been found so far, but a detailed analysis is awaiting. NGC 1065, NGC 4051 and NGC 7469 have also been found to have variable nuclei. I. I. Pronik showed line profiles of H_α, H_β, H_γ, and H_δ in the spectrum of NGC 7469 taken at a dispersion of 380Å/mm. H_α line is narrower in width than other lines. The line profiles are variable from day to day.

X-ray stars: H. Gursky in his review, indicated, that on the basis of available data it is now safe to conclude that in the life of every X-ray source, a supernova explosion had been involved, resulting in the formation of a binary system with one component being a neutron star or a black hole.

Two types of X-ray sources can be distinguished, one lying almost in the galactic plane (Cyg X-1, Cen X-3, 0900-40, 1700-37, SMC X-1) and the other rather off the plane (Sco X-1, Cyg X-2, Cyg X-3 and Her X-1). The former are all identifiable with O and B supergiant stars with large masses while the latter are low mass stars of population II. The favoured location for all these systems is in the inner sides of spiral arms.

R. A. Sunyaev discussed X-ray pulsars among X-ray sources and explained the phenomenon on the basis of a fast rotating oblique rotator model for the neutron star/black hole.

C. S. Bowyer in a discussion of the problems of optical identification of X-ray sources pointed out that in the absence of establishment of optical co-variability, UV excess and the spectrum of the star could be used as indicators. As an illustration, the case of 340614+09 was discussed.

W. Krzeminski discussed the X-ray star Cen X-3 and on the basis of available data put its spectral classification as B0-III.

A series of papers dealing with polarization in X-ray stars followed. A. B. Severney and V. M. Kuvshinov measured circular polarization of -4.34 ± 0.23 per cent and -2.60 ± 0.16 per cent. respectively in B and V filters for the star Sco X-1, while in Cyg X-1 no significant polarization was observed. The result for Cyg X-1 was confirmed by O. S. Sulov who measured the polarization for the star at six wavelengths between λ 3400 — λ 6900. Only at λ 6300 a statistically significant circular polarization of about 0.7 per cent was observed. Yu. S. Efimov suspects some linear polarization in Her X-1, though his results are still below the level of statistical significance. Thus polarization in these stars looks probable, though still not confirmed.

This was followed by papers of theoretical nature on models for X-ray stars. N. I. Shakura discussed the theoretical light curves of X-ray binary systems in which the larger component fills its Roche lobe, for different values of the mass-ratio and inclination.

G. S. Besnovaty j-Kogan and B. V. Komberg proposed a model for Her X-1 based on jets streaming out of the optical component and following its magnetic lines of force. The 35^d period in X-ray emission was sought to be explained in terms of the neutron star being or not being in these jets during the course of its orbit around the optical component.

A. I. Tsygan proposed a binary model for the pulsar component of the Crab nebula, with elements $M_1 \backsimeq 0.6\ M_\odot$, $M_2 \backsimeq 1.8\ M_\odot$, $T \backsimeq (100\text{-}600)$ yrs, $a \backsimeq (4\text{-}15)\ 10^{14}$ cm, $a\ (1\text{-}e) \backsimeq 10^{12}$ cm.

S. D. Sinvhal
S. C. Joshi

Uttar Pradesh State Observatory
Naini Tal 263129

REPORT ON THE I. A. U. SYMPOSIUM NO. 69

The International Astronomical Union Symposium No. 69 on "Dynamics of Stellar Systems" was held in the Observatoire de Besancon at Besancon, France, between September 9-13, 1974. About sixty scientists participated in the symposium.

The scientific programmes covered stellar systems of various degrees of flattening from spheres through disks. It did not however include the dynamics of spiral structure. Although the emphasis was on theory, the comparisons of theory with observations and with numerical simulations played an important role. Eleven review papers and 29 contributed papers were given. Apart from discussion after the papers, there was much time for informal discussion. At the conclusion of the symposium, Dr. Lynden-Bell symmarized the important results presented at the symposium.

It was emphasized by King and Lynden-Bell that the key to the theoretical interpretation of the various forms of galaxies lies in our understanding the process of star formation. This aspect of astrophysics therefore deserves great attention.

There was much discussion on the dynamics of a globular cluster. Spitzer discussed how mass stratification takes place in the cluster during its dynamical evolution; the stars of heavy mass move towards the centre while those of lower mass are either expelled from the cluster or are driven away to the halo. He pointed out that the rate of escape of stars, particularly of the low mass stars, is considerably increased by the external forces. The structure of a globular cluster is also affected by the gravitational shocks experienced by it during its passage through the galactic plane. Stressing the role of observations in orienting the theory, King pointed out that the observations indicate that the limit of globular clusters is determined by the gravitational field of the galaxy. The velocity distribution in a globular cluster differs from the Gaussian due to the cut-off at a certain velocity. Observations help us to decide how the cut-off occurs.

