again occur at the same critical concentration. This work is being continued, and the results will be published elsewhere in full.

R. H. GRIFFITH
P. R. LINDARS

Fulham Laboratory,
North Thames Gas Board,
King's Road,
London, S.W.6.
Dec. 2.

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² Griffith, R. H., and Hill, S. G., *Proc. Roy. Soc., A*, **148**, 194 (1935).

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Thermal Diffusion of Water-Vapour

WE have found that in a hot-wire Clusius column operating with water-vapour, molecules containing oxygen-18 concentrate at the top of the column. This is an unexpected result, since it implies that the water molecule under these conditions must be softer than a Maxwellian molecule. From our results an approximate calculation on the basis of the Furry and Jones theory¹ indicates a force-factor of 4.9.

The column used, 200 cm. long and 1.45 cm. internal diameter, was of glass. A platinum wire of 0.015 in. diameter was fixed axially and heated to 900° C.; this kept the walls of the column a little above 100° C. when a wire screen was put round to stop draughts. At one end of the column a side-tube communicated with a small reservoir containing 2 c.c. of liquid water maintained at 100° C. by a jacket containing boiling water open to the atmosphere. At the other end a side-tube communicated with a small bulb which could be sealed off for sampling. A mercury manometer was used for measuring the pressure inside the column, which was approximately atmospheric.

Experiment	Time of operation (hr.)	Ratio of O ¹⁸ /O ¹⁶ in sample
1. Sample from bottom of column	30	0.18 per cent
2. Sample from bottom of column	8	0.18 "
3. Sample from top of column	4	0.22 "
4. Sample of ordinary water	—	0.20 "

The percentage of oxygen-18 in a sample was found by converting the water to carbon monoxide and dioxide and then using a mass-spectrometer. The results are shown in the accompanying table. No experimental determination was made of the equilibrium time of the column; but it was apparently less than four hours.

We should like to thank Mr. J. Blears and Mr. D. L. Nicholson, who carried out the mass-spectrometer assays in this laboratory.

R. H. DAVIES*
J. T. KENDALL†

Research Department,
Metropolitan-Vickers Electrical Co., Ltd.,
Manchester.
Nov. 24.

* Now at the Atomic Energy Research Establishment, Harwell.

† Now Leverhulme Research Fellow, Imperial College, London.

¹ *Rev. Mod. Phys.*, **18**, 151 (1946).

Structure of the Galaxy and the Sense of Rotation of Spiral Nebulae

WE have recently completed a survey of galactic noise over the southern skies at a frequency of 100 Mc./s.¹ This, in conjunction with previous surveys by Hey, Parsons and Phillips² (64 Mc./s.) and Reber³ (160 Mc./s.), has been used to provide information on the distribution of material in our galaxy.

Hubble has shown that the size of the external galaxies increases steadily with increasing spiral structure; our own galaxy, which is comparable in size with the largest of the external systems, may, therefore, be expected to show some spiral formation. If the intensity of radio-frequency radiation from a given direction be taken as an indication of the extent of galactic material in that direction, radio observations may be used to provide evidence as to the structure of the galaxy. From the surveys of galactic noise referred to above, the distribution of intensity over the whole celestial sphere has been obtained. Corrections were made in Cygnus⁴ and Cassiopeia⁵ for the effects of the intense discrete sources in these constellations. The important features of the resulting distribution are an extended principal maximum in the direction of the galactic centre, and a sharp secondary maximum in Cygnus. These maxima appear on the section through the galactic plane shown in the accompanying graph. These observations can be interpreted as placing the sun in or near the arm of a spiral galaxy, this arm extending from Carina through the region of the sun to Cygnus.

Distribution of equivalent temperature along the galactic equator

An optical determination of the location of the sun with respect to possible spiral features requires a knowledge of the star distribution in the region around the sun. Present data, however, are limited to certain regions up to a distance of 5,000 light-years, and may be affected by incomplete information on the absorption in interstellar space. It appears, however, that in most directions the star density remains constant for the first 1,000 to 2,000 light-years, thereafter decreasing. The exceptions are, first, an initial decrease followed by large increases at 3,000–5,000 light-years in the general direction of the galactic centre; and secondly, constant density for at least the first 5,000 light-years in the direction of Cygnus and Carina. It would seem that there is a general concentration of stars towards a line running