of using an ultraviolet cut-off filter for wide-band blue magnitudes has indeed been demonstrated quantitatively on the basis of narrow-band photometry.

In the field of absolute spectral photometry (Williams 1940, Williams and Hall 1941, Dyson 1932, Kienle, *et al.* 1938, Barbier and Chalonge 1941) the establishment of a set of standard sources may be regarded as the most important problem that can be profitably pursued at this time. The last of these papers contains an extended bibliography. The generally recognized superiority of the photoelectric method and the possibility of observing over a wider spectral range justify the repetition and extension of earlier photographic observations. Absolute energy curves of a few stars of types Bo, Ao and Go, and a diffuse source such as M 32 or a definite patch of the Orion nebula would provide "standard lamps" to all observers.

The application of photoelectric techniques to problems of spectrophotometry provides a valuable astrophysical tool which will undoubtedly be exploited to a greater and greater degree in the next few years.

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Eggen, Olin J. Intrinsic variable stars.

The intrinsic variables may be divided into two main groups, (1) pulsating variables and (2) cataclysmic variables. Within each of these major divisions the variables can, in most cases, be divided into Baade's two population groups. The present discussion deals primarily with what has been and can be done photoelectrically.

Historically the most important class has been the population type I pulsating variables, the classical Cepheids. The photoelectric material was rather meagre up to 1944 when Stebbins published his six-color observations of δ Cephei. These observations showed that the light curve is smooth and had repeated itself accurately over

the years, and further, that the times of maximum and minimum light occur progressively later with longer wave lengths, an indication of pulsation in both the atmosphere and radius of the star. Similar observations of Polaris and η Aquilae have confirmed and extended these conclusions.

In 1950 the writer published light and color curves for 32 classical Cepheids. On the basis of relations between period and light- and color-amplitude, these stars were divided into three groups called A, B and C, a division that automatically sorts them by form of light curve. There is also a correlation between light and velocity amplitudes. Because of an apparent deficiency of types A and B with periods near ten days, the rarer type C may predominate at this period. These results have been confirmed by more recent observations of an additional 15 stars at Lick and at Mount Stromlo. Observations of all Cepheids brighter than photographic magnitude 13 and north of -20° are planned on the completion of a 22-inch reflector at Lick.

The second class of population I pulsating variables might be termed "short period Cepheids." There are at least two subgroups, typified by β Cephei and by δ Scuti. The β Cephei stars have periods from $3\frac{1}{2}$ to 6 hours, have closely bunched spectral types, B1 or B2, and may be recognized from their spectra alone. Their absolute visual magnitudes are -3 to -5 . Struve and his co-workers have profitably employed a simultaneous photometric and spectroscopic attack on this group. Although photometrically indistinguishable from the β Cephei stars, the δ Scuti class are F-type stars of absolute visual magnitude near $+1.5$. Neither of these two groups seems to be directly connected with the classical Cepheids. Another group of variables is that of the spectrum variables, which possess varying magnetic fields.

The long-period variables can be divided into two groups, one with high luminosity and shorter period, about 200 days, and the other with lower luminosity and longer periods, near 350 days. The division is not sharp, but the second group probably is characteristic of population I. Little photoelectric work has been done, but light-curves in two colors, both centered shortward of about 4200A, probably would make the best photometric contribution to this problem.

The usual examples of population II Cepheids are RR Lyrae, for short periods, and W Virginis, for longer periods. The RR Lyrae variables are