35. COMMISSION DE LA CONSTITUTION DES ETOILES

Report of Meetings 19, 21, and 22 August 1961

PRESIDENT: M. Schwarzschild.
SECRETARIES: M. Wrubel, A. G. Massevitch.

Draft Report

The *Draft Report* was accepted, subject to minor revisions by the President.

Ages of Old Stars

O. Wilson reported on a new Hertzsprung-Russell diagram in which the absolute visual magnitudes are determined from the exterior width of the emission core of the K line. Approximately 400 stars for which colors are available were plotted, and the provisional results indicate that Sandage's curve for NGC 188 fits the lower boundary for the field stars in the solar neighborhood. Thus a line representing the oldest disk population stars appears to be established. Oke, using an independent method, has found similar results.

Hoyle discussed the sensitivity of computed evolution tracks to age. He pointed out that the 'plateau' in population I cluster diagrams was particularly suitable for age determinations. Computed tracks for M 67 yield an age of 10^{10} years; the age of NGC 188 was determined by applying a homology transformation to the M 67 tracks. The greatest uncertainty in recent age determinations is probably due to the revised rate for the $He^3 + He^4$ reaction, which may lead to a reduction in age of perhaps 30%.

Aller pointed out that diffusion may not be negligible over such long times and that spectra may not be a reliable indication of the heavy element abundance in the interior.

Opacity data

A. N. Cox briefly described the parameters of a computer code for calculating opacities and offered to compute tables for specific mixtures if requested.

Pulsation theory

J. P. Cox reported on calculations of the instability produced by He II ionization, as first suggested by Zhevakin. The instability appears to be sensitive to the location of the narrow ionization zone within the star. The numerical results for the classical Cepheids and the RR Lyrae variables appear highly promising.

Kippenhahn described similar work done with Baker in which detailed model atmospheres were included to consider the effect of convection. In general, the results agreed with those of Cox.

Convection during pre-main sequence contraction

Hayashi outlined his work on a possible explanation of the location of faint stars in the HR diagram of very young clusters. His results suggest that convection is much deeper in the pre-main sequence contraction phase than has previously been supposed. The corresponding luminosities and evolution rates of these phases come out much higher than earlier estimates.

Biermann suggested that the observed effect may be due to a combination of convection and mass ejection.

Urey discussed the effect on the evolution of the solar system if the Sun was brighter during its early life.

Numerical techniques

Brownlee briefly described the computing scheme used with A. N. Cox at Los Alamos.

Henyey reported in detail the method now being used at Berkeley. The essential points were the selection of grid points, the choice of variables, the difference scheme used for second-order accuracy and stability, the boundary conditions, and—most importantly—the method for solving the resulting matrix.