instrumental effects over the time-interval involved. The weekly measurements are shown in Fig. 2. Even over this short interval of time there is evidence of a systematic change in the ratio of Cassiopeia A to Cygnus A flux density. A least-squares solution for the best straight line representing all sixteen measurements gives a rate of decrease of 2·3 per cent per annum. This solution is shown by the solid line (I) in Fig. 2. A second solution was made omitting the four days on which the measurements deviated from the mean value by more than five standard errors. On two of these days (June 24 and July 8) the observer had noted on the records as they were obtained the probability of interference or marginal receiver performance. This solution, indicated by the dashed line (II) in Fig. 2, gives a rate of decrease of 0·9 per cent per annum. Both values are in good agreement with the results of Högbom and Shakeshaft.

The 1,400-Mc./s. measurements are not sufficiently accurate to determine the rate of decrease of intensity of Cassiopeia A with any reliability, so the question as to whether the rate of change is independent of frequency remains open.

We wish to thank Messrs. Högbom and Shakeshaft for a copy of their paper prior to its publication.

D. S. Heeschen
B. L. Meredith

National Radio Astronomy Observatory,
Green Bank, West Virginia.

[1] Högbom, J. A., and Shakeshaft, J. R., *Nature*, **189**, 561 (1961).
[2] Westerhout, G., *B.A.N.*, **14**, 215 (1958).
[3] Mezger, P. G., *Z. Astrophys.*, **46**, 234 (1958).
[4] Heeschen, D. S., *Astrophys. J.* (in the press).
[5] Hagen, J. P., McClain, E. F., and Hepburn, N., *Proc. Inst. Rad. Eng.*, **42**, 1811 (1954).

ASTROPHYSICS

Solar Wind and Terrestrial Oxygen

Stefansson[1] pointed out that nothing gained such universal acceptance as an error. This should make us all wary of unanimity, and it has led me to question persistently the general assumption that Earth's original atmosphere contained little or no oxygen and that the origins of life are to be sought exclusively among anaerobic reactions. The atmosphere now contains 230 gm. of oxygen per sq. cm. and perhaps twice that amount must have passed through the atmosphere at an early stage of Earth's development to account for ferric iron, sulphates, etc., in sediments. These quantities are so small that slightly different assumptions lead to radically different conclusions about the amount of oxygen at various times during the past 3×10^9 years. It has, nevertheless, been difficult to account satisfactorily for the oxygen and there is opposition to all the mechanisms proposed for its formation.

Those interested in the origins of life are therefore eager for comment on the suggestion[2] that Earth is gaining 1·5 tons of hydrogen a second from the solar wind, for this rate of accretion would provide all the hydrogen in the ocean in 3×10^9 years. If this is so, the oxygen in the ocean comes into the category of 'fossil oxygen' along with ferric iron. There are 230 kgm. of it per sq. cm., that is, 500 times the amount that has been causing trouble hitherto. If we exist, and have always existed, in this hydrogen hurricane, the problem of the origin of oxygen is more intractable than we thought.

N. W. Pirie

Rothamsted Experimental Station,
Harpenden, Herts.

[1] Stefansson, V., *The Standardisation of Error* (Kegan Paul, London. 1928).
[2] de Turville, C. M., *Nature*, **190**, 156 (1961).

RADIOPHYSICS

Variation in Height of Anisotropy and Random Drift Velocity of the Irregularities in the Ionosphere

Horizontal ionospheric drift records taken by the spaced receiver method of Mitra[1] are used here to analyse the variation with height of anisotropy and random drift speed $(V_C)_v$ along the direction of steady drift of the irregularities.

Horizontal drift records were taken in rapid succession on several frequencies corresponding to different levels of reflexion on six days around the morning hours of 0900 I.S.T. The drift records were analysed by Phillips and Spencer's[2] correlation method to determine the steady and random drift velocities as well as the axial ratio r and orientation of the anisotropy ellipse. It is generally assumed that these values refer to the irregularities in the ionosphere. The true height of reflexion corresponding to each drift record was calculated, using Schmerling's[3] method, from an $h'(f)$ record taken at the same time.

Values of ν, the orientation of the major axis of the correlation ellipse in degrees east of north, showed no preferred direction, a feature which has also been reported earlier by Phillips and Spencer. However, on each occasion, the variation of ν with height in the ionosphere was found to be very systematic. A clockwise rotation of the major axis with increasing height is clearly evident on five of the six occasions. The gradient $\partial\nu/\partial h$ was found to vary between 54′ to 1° 42′ km.$^{-1}$ with an average of 1° 28′ km.$^{-1}$.

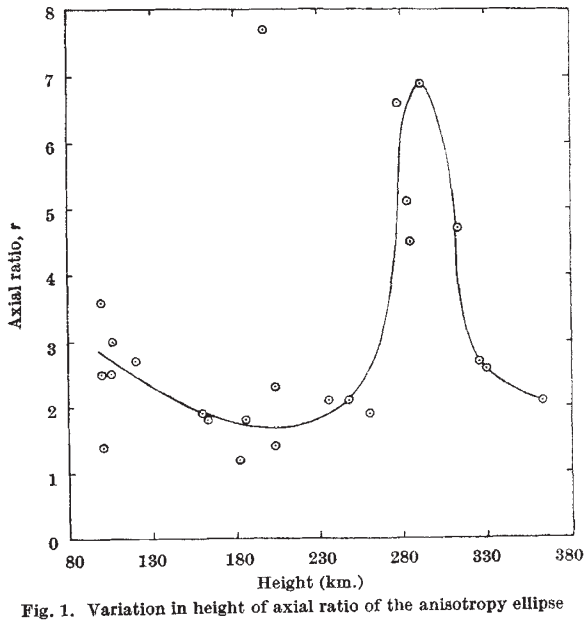

Fig. 1. Variation in height of axial ratio of the anisotropy ellipse