constitute two groups. Group 1 has mean $\left\langle \frac{F_e}{H} \right\rangle =$ $= -0.3$ and mean velocity component in the galactic plane $\langle V \rangle = -40$ km/sec. Group 2 has mean $\left\langle \frac{F_e}{H} \right\rangle =$ -0.2 and $\langle V \rangle = -30$ km / sec.

The absolute magnitude of RR Lyr stars, based on a series of line blanketed model atmospheres, have been given to be $+0.58$ and $+0.55$ for Oosterhoff groups I and II respectively, and $+0.82$ for field RR Lyr stars. These values are brighter than the ones given by Christy's P_{tr}–L relation.

RR Lyr stars in NGC 6712 are quite different from the field RR Lyr in that the helium percentage Y in NGC 6712 is larger by 0.07 as compared to the solar vicinity RR Lyr stars, and they are fainter by 0.27 magnitudes.

The question remains as to why some clusters have RR Lyr variables and others with similar composition do not.

AM Her Type Stars

Krzeminski described the AM Her type stars as a new class of magnetic binaries. These stars are variable in the visible and in the infrared region. Their spectrum, radial velocity and polarisation also undergo variations. They are sources of both hard and soft X-rays. Three representative stars show the following characteristics: (i) The periods are short varying from $1^h\,40^m$ to 3 hr, (ii) the light varies from 1-3 magnitudes, (iii) broad minima extending to half the orbital period, (iv) spectra of neutral H and He, and (v) little polarisation $\sim 1\%$.

Late-type Stars

Winnberg gave a review on molecular line formation in late-type stars. He pointed out that the maser lines of OH, SiO, CO, and H_2O have helped in understanding about the late-type stars. He quoted the results for U Ori as follows :

(i) Core diameter $\sim 0''.03$, (ii) halo diameter $\sim 0''.3$, (iii) distance 190 pc, (iv) diameter at $2\mu = 0''.0155$, (v) diameter $\sim 4 \times 10^{18}$ cm and (vi) envelope diameter 10^{10} cm.

SiO line was discovered in Orion Nebula, which shows intensity variation. Other SiO line sources have been found to be S CrB, W Hydrae, and R Leonis. There is no correlation between the intensity variation of SiO line and the optical light variation.

Reimers suggested that different optical methods may be employed to determine the mass loss rate in K, M and red giant stars. These methods could be (i) analysis of P Cyg profiles, (ii) shift of chromospheric lines, and (iii) Ca infrared triplet. He further suggested stellar wind velocities $V_{wind} \sim V^2_{escape}$ and in M and K giants, $\frac{E_{wind}}{E_{luminous}} = 2.5 \times 10^{-6}$.

Weymann also proposed a theory of mass loss for late-type stars in terms of thermally driven stellar winds akin to solar wind.

Joshi and Rautela pointed out that the circumstellar envelope surrounding ρ Cas grew denser in 1974 as compared to in 1970, and that the Balmer continuum emission was variable.

Cepheids

Davis presented a theoretical model for a ten day cepheid. In case of cepheids, the masses computed from evolutionary theory and from pulsation theory do not agree. The pulsation theory gives smaller masses. The various factors that need be checked are : (i) distance to Hyades, (ii) opacities, (iii) composition, and (iv) mass loss.

Kraft further remarked that more accurate values for interstellar reddening and better θ_e, (B-V) relations have been derived for cepheids now, hence more reliance should be placed on these values.

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NATO ADVANCED STUDY INSTITUTE ON ENERGY SOURCES AND EMISSION MECHANISMS OF QUASARS

Over 80 astronomers and astrophysicists gathered in the Institute of Astronomy, Cambridge between 25 July-4 August, 1977 to take part in the NATO Advanced Study Institute on Energy Sources and Emission Mechanisms of Quasars. Though no substantially new results were reported, the meeting was successful in bringing together and assessing the diverse developments in both theory and observations of the Seyfert and radio galaxies, BL Lac objects, quasars etc.

