antenna must not be too small, unless very good means of tracking are available.

From the point of view of communications, we must pay attention to the very unfavourable power balance in the use of a passive satellite; even with elaborate equipments, the band-width capabilities are limited to a few voice channels. But the simplicity of the balloon, together with the value of the many scientific results obtained with *Echo* I, argue for more elaborate tests of this kind.

Thanks are expressed to the National Aeronautics and Space Administration, which gave us much information, and to the Bell Telephone Laboratories, which supplied the transmissions to the balloon at the time when it was visible from both Europe and America.

We are indebted to Prof. P. Muller of Meudon Observatory for his optical observations, to Mrs. Epfelbaum for her constant help in the computations, and to the Direction des Etudes et Fabrications d'Armements for the loan of an electronic computer.

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OBITUARIES

Prof. J. S. Rankin

Dr. James S. Rankin, Freeland professor of natural philosophy in the Royal College of Science and Technology, Glasgow, died on November 16 in his sixty-seventh year.

Dr. Rankin joined the staff of the Natural Philosophy Department of the College in 1919, after a few years of postgraduate experience in industry, and except for the period 1943–45, when he was seconded to the University of Istanbul to occupy the chair of theoretical mechanics, his service to the College remained unbroken. He was appointed to the Freeland chair in 1942, and under his leadership the Department was a most stimulating place in which to work. His research interests extended over a wide field, his most notable work being concerned with the phenomenon of magnetostriction and, in particular, with attempting to explain the changes in the magnetostriction of steel resulting from various degrees of tensile over-strain.

One of his greatest achievements lay in the development of his course leading to the associateship of the College in applied physics. None of his predecessors had thought of the Department as other than an ancillary one for the engineering and other applied science courses in the College. In 1947 he set about his task of building up a school of applied physics which would have a recognized place in the higher aspects of technology. It was characteristic of his vision and determination that he succeeded, and young graduates from his school are now helping to bridge the gap that exists in industry between the 'pure' physicist and the engineer.

Among his other activities he was a governor of the West of Scotland Agricultural College, a member of the Vice-Chancellors' Committee on Hungarian Students and an ex-chairman of the Scottish Branch of the Institute of Physics and the Physical Society.

He had great gifts which he put to fine use in the service of the College. A devoted teacher, he will long be remembered by generations of students who came to know the warmth of his friendship.

J. W. Sharpe

Mr. E. C. Fieller

Edgar Charles Fieller, officer-in-charge of the Statistical Advisory Unit of the War Office, died suddenly on December 1. He was fifty-three years of age.

A prominent member of the Royal Statistical Society, he had served as a vice-president, several terms as a member of Council, as secretary, then chairman of the Research Section, and as a member of several committees. In 1960 the Society honoured him by the award of the Guy Medal in silver. He was for four years secretary of the British Region of the Biometric Society.

As a young man, after taking the Mathematical Tripos as a scholar of King's College, Cambridge, he was for a time a member of Prof. Karl Pearson's staff. This began an association with the School of Statistics at University College, London, which was

renewed in later years through his membership of the University board of studies and by his appointment as an examiner.

His subsequent experience with Messrs. Boots led him into the fields of market research and bioassay, in which he made several original contributions; one of these, a method for obtaining confidence limits for a ratio, is now well known as Fieller's Theorem.

Fieller served during the Second World War in the Operational Research Group of Fighter Command, R.A.F., part of the time as deputy to the officer-in-charge. After the War he joined the National Physical Laboratory in charge of the Statistics Group of the newly formed Mathematics Division. This Group was eventually transferred to the Ministry of Supply and, on the dissolution of that Ministry, to the War Office.

While on leave of absence from the Ministry of Supply, he fulfilled an assignment in Turkey for the Food and Agriculture Organization of the United Nations. There he conducted a training course in sampling methods which enabled a national survey to be made. He made many friends in Turkey, and his work there will have lasting effect.

