II

THE SPHERE OF LUCID STARS

TO supplement the results on the distances of the stars obtained by observers of trigonometric parallax, the method of spectroscopic parallax was developed by Adams and Kohlschutter some fifteen years ago. The method is primarily photometric, since the derivation of a star's distance in parsecs, $\log d = 0.2\ (m - M.) + 1$, depends as much on the photometric measurement of the apparent magnitude m as on the derivation of the absolute magnitude M, and the absolute magnitude also is determined from photometric estimates of the intensities of lines and bands in the stellar spectra. The progress of the spectroscopic parallax method has been somewhat disappointing. The difficulties are largely observational, but they are partly dependent on uncertainties in the correlation of line intensities with absolute magnitudes for the various spectral classes of stars.

At the Mount Wilson and Harvard observatories considerable attention has been given to the search for new criteria of absolute magnitude in stellar spectra. At the Dominion Astrophysical Observatory in Victoria, Harper and Young have investigated, extended, and applied the original Mount Wilson criteria. Lindblad, in Stockholm, has made use of the cyanogen absorption band in the effort to find workable indicators of the real luminosities of stars. Also at the Norman Lockyer Observatory, and at Arcetri and elsewhere, the absolute magnitudes and distances of early type stars have been estimated.

Notwithstanding the extensive work in this field, much remains to be done in a fundamental way. It appears that there is less need than formerly suspected of spectroscopic criteria for the absolute luminosities of stars of the late spectral classes, because the dispersion in the actual luminosities is not so great but that, for the present at least, rough criteria are sufficient to distinguish supergiants, giants, and dwarfs. Greater difficulty is encountered in estimating the absolute luminosities directly from the spectra of the hotter stars, Classes B, A, and F.

In one contribution toward the study of the distances of stars bright enough to permit spectroscopic analysis, the Harvard Observatory has for several years been photographing individual stars in the southern hemisphere, particularly with the 13-inch Boyden telescope and objective prism. Supplementing the general collection of spectrograms, a considerable amount of special material has thus been accumulated, which can be evaluated when further study of the criteria of absolute magnitude makes possible its use. Current researches on the criteria by Dr. Öpik, Miss Anger, and others concern not only relative line intensities but line contours and the distribution of light intensity throughout the spectra. What we need is to discover new indicators such that they will not only open up the region of the naked-eye stars but penetrate to stars a few magnitudes fainter. The aim of this inquiry is an understanding of the distribution of objects which lie too inconveniently remote for ordinary trigonometric survey, but sufficiently close to the solar neighborhood to be, because of their proximity, of high importance in many astronomical problems.