



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  $1^\circ$  (as for the transmitting antenna at Holmdel), an error of tracking of  $\frac{1}{2}^\circ$  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<sup>5</sup>.)

### 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.

### 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

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.

<sup>1</sup> Carru, H., Gendrin, R., and Reyssat, M., "Proc. of the First Int. Space Science Symp." (North Holland Pub. Co., Amsterdam, 1960).

<sup>2</sup> Carru, H., Gendrin, R., and Reyssat, M., *Toute la Radio*, No. 250 385 (1960).

<sup>3</sup> Jaffe, R., and Rechin, E., *Inst. Rad. Eng. Trans. on Information Theory*, 1, 66 (1955).

<sup>4</sup> Vea, T. H., Day, J. B., and Smith, R. T., *Proc. Inst. Rad. Eng.*, 48, 620 (1960). See also comments about this paper in *Proc. Inst. Rad. Eng.*, 48 (September 1960) by Kennaugh, E. M., Morgan, S. P., Weil, H. (p. 1781), and Laugan, N. A. (p. 1782).

<sup>5</sup> *Aviation Week and Space Technology*, 73, No. 8, 30 (August 22, 1960).

## OBITUARIES

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