

34. COMMISSION DE LA MATIERE INTERSTELLAIRE ET DES NEBULEUSES PLANETAIRES

Report of Meetings, 16, 17 and 22 August 1961

PRESIDENT: Lyman Spitzer, Jr.
SECRETARY: F. D. Kahn.

Business session

At the first meeting, on Wednesday, 16 August, no member commented in reply to the President's request for suggestions on the future organization of the Commission and on the type of programme it should undertake. In reply to a request for comments on the *Draft Report*, Dr L. H. Aller suggested that emission nebulae in external galaxies ought to be discussed by Commission 28; Dr B. Bok felt that Commission 34 could deal with nebulae near enough to be seen in detail, and Dr R. Minkowski thought it ought to study their physics, irrespective of their distance.

The *Draft Report* was then approved, subject to minor corrections and additions.

Scientific sessions

In the subsequent scientific session, Dr B. Bok spoke about recent Australian work, including spectroscopic and photographic studies of the Southern Milky Way and the Magellanic Clouds. He described the recently completed Mount Stromlo Atlas, and discussed the connection between optical and radio studies of the Galaxy.

Next, Dr G. Courtès spoke about recent work done at the 75-inch telescope at Haute Provence with an interference filter 60\AA in width. This combination proved to be most powerful in discerning H II regions, in particular it had revealed a gaseous filament of galactic dimensions in NGC 4258.

He had further studied radial velocities of H II regions; thus he had confirmed the galactic rotation curve deduced by Münch by means of interstellar absorption lines. He had also found, together with Dr S. Pottasch, that the H II regions surrounding elephants' trunks tend to expand at the speed of sound. Dr Pottasch then briefly showed that this result agreed with theory.

Finally Dr L. Woltjer assessed the present evidence on the strength of the galactic magnetic field. A field of some 3×10^{-5} gauss is needed to explain the non-thermal galactic radio noise, to confine cosmic rays and to explain the large-scale motions of the interstellar gas. A much smaller field, of less than 3×10^{-6} gauss, is needed for theories of star formation and to explain why the Zeeman effect is not seen at 21-cm. wave-length. In any case it is hard to explain how the field would have originated. To help settle the problem one ought to try to measure the Faraday rotation of polarized galactic radio noise, and study the gas dynamics of H II regions with magnetic fields. In the discussion which followed Dr R. D. Davies argued that the non-thermal galactic radio noise originates in super-nova remnants, and has nothing to do with the Galaxy at large.

At the second meeting, on Thursday, 17 August, Dr B. Vorontsov-Velyaminov spoke about his catalogue of planetary nebulae, which contains data on their magnitudes, spectra, radial velocities, and internal velocity dispersions. Distances of nebulae are hard to estimate and are therefore not given. He went on to discuss intensity changes in the spectral lines of nebulae and their possible explanation.

Dr R. Minkowski then briefly mentioned his own catalogue of 730 planetary nebulae, and Dr L. H. Aller said that modern photo-electric data would enable distances to be found.

Dr J. M. Greenberg spoke next about the nature of interstellar dust grains. They may be dielectric, metallic, made of graphite, or they may be large free radicals. The choice between these possibilities must be based on measurements of extinction at different wave-lengths and in different planes of polarization, and by considering whether the grains can grow at all and be lined up by a magnetic field. For optical data Dr Greenberg largely used his results on the scattering of electromagnetic waves by model grains (on the scale of $1 : 10^5$). The evidence tended to favour the dielectric grains.

Dr F. D. Kahn then discussed the implications of the density profile deduced by Menon for the Orion Nebula. Its details should be correct to about 0.5%. The electron density decreases by a factor 200 from the centre to the boundary. The implied pressure gradient must noticeably change the density profile within 10 000 years. This limits the time which can have elapsed since the original ionization of the nebula. Dr T. K. Menon then showed a profile for the electron density in the Rosette Nebula, in which the predicted change has already occurred.

Finally Dr E. E. Khatchikyan described his measurements of the polarization of the light of the Omega Nebula. It amounts to 26% in the mean, and 50% at the maximum. In reply to questions he stated that polarization was seen in integrated light and that his instrumental polarization was negligible.

An informal discussion meeting of Commission 34 was held on Tuesday, 22 August, for the purpose of considering observational programs relating to theories of interstellar grains. The discussions were led informally by J. M. Greenberg, who presented a brief outline of some of the observations needed to establish the physical characteristics of the grains.

Short reports on present and future programs of investigation were given by J. S. Hall, W. A. Hiltner, A. Behr, P. J. Treanor, S. J., G. Westerhout, T. Walraven, L. Divan, J. Borgman, C. Schalén, A. S. Meltzer, A. Elvius, and C. J. van Houten. The main subjects discussed were: (a) wave-length dependence of polarization; (b) wave-length dependence of extinction; (c) variation of (a) and (b) with galactic longitude; (d) continuation of surveys of extinction and polarization; and (e) extra-galactic studies of scattering by grains.

In addition to the work of the above speakers, reference was made to the recent works of E. J. Wampler and A. Rogers on the wave-length dependence of extinction and of H. L. Johnson on extinction in the far infra-red. Also mentioned were programs for future investigations by A. A. Hoag and B. J. Bok.

The existence of a correlation between variations of the extinction curve with the degree of polarization (galactic longitude) has received a fair degree of confirmation, although there is not yet unanimity on interpretation.