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Hydrogen Line Observations of M31 and M33 with the NRAO 300-ft Telescope. B. F. BURKE, E. T. ECKLUND, P. A. JOHNSON, K. C. TURNER, AND M. A. TUVE, *Carnegie Institution of Washington*.—A moving antenna feed has been constructed at the Department of Terrestrial Magnetism and used on the NRAO 300-ft transit telescope, in conjunction with the Carnegie 90-channel *H*-line spectrograph. The off-axis aberrations limit the available tracking time to about 5 min at the equator. An observing program has begun and preliminary observations of M31 and M33 will be presented. The greatest surface brightness observed for both objects is about 25°K , as observed with a beamwidth of 10 min of arc. The velocity spread in M31 observed 1° from the center along the major axis is about 32 km/sec to half-power points.

Brightest Stars in Open Clusters. WILLIAM BUSCOMBE, *Mount Stromlo Observatory*.—Johnson and others have shown that photoelectric photometry in three colors is necessary before accurate distances can be derived for galactic clusters, with proper allowance for interstellar reddening. It is found that the absolute magnitude of a cluster, based on its brightness over the area of sky subtended, is an important parameter for classification.

The 150 clusters with photometric parallaxes have been grouped in seven groups of absolute photographic magnitude. A high degree of correlation is noted between the luminosity parameter for a cluster and the MK type of its brightest star. Due to observational selection, the average distance to which clusters have been surveyed declines steadily with their total luminosity. A similar decline in the mean linear diameter indicates that angular diameter alone is not reliable for estimation of the distance of a cluster, unless other information on the type of cluster is available.

Red Giants and Neutrino Processes. H. Y. CHIU, *Goddard Institute for Space Studies*.—Recent work of Adams *et al.* (Adams, Ruderman, and Woo, *Phys. Rev.*, to be published) have indicated that neutrino processes are important in the red giants. It is found that the total neutrino energy loss rate of the core of the red giant studied by Schwarzschild and Selberg (Schwarzschild and Selberg, *Astrophys. J.* **136**, 150, 1962) is $2.8L_\odot$. This is not negligible as compared to the gravitational energy flux, which is $13.8L_\odot$.

This also brings up the problem whether neutrino processes exist. Hayashi and Cameron have suggested that, because of the incompatibility of neutrino processes with their stellar models, they do not seem to exist. However, from a more thorough analysis we conclude that neutrino processes are not incompatible with the astronomical data. There are also strong physical reasons to believe that they exist.

Some Applications of a Third Integral of Motion. G. CONTOPOULOS, *Yale University Observatory* (permanent address: *Thessaloniki University, Thessaloniki, Greece*).—A third integral of motion besides the energy and the angular momentum has been found in many axially symmetric potential fields in the form of formal series expansions. If the potential function is given in the form of a polynomial or a series, then there is another potential function coinciding with the given one up to terms of any given degree that has convergent integrals. In more general cases the evidence for the existence of a third integral comes from the numerical integration of some orbits. The boundaries of the orbits are not the curves of zero velocity, but form, in general, curvilinear quadrilaterals whose apices are on the curves of zero velocity. Such boundaries were found in different cases; e.g., in an almost spherical stellar system, in an oblate earth, in a system without a plane of symmetry, etc. In the case of a system without an axis of symmetry two formal integrals can be found, in general, besides the energy. However no integral corresponds to the angular momentum. The initially circular orbits in an asymmetric galaxy finally go near the center of the system.

Some resonance cases where the unperturbed frequencies along the axes have a rational ratio have also been considered. If the ratio of these frequencies is not 1/1 or 2/1 the orbits do not differ much from the cases where this ratio is irrational. In the cases 1/1 and 2/1, however, the orbits have a quite different form. There is a gradual transition to these cases as the ratio of the frequencies tends to 1/1 to 2/1.

Optical Measurements on Telstar. J. S. COURTNEY-PRATT, D. W. HILL, J. W. McLAUGHLIN, AND J. H. HETT, *Bell Telephone Laboratories, Inc.*.—The problem was to determine the orientation of the spin axis of the Telstar satellite as a function of time. Plane and fluted metal reflectors were fitted to Telstar, and for certain positions of the satellite in its orbit these mirrors reflected light from the sun to an observing station at Crawford's Hill, New Jersey.