van Wijk, Uco. On the evolution of galactic clusters.

The disruption of a galactic cluster due to encounters between field stars and cluster members has been studied by Bok.¹ On the other hand, Spitzer² has shown that a contraction of the cluster would be caused by the escape of stars. The relative importance of these two factors is estimated by means of a relation derived by differentiating the virial theorem with respect to the time.

The virial theorem is formulated for an ellipsoidal cluster with not too high a central condensation, and with the effects of differential galactic rotation taken into account.

If the value of Λ , the fraction of stars escaping per unit of time, is computed from the formula given by Spitzer, and if one uses Bok's value for the rate of exchange of energy between field stars and cluster members, the equation shows that for the Pleiades and for Praesepe the effect of escape of stars is from 20 to 30 times as large as the effect of encounters with field stars. Although the uncertainty of this figure is fairly high, the conclusion can be drawn that the density of galactic clusters like the Pleiades and Praesepe is probably increasing.

1. *Circ. Harv. Coll. Obs.* 384, 1934.

2. *M. N.* 100, 396, 1940.

*Harvard College Observatory,
Cambridge, Mass.*

Wagman, N. E. Recent astrometric results.

Measurements of 31 plates with 93 images of the star GC 18985, $14^{\text{h}}0^{\text{m}}, +11^{\circ}0'$ (1950) by Ellen Jameson show it to be an astrometric binary with a period of 12.4 years. The observations extend from 1931 through 1945. The parallax is $+".059 \pm ".006$ and the half-shift in the astrometric orbit $".15$. The shift is almost all in right ascension. From these observations the companion would seem to be either a white dwarf or a pair of faint M5 dwarfs. The shift in radial velocity should be at its maximum of about 6 km/sec in the next two years.

Altair has been observed for parallax with a seven-magnitude filter since 1934. Forty-three plates with 130 exposures yield a relative parallax of $+".189 \pm ".004$ in right ascension and $+".075 \pm ".16$ in declination. Using $".205$ for the parallax the residuals show a difference of $".061$ between the June and September seasons. An orbital motion in a period of six months is suggested.

*Allegheny Observatory,
Pittsburgh, Pa.*

Whipple, Fred L. and Stanley P. Wyatt, Jr. The Poynting-Robertson effect on meteor orbits.

The Poynting-Robertson effect will operate to sweep small particles of the solar system into the sun at a cosmically rapid rate. Robertson derived an expression for the times of fall from initially circular orbits. Since, if other parameters are equal, the times are much less for orbits of high eccentricity, tables are given here to enable simple calculation for the times of fall in terms of the initial orbital elements, q and e , and particle radius and density. Total times of collapse are computed for several meteor showers.

Since there is a linear dependence of the time on particle radius, the material in showers should ultimately be dispersed so that larger particles move with greater orbital a and e than do the smaller ones. This leads to the possibility of observing the Poynting-Robertson effect in a given swarm by a correlation of the observed mean magnitude of meteors with the time while the earth transits the shower. Such a correlation is not detected for any shower definitively; an upper limit, therefore, is set for the age of showers, ranging from about 5,000,000 years for some showers to less than 100,000 years for the Geminids.

If some sporadic meteors had a common origin with the meteorites and asteroids, the operation of the Poynting-Robertson force requires that for times of origin longer ago than the 60 million years suggested by Bauer all material of radius less than 0.08 cm has been swept into the sun. Therefore virtually no sporadic meteors fainter than the fourth magnitude can be arriving now on the earth unless they are cometary or interstellar in origin. For a time of 3 billion years the minimum radius is about 4 cm.

The tables given for computation of the times of orbital contraction are valid for any radiating body of known mass and radiation by means of a simple correction. The process of contraction is faster by a factor of about 100,000 for B stars than for the sun. But conversely, the Poynting-Robertson effect due to the general radiation of a galaxy is entirely too small to affect appreciably the dynamics of interstellar dust.

*Harvard College Observatory,
Cambridge, Mass.*

Whitford, A. E. Colors of elliptical and spiral nebulae in the Corona Borealis cluster.

Colors of four elliptical and seven spiral nebulae in the Corona Borealis cluster have been