It was generally felt that the formation of binaries plays a prominent role in the dynamics of a star cluster. Aarseth reviewed the results of N-body simulations and pointed out that stellar systems with small N evolve until they are eventually dominated by a central binary. Stars coming close to this binary may be ejected from the

cluster. Ultimately the central binary may be displaced from its dominating position or ejected as a result of violent interaction with another star. Henon indicated that systems with large N evolve a central core which dominates the system. Cohen discussed a method of studying systems of large N numerically. Wielen compared the theoretical predictions for spherical stellar systems with the results of observations and simulations. The evolution of the spatial structure of a cluster containing hundreds of stars, predicted by the theory, agrees well with that obtained from simulation.

King pointed out that an important problem in the dynamics of elliptical galaxies is to understand why all ellipticals are similar. Observations indicate that completely isolated elliptical galaxies as well as galaxies with neighbours have the same dependence of intensity on the distance from the centre.

Bardeen discussed the problems in the dynamics of disk galaxies and mentioned that the disks will be stabilized if much of the mass of the galaxy is in the form of a halo. Freeman pointed out that there is some evidence that some spiral galaxies have large corona. Hohl discussed the evolution of disk galaxies on the basis of numerical results obtained from computer experiments performed with different velocity dispersions for stars.

According to Roberts, the rotation curves on galaxies indicate that the M/L ratio varies from the distance from the centre, while Cambridge results on rotation curves presented by Baldwin show that a simple model of uniform M/L ratio fits the observations within the accuracy of observations at the present time.

Schmidt discussed the important long-standing problem of the mass discrepancy in our galaxy and indicated on the basis of recent observations that the M dwarf population is much more than what it was assumed to be until now. He indicated that although the old problem of the missing mass in our galaxy seems potentially to be solved by the M dwarfs, two new problems have now arisen, namely, it is difficult to understand the small velocity dispersion of M-type stars and how the high density of M star population can be reconciled with Toomre's criterion of stability.

Larson indicated that since the time of relaxation of the galaxies is greater than their probable age, we can hope to learn much regarding the mechanism of formation of galaxies from the observed data. He considered the role of turbulent gas dynamics to be very important in the formation of galaxies. Contopoulos reviewed the work on integrals of motion. Martinet reported orbital behaviour in various models of the galactic potential. Vandervoort discussed the occurrence of resonant stellar orbits in spiral galaxies.

Various aspects of collisional processes of importance in dynamics of stellar systems were discussed. Brahic discussed how a gravitating system of colliding particles can evolve into a disk and pointed out that we cannot get a perfectly flat disk. Saslaw mentioned that in stellar systems with dense nuclei, stars may often collide bodily. If two similar stars collide at relative velocities exceeding several hundred kilometers per second most of the gas will interact supersonically relative to the local sound speed and shocks will convert much of the kinetic energy of stellar motions into thermal motions which is then radiated. The two stars may coalesce and the distended newly-formed object may pulsate for sometime and then settle down to a well defined star. Alladin discussed the dynamics of colliding galaxies and indicated that double galaxies may be formed due to tidal capture in slow close collisions.

Lecar discussed the problem of the hidden mass in clusters of galaxies. King also emphasized that we have not yet been able to solve the mass discrepancy problem in clusters of galaxies. The mass of the Coma cluster of galaxies obtained from the Virial theorem is an order of magnitude greater than that obtained from the luminosity of the cluster. Perhaps the missing mass may be in the galaxies in the form of objects of low luminosity ; perhaps the halos of galaxies may play an important r ole in solving the mass discrepancy problem.

Isper discussed the application of general theory of relativity to stellar dynmics. In all the stellar systems that we know, the relativistic effects are negligible.

S. M. Alladin

Centre of Advanced Study in Astronomy
Osmania University
Hyderabad 500 007

SYMPOSIUM ON "SOME ASPECTS OF ASTROPHYSICS"

A symposium on 'Some Aspects of Astrophysics' was held at the Physical Research Laboratory, Ahmedabad, between August 19-24, 1974. Several topics under different disciplines were discussed. Based on the meteoritic abundances, an extesnsive discussion on the condensation of the solar nebula was given by N. Bhandari. The r- and s-process nucleosynthesis were discussed by M. N. Rao, while S. Ramadurai talked about the abundances of light elements. K. Gopalan discussed the various nucleochronometers, emphasizing the anomalies of the Sr- dating. The physical and chemical properties of comets were discussed by A. Mendis. A popular talk on the origin and evolution of the solar system was given by D. Lal.

Solar wind and interplanetary gases formed the topic of B. Buti's discussion. A talk on the planetary atomospheres by R. K. Khadkikar emphasised the importance of various molecules in the Jovian atmosphere. K. R. Ramanathan elaborated the physico-chemical changes taking place on the Earth.

The study of interstellar molecules was reviewed by K. H. Bhat, detailing the nature of detectors used in various wavelength regions. P. V. Kulkarni discussed the promise of infra-red astronomy work in this regard as also the future programme of ground based infra-red astronomy at the PRL.

The redshift controversy was discussed by J. V. Narlikar and by R. Pratap. While Narlikar emphasized the importance of gravitational redshift, Pratap discussed a novel plasma physics approach to the problem. S. M. Chitre discussed the increasing role of collapsed objects in astrophysics while B. Banerjee gave a talk on the equation of state at high densities.

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