so that

$$\frac{N_2(S)}{N(S)} = \frac{\rho(L_1)}{C} \cdot \frac{1}{6} \cdot \left(\frac{L_1}{L_2}\right)^{0\cdot 3}$$

$$= \frac{\text{Number of sources per cluster}}{6(L_2/L_1)^{0\cdot 3}}, \quad (8)$$

for, by definition of $L_1$, no source properly so called has $L < L_1$.

Taking $L_2/L_1 = 10^6$, (8) becomes

$$\frac{\text{Number of pairs with both sources} > S}{\text{Number of sources} > S} = \frac{\text{Number of sources per cluster}}{400}. \quad (9)$$

From Minkowski's data, one galaxy in $10^2$–$10^3$ is a radio source (depending on the choice of $L_1$), so that the number of sources per cluster is of the order of one. Since about 2000 radio sources are known, equation (9) indicates that the number of occasions on which more than one of these sources occur in the same cluster can be counted on the fingers of one hand. Furthermore, the clusters involved should be among the nearest clusters, and the sources most probably sources of low radio luminosity.

Such evidence as we have from optically identified sources is in agreement with these conclusions. Outside the local group, which contains no "radio galaxies", the only clusters in which more than one radio source has been found are the Virgo cluster (M 87, M 84, NGC 4234, NGC 4261), the Perseus cluster (NGC 1275, NGC 1265) and possibly the cluster of $\sim 14^m$ galaxies associated with MSH 00–0*17*. But this direct evidence is not very strong, since there are strong selection effects which tend to prevent the identification of two sources in more distant clusters—in general, the sources would not be resolved by the primary beam of the radio telescope, so that accurate positions would not be obtained (cf. the history of radio investigations of the Perseus cluster).

## V. Conclusions

(i) The groups of sources associated with extended sources at high galactic latitudes do not constitute a statistically significant degree of clustering.

(ii) The clustering of radio sources which arises merely from the known clustering of galaxies (as opposed to a causal connection between the formation of several radio sources) would not yield a number of groups of radio sources comparable with the number of extended sources. Furthermore, nearly all such groups within the range of observation would consist of intrinsically faint sources in nearby clusters, and should therefore be identifiable with bright optical objects; with one possible exception, such identifications have not been found among the sources considered in paper I.

(iii) From optical identifications, we find one pair of sources at comparable distances, and probably two cases of "optical doubles".

(iv) Some extended sources at moderate galactic latitudes are diffuse objects of low surface brightness. Their surface brightness is comparable with that of structure in the galactic background which can be seen over most of the sky on the 408 Mc/s records, and they do not seem to require a separate explanation.

## VI. Acknowledgments

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## VII. References

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## Appendix

Mills and Slee (1957) concluded that the extended sources represent significant clustering (if they are not a new type of source altogether); by studying a representative sample of the same objects we reach the opposite conclusion. A number of causes contribute to the discrepancy.

(i) In calculating the expectation of chance "blends" of sources with total flux density greater than $S$, Mills and Slee counted only pairs in which each source has a flux density greater than $\frac{1}{2}S$. Thus their estimates may be too low.

(ii) Some extended sources at quite high galactic latitudes appear to be galactic irregularities, and these have been excluded from the present analysis.

(iii) Even after due allowance has been made for the systematic difference between the MSH and CKL scales of flux density (paper I, Fig. 1(*c*)), the groups of sources found in the present work do not always account for the total flux density reported by Mills, Slee, and Hill.

To show how these causes operate, we follow Mills, Slee, and Hill (1958) in examining extended sources between right ascensions $09^{\mathrm{h}}$ and $15^{\mathrm{h}}$, and between $21^{\mathrm{h}}$ and $05^{\mathrm{h}}$, and with total flux density exceeding 30 (on the CKL scale, i.e. 40 on the MSH scale). Mills, Slee, and Hill found 20 such sources, where they expected only 2 by chance. Of these sources, 10 were examined in the investigation of paper I; they appear among the 16 sources in Table 1 of paper I which lie in the same region. Extrapolating flux measurements at higher frequencies down to 85 Mc/s suggests that only 5 of the 10 sources actually have total flux densities exceeding 30 on the CKL scale. Among these five, only one (00—0*9*) contains two component sources each with a flux density greater than 15 (part of Mills and Slee's criterion for computing "blends" with total flux greater than 30), and these are further apart than the $0\cdot83°$ taken as the limiting separation by Mills and Slee. Thus, in this sample of extended sources, half of the discrepancy can be attributed to cause (iii) and the remainder to (i), while (ii) is unimportant.