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.

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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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Muller has obtained this value by a careful analysis of the earth-moon system and the motion of other planets. If G were decreasing, the moon's mean angular velocity should decrease. However, the old recorded data makes use of the astronomical time rather than the more reliable atomic time. Also, tidal effects contribute towards the change of moon's mean motion. These and other smaller corrections must be properly taken into account before deciding whether moon's mean motion is indeed affected by a decreasing G. Muller claims to have taken these corrections into account in arriving at the above value.

Although a changing G will prove embarrassing to the gravitation theories of Newton and Einstein, some other theorists may feel happier. Brans and Dicke predict a decreasing G, and for a certain range of a parameter in their theory, the rate of decrease could lie in the error bars of Muller. The Hoyle-Narlikar theory is independent of any parameter and predicts a value $\mathring{G}/G = -H$, where H is Hubble's constant. For Sandage's recent determination of $H = -(5.6 \pm 0.7) \times 10^{-11}$ year $^{-1}$ there is a good agreement between Muller's result and the Hoyle-Narlikar theory. Dirac's cosmology appears to predict a faster rate of decrease than that observed but Muller is uncertain about the interpretation of Dirac's theory.

Muller suggests new approaches, like the lunar laser ranging experiment (LURE), to narrow down the error bars on $\mathring{G}/G$.

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Diffuse Interstellar Clouds

Apart from the observed dense molecular clouds, the interstellar medium is generally assumed (G. B. Field, D. W. Goldsmith and H. J. Habing, *Ap. J.* **155,** L149, 1969) to exist in two phases in pressure equilibrium with each other, the phases being (i) diffuse clouds with typical density $n \sim 10$ cm^{-3} and temperature $T \sim 100$°K and (ii) an intercloud medium with $n \sim 0.1$ cm^{-3} and $T \sim 10^4$ °K. A calculation of molecular hydrogen concentration in the diffuse clouds assuming uniform n and T (D. J. Hollenbach, M. W. Werner and E. E. Salpeter, *Ap. J.*, **163,** 165, 1971) shows that H_2 is mostly contained in the interior of these clouds as a result of the selfshielding of the dissociating ultraviolet radiation. This will then cause inhomogeneities in the structure of the cloud, which will in turn affect the H_2 concentration. It is therefore necessary in order to obtain information regarding the existing physical conditions in the clouds from the observations, to have a detailed theoretical model which will account simultaneously for the pressure thermal, electrical and chemical equilibrium of the cloud. One such calculation for an isobaric cloud has been recently reported by Glassgold and Langer (*Ap. J.*, **139,** 73, 1974). The isobaric assumption may be valid as the typical sound crossing time for the clouds observed by OAO—III seems to be less than the average life time of a cloud. Only H, H_2, C I, C II, electrons and grains have been considered, as other components probably do not affect the thermal properties of the clouds significantly. Inhomogeneous density and temperature distributions have been obtained for given values of pressure, cosmic ray ionization rate and interstellar ultraviolet radiation field. The effect of varying the various parameters involved has been studied. The observed C I column densities can be explained by this model with cosmic ray ionization rate smaller than 10^{-16} S^{-1}. This seems to be consistent with the results of Jura (*Ap. J.*, **191,** 375, 1974) and O'Dennell and Watson (*Ap., J.* **191,** 89, 1974). Grain photoelectron heating has been found to be very important to achieve the observed cloud temperatures of 80 °K. Though a qualitative agreement with the OAO—III observations of fractional H_2 abundance has been obtained, it is not possible to determine the values of various parameters uniquely. Detailed analysis of individual clouds are necessary for more quantitative results.

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The gravitational N-body problem was discussed by R. K. Varma while the gravitational interactions between galaxies were highlighted by S. M. Alladin.

Theoretical bases for ion-atom and electron-atom collisions were discussed by N. C. Sil and A. S. Ghosh. The talk by S. M. R. Ansari summarized the atomic collision processes of interest to astrophysicists.

The importance of the properties of 'ambiplasma' for astrophysics, especially for the formation of galaxies, was discussed by P. K. Kaw. Yash Pal gave a popular talk on the 'Ancient Universe', emphasizing the importance of the recent measurements of deuterium in interstellar space.

An important feature of the symposium was the panel discussion on the 'Astrophysics in the 1970s' which brought forth the most fruitful areas of interest in Astrophysics.

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