COMMISSION 34: INTERSTELLAR MATTER AND PLANETARY NEBULAE (MATIERE INTERSTELLAIRE ET NEBULEUSES PLANETAIRES)

Report of Meetings, 17, 18, 20 and 21 August 1979

PRESIDENT: G.B. Field VICE-PRESIDENT: V. Radhakrishnan

Business Meeting

The policy of admitting to membership all members of the IAU who have published research results in the subject area of the Commission was reviewed and approved.

Approximately 120 new members were admitted to the Commission, and 30 members were retired, bringing the total membership to 419. While this is a large number of members, it was agreed that it is manageable, and that scientific sessions should continue to be held at General Assemblies in the same style as in the past. Perhaps more sessions than at the present General Assembly (six) will be necessary.

The slate of Officers and Organizing Committee for the next Triennium was approved: President, V. Radhakrishnan; Vice-President, M. Peimbert; Organizing Committee, T. de Jong, B. Donn, G. Field, L. Higgs, E. Kostyakova, J. Lequeux, U. Mebold, M. Morimoto, Y. Terzian, and B. Zuckerman.

Commission 34 will sanction a meeting on Infrared Astronomy in Hawaii, June 1980.

Commission member H. Dickel led a discussion of how astronomical objects of interest to Commission 34 should be designated in publications, particularly catalogues. She agreed to chair a group of members to review current practice and to recommend policy to Commission 5 in those areas of interest to Commission 34.

Five scientific sessions were planned for the General Assembly, and are discussed below. In addition, in response to the interest expressed by many members, a special session on Abundance Gradients in Galaxies was arranged and chaired by P. Mezger.

Supernova Remnants (Chaired by L. Higgs)

Presentations were made by L. Cowie, K. de Boer, J. Dickel, L. Higgs, S. Murray, N. Panagia, V. Radhakrishnan, and S. van den Bergh. Attention was drawn to clouds of neutral hydrogen moving at high velocity in the galactic disk, both within supernova remnants and outside them as well. Apparently acceleration of clouds by supernova shock waves can account directly for much of the kinetic energy of observed HI clouds. The first detailed x-ray images of remnants were discussed. Although they appear to be in general agreement with theoretical expectations, more detailed study is warranted.

Planetary Nebulae (Chaired by Y. Terzian)

Y. Terzian presented a review talk, and a written review by G. Khromov was made available. Other papers were presented by L. Aller, Y. Andrillat, H. Ford, S. Kwok, M. Peimbert, C. Purton, and V. Weidemann. The nuclei of planetary

https://doi.org/10.1017/S0251107X00025839 Published online by Cambridge University Press

nebulae are complex systems. About eight (8) nuclei are known to be binaries. The occurrence of higher ionization in many planetaries than can be explained purely on the basis of the radiation emitted by the observed nucleus suggests that other phenomena, such as high speed hot winds, may be present. The apparent discrepancy between ultraviolet and optical determinations of the carbon abundance in several planetaries has been resolved by better observations; the average carbon abundance is 2 or 3 times solar. An evolutionary sequence is envisioned in which the gas expelled previously as a red giant wind is ionized progressively by the exposed hot stellar nucleus; this accounts for a number of objects having rather characteristic radio spectra. Later, a fast wind (1000 km sec^{-1}) emitted by the nucleus pushes this gas from inside, forming and accelerating outward the shell of gas observed as a planetary nebula.

Ionized Gas (Chaired by M. Peimbert)

Papers were given by E. Becklin, E. Gerard, T. Gull, M.C. Lortet, J. Mathis (for R. Reynolds), C. Montes, M. Peimbert, and M. Perinotto. It was found that in the Orion nebula the carbon abundance in the gaseous phase is solar; models of this object based on dust scattered starlight were presented. From a survey of the galactic plane in $H\alpha$ + [N II], [O III], and [S II], new supernova remnants and distorted bubbles have been found. Two very faint filaments, emission measures of 3 and 11 $cm^{-6}pc$, that extend at least 12° have been detected at b= -21° with radial velocities $\sim$ -70 and -10 km s^{-1} (LSR); a radial velocity gradient of 20 km s^{-1} across the length of the low-velocity feature has been found. A theory based on nonlinear compton scattering has been proposed to interpret the strong variability of H_2O interstellar masers.

Atomic Hydrogen (Chaired by H. van Woerden)

Papers were given by W.B. Burton, A. Dupree, G. Knapp, U. Mebold, E. Salpeter, and U. Schwarz. A definitive model for the HI at the galactic center requires a disk tilted at $\sim$ 24° to the galactic plane. Measurements using lyman-α backscatter and absorption show that within 100 pc of the sun, the average value of n (HI) along various lines of sight is between 0.01 and 0.1 cm^{-3}. High-velocity clouds have been resolved at Westerbork into individual condensations with dimensions 1-10 pc, densities 5 - 50 cm^{-3}, and masses 0.1 to $2M_\odot$ (if the distance is 1 kpc). The spin temperatures of some high-velocity clouds are high, ranging between 60 and 900°K. Absorption measurements in the disk indicate that not all the apparent emission unaccompanied by absorption can be explained by a population of very small clouds. Instead, warm gas is definitely present, with spin temperatures as high as 5000°K. Some warm HI is located in shells around molecular clouds; the highest column density observed, $\sim 3x10^{20}cm^{-2}$, is about what is expected from theoretical calculations of the dissociation of H_2 molecules by ultraviolet starlight.

Interstellar Dust (Chaired by B. Donn)

Papers were given by P. Aannestad, B. Donn, W. Duley, J.M. Greenberg, W. Kratchmer, J. Mathis, and A. Webster. A good fit to the 3.1-micron obsorption feature observed in dark clouds can be obtained with laboratory mixtures of H_2O and CH_4 ice, which have been irradiated by ultraviolet at low temperature and then warmed up so that the radicals formed by photolysis combine to form new molecules. On the other hand, a newly discovered allotropic form of carbon, called carbyne, may form at high temperatures in stellar atmospheres rather than graphite, and theory suggests that it also may have a band at 3.1 microns. Experiments and calculations indicate that various other infrared bands are due to compounds of Si, Mg, and Fe with oxygen. While the compounds in question have usually been identified as silicates formed in near thermodynamic equilibrium in stellar atmospheres, better fits to the data are obtained if the

https://doi.org/10.1017/S0251107X00025839 Published online by Cambridge University Press

compounds are mixtures of metallic oxides formed by accretion of atoms on grains occurring in the interstellar medium itself. Such an origin of interstellar dust would be consistent with recent ultraviolet absorption-line data, which indicate that depletion of metals is reduced in high-velocity clouds where one infers that shock waves capable of sputtering grains are present, while depletion is enhanced along lines of sight intersecting particularly dense clouds.

Abundance Gradients in Galaxies (Chaired by P. Mezger)

Papers were given by L.H. Aller, C. Chiosi, E. Churchwell, S. D'Odorico, B.E.J. Pagel, V. Pankonin, M. Peimbert and J. Schmid-Burgk. Extragalactic determinations of abundance gradients based on H II regions and supernova remnants were analyzed with special emphasis on the production of nitrogen. Galactic determinations based on optical observations of H II regions and planetary nebulae were reviewed. Radio determinations of abundance gradients across the disk of the Galaxy based on: a) He^+/H^+ abundance ratios and b) a T_e versus O/H relationship were presented. Theoretical models of the chemical evolution of the Galaxy are being undertaken to explain these observations.

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