Osterbrock summarised the recent resluts on the emission line spectra of Seyfert and radio galaxies. He brought out the similarities in the optical spectra of Seyfert galaxies of Type I, broad line radio galaxies (BLRG) and the quasars. Seyfert galaxies of Type II and narrow line radio galaxies (NLRG) have indistinguishable optical spectra. The limits on electron densities in quasars can be obtained from the absence of forbidden lines in their spectra and the presence of C III. These turn out to be $10^8 < N_e < 10^{10}$ cm^{-3}.

The input mechanism causing the emission lines is not very certain. The photoionization with a power law spectrum for the radiation field seems to represent the NLRG and Seyfert galaxies of Type II. But in the case of BLRG and quasars, the mechanism may be resonance-fluorescence especially at every large optical depths. Other processes like collisional excitation may also play an important role.

Several models to explain the optical spectra of emission line regions were presented by Colin Souffrin,

Davidson, Netzer, McKee, Cowie, Perry, Bertoretti, Blumenthal and others. The basic model seems to to be converging on to some sort of shock mechanism.

The nonthermal optical and radio continuum was summarised by O'Dell. The importance of X-ray measurements in this connection was touched on by him. X-ray observations from Seyfert galaxies as well as 3C273 were reported. The X-ray line of Fe X will play an important role in determining the physics of emission line regions.

The physics of compact radio sources was discussed by Blandford. He pointed out the validity and sufficiency of synchrotron explanation for the majority of radio sources as against the van der Laan's model. However, for a few cases, the simple synchrotron models fail and one has to look for other explanations like Synchro-Compton, multiple scattering, bremsstrahlung etc. The necessity to go for relativistic gas dynamical model was convincingly demonstrated by him and one such model was presented by McKee.

The wind model for the quasars was very clearly presented by Mestel. The physics of the model is very simple and hence such models are very appealing. Now detailed work on comparing the various observations with this model are in progress.

Martin Rees and M. Begelman considered the evolution of dense star clusters, possibly leading to the formation of massive black holes.

Though there was an unexpressed consensus on black holes as the basic power source of these enigmatic objects, the case of massive spinors was elucidated by Pacini. The role of black holes in galactic nuclei was convincingly argued by Hills. The power source was considered as a Black Flash by Shapiro and Shields. Young presented an argument in favour of the presence of a black hole in M87 on the basis of his own observations. However, as commented on by Simon White, the stellar dynamics involved in drawing this conclusion is so complicated, as to make an unambiguous explanation impossible.

Another aspect of black hole physics, which evoked much attention, was the aspect of accretion discs. The physics of such accretion processes was reviewed by McCray and Pringle. The electrodynamical processes occurring around black holes were summarised by Blandford and detailed models were presented by Lovelace and Znajek.

One very important aspect of this meeting was the role played by many of the theorists working on the novae, X-ray bursters etc. They repeatedly emphasised the similarities between several phenomena encountered in ordinary stellar accretion discs and these violent outbursts in the extragalactic objects.

The data on the absorption line redshifts were summarised by Bahcall from the view point of cosmological hypothesis. The main basis for the cosmological faith (!) are :

(a) $v_{width}/v_{eject} < 10^{-3}$,

(b) $\left| \lambda^{-1} \frac{d\lambda}{dt} \right| < 2 \times 10^{-5}$ /yr ,

(c) smooth spectra for 3C273,

(d) existence of 21 cm absorption lines, and

(e) the absence of Lyman α halos.

However, as pointed out by Rees, none of the above arguments are unambiguous and hence the matter has still eluded solution.

21 cm absorption lines in quasars were looked for and evidence for their presence was reported by Wolfe. Ths line will play a very important role, in future, in deciding between the cosmological vs local hypothesis.

The cosmological side of the quasar problem was discussed in the concluding session. More than the quasars, the radio sources themselves play the major role and the radio observations were summarised by Longair without any cosmological interpretations. An explanation of superluminal expansion of radiosources in terms of light echo theory by Lynden-Bell forced him to yet again revise the Hubble constant to 100 (km/sec) /Mpc.

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