Keenan, Philip C. and Geoffrey Keller. The spectrum-luminosity diagram for the high-velocity stars.

The position of the giant branch of the high-velocity stars has been determined by means of spectroscopic absolute magnitudes and types. A check on the luminosity scale was furnished by 19 giants and subgiants with apparent magnitudes between 3.0 and 5.5. For this group of high-velocity stars the difference between the trigonometric mean reduced parallax and the spectroscopic value was less than its probable error $\pm 0''.004$. Hence, no systematic correction was applied to the spectroscopic absolute magnitudes.

High-velocity stars were defined as those for which the space velocities exceeded 70 km/sec by at least the amount of their probable errors.

The spectrum-luminosity diagram for the non-variable high-velocity stars appears to differ from that of stars in globular clusters in these respects:

(1) The extreme scarcity of supergiants of types G and K. Of the stars plotted, only HR 1908 with $M_v = -2.5$ exceeds -2 in absolute magnitude.

(2) The presence of a normal red-giant branch for types K3 to M6. It should be noted, however, that the mean space velocity of the stars of this branch is appreciably lower than that of the high-velocity giants of types G2 to K2.

The spectral peculiarities of the high-velocity stars show a general correlation with space velocity, but there is a real dispersion in the strength of the peculiarities. The spectra show no clear-cut separation into two groups having the characteristics of high-velocity stars and of low-velocity stars, respectively. Instead, there is a progression of physical properties extending from the one extreme to the other.

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Kerr, Frank J. and Fred L. Whipple. Possible explanations of the secular acceleration of Phobos and Jupiter V.

Secular terms in longitude have been reported for Phobos and Deimos by Sharpless,¹ and for Jupiter V by van Woerkom.² Phobos and Jupiter V show an increase in mean motion while Deimos shows a decrease. The effect seems well established for Phobos, rather uncertain for Jupiter V, and highly doubtful for Deimos. Possible explanations have been considered for such effects

in Phobos and Jupiter V, with the Deimos result, assumed to be sensibly zero, used only as a check.

One possible cause for the accelerations is a resisting medium of asteroidal and other interplanetary matter.

The values derived for the interplanetary density on such an assumption depend in a complicated manner upon the velocity of the asteroidal matter. Typical examples of the derived densities are 2×10^{-17} gm/cm³ at the orbit of Jupiter, and 4×10^{-16} gm/cm³ at the orbit of Mars, for a differential velocity of planet and interplanetary matter of 4 km/sec. Such a density at Jupiter's orbit seems uncomfortably high, since it leads to the unlikely result that Jupiter is receiving half as much energy from the impact of this matter as it receives from the sun.

In the case of Mars, it is probable that the resisting medium cannot account for more than a small portion of the observed effects, since an acceleration of observable magnitude should then have been found for Deimos. The derived space density, however, is comparable with that in the center of the asteroid belt.

For the Martian satellites, there is more promise for a tidal type of explanation because tidal effects decrease very rapidly with distance from the planet, in keeping with the small, or zero, value for Deimos. Also the effect should be of opposite sign for the two satellites, as reported by Sharpless. In the absence of seas on Mars, a body tide is required. Application of Jeffreys' tidal theory shows that tides in the mantle of Mars would be many times too small to account for the effect if viscosity there is similar to that in the earth's mantle. It is possible, however, that, if the core of Mars is liquid, tidal friction of sufficient magnitude could arise between the core and the mantle to account for the observed secular changes in longitude.

Whatever the actual sources of the observed secular changes, we may deduce definite upper limits to the space density of matter near Mars and Jupiter, viz., 4×10^{-16} gm/cm³ and 2×10^{-17} gm/cm³, respectively. In view of the difficulty in explaining physically the secular acceleration of Jupiter V, we concur with van Woerkom that "confirmation from further series of observations would be desirable."

1. *A. J.* **51**, 185, 1945.

2. *Astr. Papers Amer. Ephemeris* **13**, Part 1, 1950.

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