constitution. Fragmentary material on the pulsation pattern for Type II Cepheids suggests a further shift of the pattern towards shorter periods.

In the characteristics of their motion, their distribution, and their variability, the intrinsic variables fall into the following sequence, counting from Type II to Type I characteristics: cluster-type stars and Type II Cepheids; short-long period variables; long-long period variables and low luminosity semiregular variables; high-luminosity semiregular variables?; classical Cepheids.

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**Keenan, P. C., W. W. Morgan and G. Münch.
Spectra of high-velocity giants.**

From a comparison of Yerkes, McDonald and Perkins spectrograms it is found that the characteristic differences between high-velocity giants (space motion > 75 km/sec) and the ordinary giants assigned to population I by Baade are:

(1) In types G and K the bands of *CN* are definitely weaker in high-velocity stars than in ordinary stars of the same luminosity. The stronger metallic lines appear nearly normal in the high-velocity stars. The Balmer lines of *H* and the G-band ($\lambda 4300$) of *CH* are at least as strong as in ordinary stars and may be slightly strengthened in high-velocity stars.

(2) Among the carbon stars (Type R) the high-velocity ones are marked by such tremendous strengthening of the G-band that they have been called *CH*-stars. The *CN*-bands appear on the average to be somewhat weaker than in ordinary carbon stars. The Balmer lines and $\lambda 4554$ of *Ba+* are slightly strengthened.

In both of these groups the peculiarities shown by the high-velocity stars are more pronounced in molecular features (*CH*, *CN*) than in atomic lines. The elements most affected are *H*, *C*, *N* and possibly *O* (because of the great influence of *CO* abundance upon the equilibrium concentration of *CN*). It is significant that these are among the abundant light elements the concentration of which appears to be a determining factor in the structure of a star.

Twenty stars of types G and K having space motions estimated at more than 75 km/sec in Miczaika's catalogue were examined on the Yerkes spectrograms. Sixteen of them definitely showed the peculiarities, while, in the spectra of the remaining four, differences from normal stars could not be established with certainty. When

revised spectroscopic absolute magnitudes were estimated from the new plates, however, the corresponding space velocities for these four stars were reduced to less than 75 km/sec, and their assignment to the high-velocity group was accordingly thrown into doubt. It is concluded that the appearance of the peculiarities to at least some degree is a quite general feature of the spectra of high-velocity stars.

If the metallic lines are used in preference to the $\lambda 4215$ band of *CN*, fairly reliable spectroscopic absolute magnitudes can be found for the high-velocity stars. For this purpose spectrograms of moderate dispersion appear most efficient. On the other hand, the fact that the peculiarities become more conspicuous on small-scale spectrograms suggests that objective-prism plates can be used to discover faint stars having the high-velocity characteristics.

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Kuiper, G. P. High and low velocity dwarf stars.

Results are shown based on a study of about 3000 stars of large proper motion and large parallax, for which spectral types and magnitudes were derived at the McDonald Observatory. These results are a slight extension of data presented at the symposium of September 1941, but the conclusions are the same.

1. The frequency distribution of stars in the H-R diagram is not an inverted 7 but an inverted y (∇). It shows for a volume of space a main sequence containing 95 per cent of the stars brighter than $M_{pg} = 15$; a vertical branch near *Ko* mostly contained within 0.5 spectral class, composed of subgiants, which in the giant and supergiant region fans out with greatly diminished frequency; this branch accounts for about one per cent of the stars; further, the subdwarfs, running below the main sequence at least from A to M, comprising another one per cent of the stars; and finally the white dwarfs which account for about 3 per cent of the stars brighter than $M_{pg} = 15$.

On the main sequence itself, for $M_{vis} < 17$, about 81 per cent are dM, 12 per cent dK, 4 per cent dG, $2\frac{1}{2}$ per cent dF and $\frac{1}{2}$ per cent dA. Only 5 per cent of these stars are brighter than the sun. The main sequence contributes 0.09 stars per cubic parsec; their total mass is about 0.03 $\odot$;