LETTERS TO THE EDITORS

The Editors do not hold themselves responsible for opinions expressed by their correspondents. No notice is taken of anonymous communications

Radio Emission from the Perseus Cluster

A RADIO source the position of which coincides closely with the cluster of extragalactic nebulæ in the constellation of Perseus has been observed by Ryle, Smith and Elsmore[1], by Mills[2] and by Hanbury Brown and Hazard[3]. The last-named authors have suggested that the observed radio emission is to be associated with the cluster as a whole, and they have pointed out that on this hypothesis there is an important discrepancy between the average radio emission of the individual galaxies of the cluster and that of nearby galaxies. Baade and Minkowski[4], on the other hand, have suggested that the radio source should be identified with *NGC* 1275, one of the members of the cluster. This nebula, like that associated with the intense radio source in Cygnus, is probably another example of two galaxies in collision; the optical spectrum contains lines of high excitation and the structure suggests that a collision has taken place between an elliptical and a spiral nebula.

Experiments to decide which of these two hypotheses is correct are important since they might provide information concerning the radio emission accompanying a collision of this type; alternatively, if the radiation were found to originate in the cluster as a whole, it would have importance in connexion with the relation between the visual and radio magnitudes of extragalactic nebulæ.

The angular diameter of the whole visible cluster is approximately 2°, whereas that of *NGC* 1275 is only 0·7′. Measurements of the angular diameter of the radio source should therefore be important in distinguishing between the two possible interpretations. If the source proved to have small angular size, its association with *NGC* 1275 might be confirmed by accurate positional measurements.

Observations with the new Cambridge radio telescope[5] have been made on a wave-length of 3·7 m. using interferometer apertures of 14 λ and 157 λ. On the assumption that the radio emission was produced by the integrated effect of all the component members of the cluster, the angular distribution of intensity was calculated from optical counts of nebulæ in the cluster. For a source having this distribution, the apparent intensity which would be observed with an aperture of 157 λ would be 7 per cent of that obtained with a 14 λ aperture. If, on the other hand, the radiation originated in *NGC* 1275, the intensities observed with the two apertures would be the same to within ½ per cent. The results obtained are summarized as follows:

Aerial spacing	Apparent intensity
14 λ	16×10^{-25} W.m.$^{-2}$ (c./s.)$^{-1}$
157 λ	12×10^{-25} W.m.$^{-2}$ (c./s.)$^{-1}$

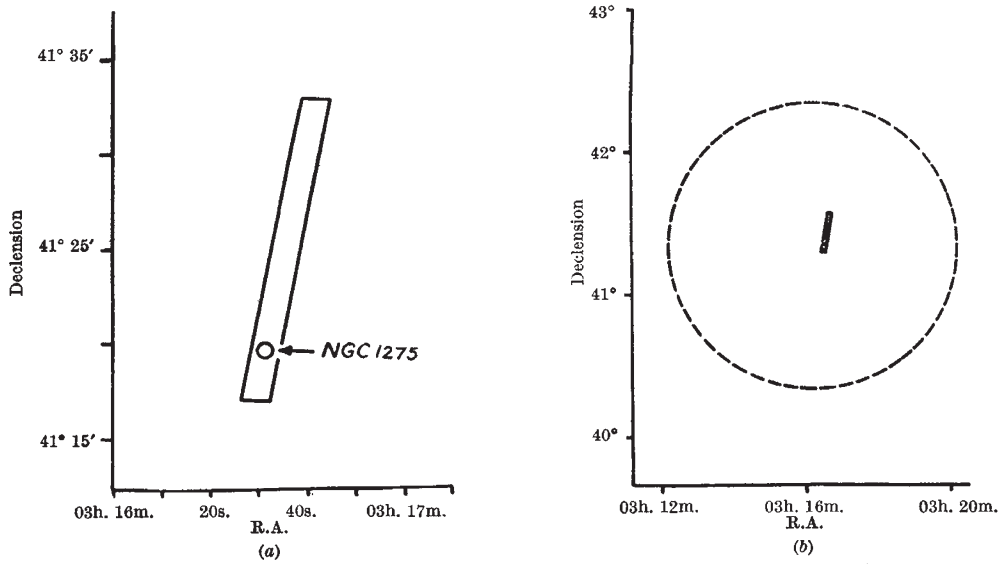

Figure showing the position and limits of error of the radio source obtained with the 157 λ aperture in relation to (*a*) *NGC* 1275 and (*b*) the Perseus cluster as a whole. (Epoch 1950.0)

These results show that about 75 per cent of the radiation originates in a source of small angular size; the close agreement between the position obtained with the high resolving power and that of *NGC* 1275 shown in the figure provides strong confirmation of the identification made by Baade and Minkowski.

The intensity produced by the remaining galaxies of the cluster is approximately 4×10^{-25} W.m.$^{-2}$ (c./s.)$^{-1}$; this is in good agreement with that derived on the assumption that there is a constant ratio between the optical and radio emission of extragalactic nebulæ.

These observations were undertaken as part of a programme of research supported in the Cavendish Laboratory by the Department of Scientific and Industrial Research, to which one of us (J. E. B.) is indebted for a maintenance allowance.

J. E. Baldwin
B. Elsmore

Cavendish Laboratory,
Cambridge. March 6.

[1] Ryle, M., Smith, F. G., and Elsmore, B., *Mon. Not. Roy. Astro. Soc.*, **110**, 508 (1950).
[2] Mills, B. Y., *Aust. J. Sci. Res.*, A, **5**, 266 (1952).
[3] Brown, R. Hanbury, and Hazard, C., *Phil. Mag.*, **43**, 137 (1952).
[4] Baade, W., and Minkowski, R., *Astrophys. J.* (in the press).
[5] Ryle, M., and Hewish, A. (in preparation).