In later years, when Fieller became a member of the International Statistical Institute, he made a particular point of seeking the acquaintance of the mathematical statisticians of other countries. These personal friendships must have made a considerable contribution to international understanding.

Fieller's published work of earlier years on probability problems and on bioassay was supplemented later by a paper on fiducial limits; in this, with his usual caution, he pointed out the consequences and paradoxes of a theory while reserving judgment on controversial points.

The pleasure he took in social contacts, his understanding of others and his fund of anecdotes, made him a good companion who will be missed in many places.

E. D. van Rest

NEWS and VIEWS

Entomology at the British Museum (Natural History): Dr. W. E. China, C.B.E.

Dr. W. E. China, who retires from his post as keeper of the Department of Entomology in the British Museum (Natural History) at the end of January, is a world authority on the insect order Hemiptera. During his thirty-nine years of service on the staff of the Department he has published more than two hundred papers on the structure, taxonomy, evolution and zoo-geographical distribution of this group of insects. After his retirement he intends to return to this work, which his administrative duties as keeper have interrupted. He became deputy keeper in 1945 and was largely responsible, under the keeper, Mr. N. D. Riley, for the rehabilitation of the Department of Entomology after the war-time bombing and the return of the National collection of insects, much of which had been evacuated. On the completion of the new building in 1951 he was concerned with the keeper in organizing the re-allocation of the entire entomological collection. He was appointed keeper in 1955. Dr. China is a foreign member of the Societas pro Fauna et Flora Fennica and corresponding member of the Société Entomologique d'Egypte. In 1959, he was appointed assistant secretary of the International Commission on Zoological Nomenclature.

Engine Research, Ministry of Aviation: Mr. Peter Lloyd, C.B.E.

Mr. Peter Lloyd has been appointed director general engine research and development, Ministry of Aviation, in succession to Mr. R. H. Weir, who is now director of the National Gas Turbine Establishment, Pyestock. Born in 1907, Mr. Lloyd went from Greshams School, Holt, to Trinity College, Cambridge, in 1925, where he took the Natural Science Tripos, Parts 1 and 2 (chemistry). After a year's research under Dr. (now Sir) Eric Rideal and a year in the German chemical industry, he was with the Gas Light and Coke Co. from 1931 until 1940 in charge of research on the industrial utilization of gas. In 1940 he joined the Royal Aircraft Establishment working first for Prof. G. T. R. Hill in the Air Defence Department at Exeter, and then in 1941 under Hayne Constant and W. R. Hawthorne in the turbine division of the Engine Department. With that team he transferred to Power Jets, Research and Development, Ltd., at Pyestock, in 1944, and soon after that body became the National Gas Turbine Establishment he became a deputy director. During the first part of this period his work was mainly concerned with combustion researches including studies of spontaneous ignition characteristics at high temperatures and the evaporation and burning characteristics of liquid fuel drops in high-speed air streams. Latterly he assumed a more general responsibility for Pyestock's research on aerodynamic, mechanical and metallurgical problems. Following two visits to Australia in connexion with the work of the Commonwealth Advisory Aeronautical Research Council, he was posted to Australia in 1960 as temporary head of the Ministry of Aviation Staff, during the period of recent negotiation with the Australian Government on space research. Peter Lloyd is a mountaineer who has taken part in three Himalayan expeditions, including the 1938 attempt on Everest, in the course of which he made the first comparative trial between open- and closed-circuit equipments. As a member of the Himalayan Joint Committee of the Alpine Club and the Royal Geographical Society he was closely concerned with the assaults on Everest, being responsible for the provision of the oxygen equipment used in the successful assault.

Monsanto Chemicals, Ltd.: Senior Scientist

Dr. I. S. Wilson has been appointed senior scientist to Monsanto Chemicals, Ltd. This appointment is part of a Monsanto scheme under which outstanding scientists on the company's staff may receive proper recognition of their status while continuing to specialize in scientific or technical work rather than accepting increased administrative responsibility. In his new capacity Dr. Wilson will be free to devote his whole time to research on effluent treatment and the microbiological breakdown of organic compounds.