Roman, Nancy G. High-velocity stars as Population I objects.

Since Baade's recognition of two types of stars in the Andromeda Nebula, the terms Population I and Population II have proved useful even without a precise definition of their meanings. Generally, Population I is assumed to include the supergiants, O-B stars, open clusters, and low-velocity stars near the sun. Population II is assumed to include the globular-cluster stars, stars in the nucleus of the galaxy, and high-velocity stars. This population is characterized by an absence of supergiants and the presence of bright red giants, with visual absolute magnitudes between -2 and -3 .

The high-velocity stars cannot be associated with the spiral arms. Almost without exception, they traverse the interarm region and their orbits show no apparent preference for the arm regions. Yet the H-R diagram of the high-velocity stars bears a closer resemblance to that of the low-velocity stars near the sun, with the short-lived objects lacking, than to that of the globular-cluster stars. Normal dwarf stars are found among the high-velocity stars as early as B7 and, in increasing numbers, all along the main sequence down to the M stars. Except for a few RR Lyrae stars, there is no evidence among the nearer high-velocity stars of a horizontal branch through the A- and B-type region. The red giants among the high-velocity stars have visual absolute magnitudes near zero, as in the older open clusters; only one star has been found which might compare in luminosity with the globular-cluster giants. As with even the spectroscopically most peculiar high-velocity stars, the spectrum of this star has little resemblance to those of the brighter stars in M92, M13, and M5.

However, the high-velocity stars do differ not only from low-velocity stars but also among themselves. The giants are appreciably earlier among stars whose galactic orbits are more eccentric than 0.6, that is, which penetrate within about 3 kpc. of the galactic center, than among those which remain in the outer regions of the galaxy. The same appears to be true for the dwarfs. The subdwarfs are almost all members of the eccentric group. Between $B - V = +0.3$ and $+1.0$, the $U - B$ colors are smaller than those for low-velocity stars of the same $B - V$ colors. This so-called ultraviolet excess increases with the mean space velocity of the group of stars with respect to the local centroid. The relation, which is best determined for the

dwarfs between F0 and G4, is evident for other types in the $B - V$ interval also. Approximately (for $1.7 < \log V < 2.7$):

$$U_{\text{ex}} = -0.31 + 0.18 \log V.$$

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Seyfert, Carl K. and Hardie, Robert H. The structure of the Milky Way. I. The stellar association I Lacerta.

Magnitudes, UBV colors and spectral types for 82 stars in the I Lacerta association have been determined with the 24-inch Baker-Schmidt telescope of the Dyer Observatory. The Hertzsprung-Russell diagram for this association shows a small dispersion in the apparent magnitudes corrected for absorption for the spectral classes B7 - A0. The A1 - A7 stars, however, do not form a homogeneous group and may be mainly foreground stars. If we assume that the B7 - A0 stars are of luminosity class V and on the basis of the Johnson-Hiltner zero age luminosity calibration have absolute magnitudes -0.2 to $+1.6$, their mean distance is 550 parsecs. This distance for the I Lacerta association is reasonably consistent with the spectroscopic and photometric data given by Harris for the early B stars in this region.

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Spiegel, Edward A. Problems of radiative hydrodynamics.

The equation of heat transfer for a radiating medium (Spiegel 1957) has been applied to three hydrodynamical theories with a view toward adapting these to problems of stellar atmospheres. The hydrodynamical theories so treated are:

1. The study of the thermal instability of a plane layer heated from below;
2. The behavior of isotropic temperature fluctuations in a turbulent medium;
3. The propagation of sound.

In all cases only the effects of integrated radiation have been considered, and only mean absorption coefficients figure in the theory.

The stability investigation begins with the Rayleigh-Boussinesq equations in combination