filled in the restricted problem of three bodies of the second kind, assuming initial conditions of symmetric conjunction.

Facts and Myths Concerning Image Tubes.

WILLIAM A. BAUM, *Mount Wilson and Palomar Observatories*.—For the blue region of the spectrum commonly used in astronomical spectroscopy, the gain of image tubes over the best unaided photographic emulsions cannot exceed a factor of about 20. The larger figures often quoted are fundamentally impossible. Electronographic tubes, cascaded converters, and mica-window converters offer the best hopes for actually achieving gains of 10 or more. Present performance is not consistently as good as this but is progressively improving. Imaging photomultipliers are running somewhat behind, and scanning tubes (such as the image orthicon) are the poorest of the candidates. When various image tubes are being compared with one another and with unaided photography, their performance must be judged in terms of their relative "information rates." Separate figures on resolution and speed-gain can be misleading.

Astrometric-Spectroscopic Triple System Mizar

B. WALLACE R. BEARDSLEY, *Allegheny Observatory*.—A parallax determination of Mizar B by N. E. Wagman (*Astron. J.* **68**, 352, 1963) has yielded orbital residuals with a period of 3.7 yr and a semi-amplitude of the same order as the parallax.

H. A. Abt (*Astrophys. J. Suppl.* **6**, 37, 1961) found that another orbit existed and suggested a period of 1.0 yr. From new spectroscopic data obtained over the past three years at the Dominion Astrophysical Observatory F. Gutmann (*Quart. J. Roy. Astron. Soc.*, **5**, 40, 1964) has found this period to be 0.5 yr.

I have analyzed the monthly means of all published radial velocities. Successive approximations were used beginning with a guess as to what the 3.7-yr radial velocity orbit might look like based on the astrometric results. Removal of this orbit from the monthly means gave independent confirmation to the 0.5-yr orbit. Continued approximation and removal of first one and then the other orbit over some 50 yr of observations has yielded fairly reliable radial velocity curves for these orbits.

Apparent rapid fluctuation of the individual radial velocities also indicated the presence of a possible short-term periodicity. Removal of both long periods from the individual radial velocities indicated this variation to be less than 0.2 day. A series of eight spectrograms at the Allegheny Observatory on 26 April 1964 confirmed this and

implied the variation is due to pulsation. A possible change in period and amplitude of this pulsation is being investigated. Preliminary orbital elements are:

$P_1 = 1350$ days, $e_1 = 0.20$, $\omega_1 = 270^\circ$,
velocity range = 8.8 km/sec, $\gamma_1 = -8.0$ km/sec;

$P_2 = 182.33$ days, $e_2 = 0.60$, $\omega_2 = 350^\circ$,
velocity range = 19.7 km/sec;

$P_3 < 0.2$ days (pulsation).

For the series on 26 April 1964 the pulsation was measured from the metallic lines. These lines generally yielded a significantly different velocity from the *H*, *Ca II*, *Mg II*, lines which evidently were blended by the other star in 0.5-yr system. These metallic lines also showed evidence of doubling at the positive peak of the variation. From this doubling it is possible to infer that the pulsating star is the Am star and is slightly more massive than the other star in the 0.5-yr system (probably early F) while about these two stars revolves another star (probably early G) in a 3.7-yr orbit. Definitive orbits are being determined at Allegheny Observatory utilizing both astrometric and spectroscopic data.

Model for a Homogeneous Star of Moderate Mass.

ALFRED BENNICK, *Hunter College*, AND LLOYD MOTZ, *Rutherford Observatory*.—A method for obtaining a set of integration variables which are continuous across the interface between the central convective core and radiative envelope of a stellar model is derived. Once the core size and the composition are chosen, the set of variables is a function only of the ratio β of the rate of energy production by the carbon cycle to that of the proton-proton chain in the core. The set of variables is then used to construct a stellar model that has a convective central core, a radiative zone, and an outer convective layer. We do this by integrating the variables starting from the central convective core out through the radiative zone to the outer convective layer. A published solution for the outer convective layer is then attached to the radiative zone. Interpolation formulas for opacity and energy generation are obtained in terms of the variables used in the integration.

If the core size is increased, the mass and luminosity of the model also increase. If the parameter β varies, the mass and luminosity are unchanged but the radius and hence the effective temperature of the model change. By taking a fixed core size and varying β from model to model, we obtain a series of models which are displaced horizontally in the H-R diagram. In this way, a model for a homogen-