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THE CAMBRIDGE SURVEY OF RADIO SOURCES

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A survey of radio sources at a wave-length of 3·7 metres has been carried out with a large interferometric radio telescope (Ryle and Hewish, 1955) [1] which has a receiving area of about 5000 square metres. Four parabolic troughs are arranged at the corners of a rectangle 600 metres east–west by 50 metres north–south. The reception polar diagram of each, $\pm 1°$ by $\pm 7°$ to half-power points, is thus filled with interference fringes in the north–south plane as well as the east–west plane. Sources are observed at transit, the time of which gives the right ascension, while the declination is obtained by comparing the observed intensity on successive days as the phase of the north–south pattern is altered.

The four aerials have been used together in two different ways. In the first the whole system is equivalent to a phase-switching interferometer of aperture 157 wave-lengths and so it can detect only sources with angular diameter less than about 20′. The positions of 1906 such sources have been found (Shakeshaft *et al.* 1955) [2] and they are plotted on the accompanying map (Fig. 1) in equal-area galactic co-ordinates. In the second case, the two north aerials are connected and used as a phase-switch interferometer against the two south aerials. This gives an effective aperture of 14 wave-lengths, and sources of larger angular diameter may be detected. In this way 30 extended sources, marked as open circles, have been found with angular diameters between 20′ and 120′. They are concentrated towards the galactic plane, though the less intense also occur near the poles. The latter do not appear to coincide with clusters of extra-galactic nebulae and are therefore probably galactic. The small-diameter sources are isotropically distributed except for a concentration of a few bright sources near the galactic anti-centre, and areas where confusion with the most intense sources is important. There is thus little evidence to relate the majority of the sources to the general galactic structure.

About 500 of the positions are believed to be known, each within an area

of 0·05 square degrees, and it was hoped that with the new list many identifications would be made. An intense source coincides with the remnants of Kepler's supernova of 1604, so it is rather surprising that another, already tentatively identified as Tycho Brahe's supernova of 1572 by Hanbury Brown and Hazard (1952) [3], in fact seems to be 6′ of arc away in right ascension, which is considerably greater than the estimated error. IC443 has been identified as a source and the nebulosity in Auriga (Hanbury Brown, Palmer and Thompson, 1954) [4] confirmed as one. No significant coincidences occur with novae, globular clusters, magnetic stars or flare stars.

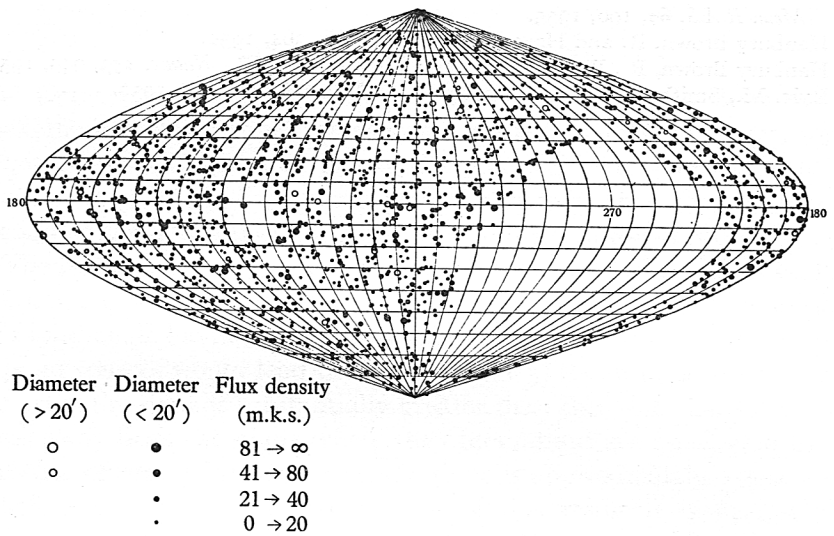

Fig. 1. Distribution of the sources in galactic co-ordinates.

Of normal extra-galactic nebulae M31 and M51 are observed and it is not to be expected that many more would be seen owing to the upper limit of angular size set by the interferometer. The positions of two sources previously identified with M33 and M101 by Ryle, Smith and Elsmore (1950) [5] were found not to agree with those of the optical objects and in each case the angular diameter is less than 7′, thus not supporting the original conclusion.

Seventy-five of the best positions were first examined by Dewhirst, with the 17-inch Cambridge Schmidt, and then by Minkowski, using the 48-inch Sky Survey plates, with little success except for a coincidence with NGC2623 which shows distorted spiral arms and may be another case of colliding galaxies like NGC1275.

The most startling result of the survey is the number-magnitude distribution. If a curve is plotted of log N against log I, where N is the number of sources per steradian having a flux density greater than I, the slope is steeper than $-1{\cdot}5$, and this indicates that there are more faint sources than would be expected for a uniform distribution. Mr Ryle discusses this point in the following paper.

REFERENCES

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