Interior models for subdwarf stars were constructed assuming a low heavy-element content, i.e., $Z = 0.001$, for masses ranging from 0.6 to 1.0 solar mass, and hydrogen content varying from 0.75 to 0.999 by weight. The models have a structure similar to that of red dwarf stars, investigated by Osterbrock: they have a radiative core and a convective envelope in adiabatic equilibrium. The energy production was assumed to be due to the proton-proton reaction, and Keller and Meyerott's tables were used for the opacity.

In order to determine the depth of the convective zone, and therefore the position of the star in the H-R diagram, the outer boundary conditions as given by the physical conditions in the subphotospheric layers must be determined. In the atmospheres of stars with effective temperatures in the vicinity of the sun's, the temperature gradient does not approach the adiabatic gradient as soon as convection sets in. There is therefore an intermediate zone where one has to take into account the effect of the superadiabatic gradient. Such model atmospheres were constructed, making use of the theory of the mixing length as developed by Biermann.

Both cores and atmospheres were integrated with the help of the University of Toronto IBM 650 computer.

The resulting models are situated in the subdwarf region of the theoretical H-R diagram. One notices that for a given mass the helium content strongly affects the radius and therefore the effective temperature, in the sense that abundant helium makes for a smaller star with higher surface temperature. Unfortunately, comparison with observation is difficult because the actual position of observed subdwarfs in the $\log \frac{L}{L_{\odot}} - \log T_e$ diagram is still uncertain. The results can be used to estimate the masses and helium content of stars in globular clusters.

David Dunlap Observatory
Richmond Hill, Ont., Canada

Dennison, Edwin W. *Preliminary experiments with a T.V. image tube for solar photometry.*

Photo-electric surface photometry has two outstanding advantages over photographic photometry: (a) increased sensitivity and (b) linearity of response. Experiments to use these advantages in solar research are being conducted by the Sacramento Peak Observatory. The first advantage, namely increased sensitivity, will

enable us to observe the spectrum and monochromatic images of solar phenomena with considerably shorter exposure times than are now being used. Until the introduction of the G.E. type 5294 Image Orthicon it was difficult to expose the photo-cathode for periods of time longer than 1/30 second. Now exposures of at least a second and probably longer will be possible. In addition it is now possible to separate the exposure and readout cycles. This will enable us to adjust the exposure time for optimum signal-to-noise ratio and also to reduce the effects of poor seeing by using shorter exposure times.

The second advantage, namely, linearity of response, will be used to generate isophote contours during the readout process and as a result will plot isophotes directly on the viewing screen, thereby eliminating the necessity for laborious photometric reduction. Other forms of presentation can be used which will preserve the linearity of response of the photo-electric system.

Sacramento Peak Observatory
Sunspot, N. M.

de Vaucouleurs, G. *Rotation and mass of the Large Magellanic Cloud.*

New optical velocities of 7 outlying emission nebulosities observed with the 2-prism Zeiss spectrograph of the Mount Stromlo 74-inch reflector are used in conjunction with the old Lick velocities of 17 objects for a rediscussion of the rotation curve and a revision of the mass estimate $M = 0.3 \cdot 10^{10}$ solar masses previously derived from the Sydney radio observations (Kerr and de Vaucouleurs 1956). If $m_o - M = 19.0$ and $i = 63^\circ$ the maximum rotational velocity is $V_r = 145$ km/sec at $r = 3.5$ and the revised mass is $M = (2.5 \pm 0.5) \cdot 10^{10}$ solar masses. The absorption-free mass-luminosity ratio M/L is about 6 and the ratio of neutral hydrogen mass to total mass $H I/M$ is 4 to 5 per cent.

The large discrepancy between radio and optical results in part from a change in the adopted distance (63 kpc vs. 46 kpc in 1956), and in larger part from the interpretation of the data. This interpretation should be greatly assisted by the new radio observations currently planned at Sydney.

REFERENCE

- Kerr, F. J. and de Vaucouleurs, G. 1956, *Australian J. Phys.* **9**, 90.
Harvard College Observatory
Cambridge 38, Mass.