Rev. Mexicana Astron. Astrof., **14**, 224 (1987)

THE GALACTIC ORBITS OF NEARBY, HIGH-VELOCITY STARS.

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ABSTRACT. We have used a recently developed model for the galactic mass distribution (Allen and Martos 1986, Rev. Mex. Astron. Astrof. in press, and this conference) to numerically integrate the galactic orbits of 10 nearby high-velocity stars. The stars were chosen for their intrinsic interest, as well as for the fact that, since their space velocities are large, the usual epicyclic approximation to the galactic orbits is likely to be poor for them. The orbits were integrated backwards in time for 1.2×10^{10} years. Errors in the total energy and in the z-component of the angular momentum were of the order of $\Delta h/h \lesssim \Delta E/E \lesssim 10^{-6}$ at the end of a run.

The computed orbits do indeed strongly deviate from circular orbits. The stars undergo very large excursions in the radial coordinate (of up to 9 kpc), but they reach in general only moderately high distances from the galactic plane (not more than 1.5 kpc). Their galactic periods of revolution are between 1.3 and 2.3 Gy, and thus somewhat longer than those expected for nearby stars. The most eccentric orbit computed corresponds to Gl 191 (Kapteyn's star); it is also retrograde. Gl 699 (Barnard's star) reaches the largest apogalactic distance (15.6 kpc), and Gl 445 the largest height above and below the galactic plane. As a rule, the computed orbits are of box type; there are two exceptions: the orbits of the triple system Gl 166 (40 Eridani) and of Gl 699 (Barnard's star), which are of shell type.

On the basis of their orbits, these nearby, high-velocity stars can be classified as belonging to a very old, thick disk population. Their observed spectra and colors are, on the whole, not inconsistent with this classification.

Further details about this work can be found in Allen and Martos 1986, Rev. Mexicana Astron. Astrof., Vol. 13,137.

Key words: STARS-DYNAMICS

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