THE SPECTRA AND OTHER PROPERTIES OF STARS LYING BELOW THE NORMAL MAIN SEQUENCE

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1. Introduction. Stellar evolution

The existence of stars below the main sequence has evolutionary and cosmological significance in various branches of astrophysics. The subluminous stars, rare in space, compared to late-type dwarfs of the same luminosity, are found in proper motion surveys of faint stars (combined, in the white dwarfs, with color measurements). Few parallaxes or masses are known; since the stars are generally faint, only low dispersion spectra have been obtained till recently. I shall describe some preliminary results obtained in several current investigations on the spectra of subluminous stars, their location in the Hertzsprung-Russell diagram, their kinematic properties and the evolutionary significance of some of the results.

The following programs on various groups of stars are being carried on with the 200-inch Hale reflector. The high efficiency of the coudé spectrograph, designed by Dr. I. S. Bowen, permits spectroscopy and spectrophotometry conveniently to $12^{m}.8$ at 18 A/mm and to $14^{m}.5$ at 38 A/mm. The prime-focus nebular spectrograph will be needed for fainter white dwarfs.

(A) Spectrophotometry, classification and velocity measurements in the white dwarfs.
(B) Identification of lines and composition of some O- and B-type subdwarfs.
(C) Velocities and spectral peculiarities of the B-type "horizontal-branch" stars ($M = 0$) of population II.
(D) Population II emission-line objects, old novae, SS Cygni stars.
(E) The subdwarfs of types F and G. Spectral classification, velocity measurements, search for spectroscopic binaries.

It should be pointed out that white dwarfs and F, G and K subdwarfs occur in both of Baade's population types and that some population I B-stars occur somewhat below the normal main sequence in the Scorpio-Centaurus and Orion groups. It is not yet known whether the stars of the two population types can be differentiated spectroscopically in all regions of the H-R diagram.

It is now generally assumed that horizontal-branch stars, subluminous hot stars, novae and white dwarfs form some type of evolutionary sequence for stars in which the nuclear energy sources are exhausted. The white dwarfs are to be viewed as the