Geilker, Chas. D. Three-color photometry of the ultrashort-period variable DY Pegasi.

The ultrashort-period intrinsic variable DY Pegasi was investigated in the UBV system of three-color photoelectric photometry. At the Arthur J. Dyer Observatory 1600 measures of its brightness were obtained, distributed equally in the yellow, blue, and ultraviolet spectral regions. Amplitude of variation was found to be .56, .69, and .67 mag. in the V, B, and U colors, respectively. (B — V) color index varied from +.195 at .05 period after maximum light in the blue, to +.355 at minimum light. The (U — B) index is nearly constant at +.025, but shows a possible tendency to go redward as the (B — V) goes blueward. Spectral types inferred from a two-color diagram vary from A7 at maximum light to F1 at minimum light. This compares with A3 to A9 assigned by Bidelman from slit spectrograms showing anomalous features at all phases. Absence of measures of parallax or proper motion makes it difficult to say whether the star is a giant of absolute magnitude zero at a distance of one kiloparsec, or a population II main-sequence star of absolute magnitude +4 at 150 parsecs. No substantial improvement in the 105 minute period was possible, the period apparently being constant to one part in four million.

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Howard, Robert. An analysis of the spectra of sunspots.

Spectra of three sunspots were obtained on several of the first days of their growth with the 16-inch coronograph of the Sacramento Peak Observatory. The equivalent widths of fifty lines were measured. These lines were selected to obtain the minimum magnetic intensification. Curves of growth were drawn and 4300° was derived as the average excitation temperature for iron. This value is an upper limit because of the effects of scattered photospheric light. The turbulent velocity derived from the curve of growth was 2.5 km/sec, from line profiles 1.8 ± 0.2 km/sec. Both these values should be considered as lower limits because of the effects of scattered photospheric light, and both these values are higher than the turbulent velocities for the photosphere.

Princeton University Observatory, Princeton, N. J.

Jefferies, John T. and Orrall, Frank Q. The interpretation of Balmer line profiles in solar prominences.

In the past, it has been the usual practice to interpret prominence observations on the assumption that the observed radiation is the intrinsic radiation of the prominence itself. It has been recently pointed out, however, that a major component of the observed radiation—at least in Hα—should be scattered disk radiation; the prominence thus acting as a diffuser as well as an emitter. In order to get a better understanding of the process of line formation in prominences as well as to obtain a consistent approach to the determination of prominence temperatures, high dispersion profiles have been obtained of the hydrogen Balmer lines Hα through Hγ and the helium lines λ5876 and λ4471 in prominences showing a minimum of internal motions. The prominences were observed, at the limb, with the 16-inch coronagraph at Sacramento Peak.

Several years ago, Conway (1952) and Ellison (1952) observed that Hα prominence line profiles...
could be fitted very well to theoretical profiles computed on the assumption of a source function constant in frequency across the line and constant in depth in the prominence. The same remarkable agreement has been obtained for our observations, except of course, for those cases where the \( H\alpha \) line is self-reversed. For subordinate lines like these, it is almost certain that the source function is in fact frequency independent. The good agreement obtained between the observed profiles, and those computed on the assumption of a source function constant in depth, however, is probably largely fortuitous. It seems that almost any monotonic source function could be fitted by one of the family of curves. In any case, the occurrence of double-peaked profiles in \( H\alpha \) shows that for this line the assumption is not generally valid.

In order to test this assumption further, the optical depth at the center of the \( H\alpha \) line has been computed from the run of widths of the Balmer lines \( H\beta \) through \( H\epsilon \). This method was found to give a higher optical depth than that implied by the shape of the \( H\alpha \) line using the assumption of a source function constant in depth. It seems clear that the usual method of estimating prominence temperatures from the \( H\alpha \) profile is very unreliable.

Sacramento Peak Observatory,
Sunspot, N. Mex.

King, Ivan. The dynamical lifetime of a star cluster.

It is well known that a cluster will eject stars as a result of encounters between its members. It has also been recognized that the cluster will consequently contract and the contraction will increase the rate of ejection. The purpose of the present paper is to calculate the effect of the contraction on the lifetime of the cluster. The starting point is the instantaneous rate of ejection of stars, as calculated by Ambartsumian (1938), Spitzer (1940), and Chandrasekhar (1943), who have shown that the cluster loses just under one cent of its stars in a time equal to the time of relaxation. This principle can be combined with the theory of the time of relaxation, the law of conservation of energy, and the virial theorem to give a differential equation for the number of stars in the cluster as a function of time. The equation is easily solved. The solution depends slightly on the assumption made about the amount of energy that the escaping stars carry away. It is shown to be reasonable to assume that they carry away zero energy; this assumption sets an upper bound on the life of the cluster.

The resulting evolution of the cluster may be compared with the exponential decay that would follow from assuming that the time of relaxation remains constant. For an exponential decay the time required for half the stars to escape is \( 93 \tau_0 \), where \( \tau_0 \) is the initial time of relaxation; while consideration of the contraction reduces this time to \( 39 \tau_0 \). The corresponding times required for nine-tenths of the stars to escape are \( 300 \tau_0 \) and \( 42 \tau_0 \).

All these time intervals are inversely proportional to the initial instantaneous rate of ejection of stars. Any future refinements in the theory of the ejection rate will change the estimate of the lifetime of a cluster but will not affect the conclusion that its lifetime is considerably reduced by evolutionary contraction of the cluster.

Spitzer, L. 1940, M. N. 100, 396 = Harvard Reprint No. 204.

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Urbana, Ill.

Osterbrock, Donald E. Parallel filamentary structure in diffuse nebulae.

Several diffuse nebulae are described in which parallel filamentary structure is observed in emission. The nebulae are IC 434, the filamentary structure of which was first described by Duncan, NGC 1499 and NGC 2327. In all three cases there is an O star responsible for the ionization of the nebula, with a dark cloud of unionized material to one side of it. The ionized matter, seen in emission, lies mostly between the dark cloud and the star, and is sharply bounded on the side of the cloud by a bright rim, while on the other side it fades out gradually, extending in some cases beyond the star. The parallel filamentary structure begins at the bright rim, to which it is approximately perpendicular.

These nebulae are evidently cases in which an O star ionizes one side of a relatively dense cloud, causing the ionized material to expand into a near vacuum. The parallel bright filaments must result from regions of high density in the original