DIFFERENTIAL REFRACTION IN STELLAR PARALLAX

By Keivin Burns

Three stars which have been observed for parallax by Yale Southern, latitude 25° S, and Allegheny Observatory, 40°.5 N, present an excellent opportunity to evaluate the effects of differential refraction due to color difference. The faint stars in the fields around these three have been classified by McCormick Observatory. The stars are θ Virginis, 13°.05'' — 5° 00'; μ Aquarii, 20°.47'' — 9° 22'; η Eridani, 4°.19'' — 3° 58'' (1900). The parallax stars are of classes A, A3, and A2; the field stars are K0, K0, and G5. The weighted mean of the difference in position of the parallax star with respect to the comparison stars on the northern and southern plates is +0.07 ± .008 in the expected direction when reduced to zenith distance 45° and color difference A to K. Hertzsprung found a difference nearly three times as great, which he (with others) has explained by the fact that the effect is greater with small apertures than with larger objectives, and increases with strength of exposure. Least images of the Thaw Refractor do not show this type of differential refraction at zenith distance 45°. But one cannot always work with least images and must expose strongly in bad seeing. So, in order to avoid the possibility of any such effect in stellar parallax observations, one must confine his hour angle to about 10 minutes on either side of the mean when dealing with white stars. It is interesting to note that Schlesinger arrived at the same conclusion through consideration of quite different data.

A STATISTICAL THEORY OF STELLAR ENCOUNTERS

By S. Chandrasekhar

In this paper the principles of a statistical theory of stellar encounters are developed. The fundamental idea of this new method is to describe the fluctuating part of the gravitational field acting on a star in terms of two functions: a function W (F) which gives the probability of occurrence of a field strength F and a function T (F) which gives the average time during which the field strength F acts. With regard to W (F) it is shown that a probability distribution function derived by Holtsmark to describe the inter-ionic fields in a discharge tube, can be adapted to suit the gravitational case. In a certain approximation this probability of a given field is directly related to the probability of finding the nearest neighbor to a given star at some prescribed distance. In this latter approximation, the mean life of the state F can be obtained by using a formula due to Smoluchowski in the theory of Brownian motion. In the terms of these functions W (F) and T (F) the probable accelerations which a star will undergo can be determined according to the principles of the theory of random walk.