Little evidence exists to suggest that G stars form part of the Gould belt. There appears to be a clean break between the O-B stars and the later spectral types regarding participation in the Gould belt; O-B stars have definite Gould belt members whereas the others do not. Nevertheless, a plane will be fit to the G giants in a later section, but to examine the randomness of the data, not to infer that some G giants actually belong to the Gould belt.

To summarize briefly the mathematical procedure used, one solves for the kinematics and velocity ellipsoid of the G giants by use of semi-definite programming (SDP), which forces the solar motion calculated from the velocity ellipsoid to be the same as that calculated from the kinematical parameters. Nor is it necessary to use the same adjustment criterion for the two sets of calculations: the kinematical parameters may be reduced by use of a least squares criterion whereas the velocity ellipsoid may be calculated with the robust L_1 criterion (minimize the sum of the absolute values of the residuals), or with the same L_1 criterion for both. For a readable discussion of SDP see Vandenberge & Boyd (1996).

In their classical work *Statistical Astronomy*, Trumpler & Weaver (1962) refer to two incompleteness factors, K_1, which compensates for the deficiency of proper motions in a parallax catalog compared with a proper motion catalog, and K_2, which corrects for the absence of proper motions nearly in the line of sight and thus not detectable in either a proper motion or a parallax catalog. This study, however, shows that the calculation of incompleteness factors for the G giants is unnecessary or counterproductive.

2. THE OBSERVATIONAL DATA

The proper motions and parallaxes used in this study were taken from van Leeuwen's version of the Hipparcos catalog (van Leeuwen 2007), henceforth called simply the Hipparcos catalog, the radial velocities from the Wilson (Nagy 1991) and Strasbourg Data Centre (Barbier-Brossat & Figon 2000) catalogs. van Leeuwen's catalog (2007) omits a few stars contained in the original catalog (ESA 1997). For those few stars the relevant data were taken directly from the original catalog. The equinox of the Hipparcos catalog is J2000 and the catalog epoch is J1991.25. Stars listed as spectral class G, luminosity class III were extracted from the catalog. This resulted in a total of 3,075 G giants, of which 658 have radial velocities. The G giants are skewed towards the later giants; over 94% fall between G5 and G9, and the G8 stars alone account for 64.9% of the total.

The star's HD number determined if either of the two radial velocity catalogs contained an entry for that particular star. Not all of the data could be accepted. Negative parallaxes were excluded as were parallaxes smaller than 1 mas because the Ogorodnikov-Milne (OM) model was used for the equations of condition (Ogorodnikov 1965, pp. 61–63). This model, valid out to about 1 kpc, should be adequate because the minimum parallax used in this study, 1 mas, corresponds to a distance of 1 kpc. For a justification of this distance limit see Smart (1968, p. 285). Parallaxes smaller than 1 mas have such large mean errors that their inclusion seems unwarranted because of the uncertainty in their distances. Known multiple stars, flagged in the catalog, contaminate the proper motion by confusing orbital motion with genuine proper motion and were also excluded. And some of the solutions for the astrometric data in the catalog, also flagged, are substandard and were likewise excluded. Smith & Eichhorn (1996) have derived a procedure to correct the observed parallaxes, and this procedure was used to transform all of the parallaxes used in this study. In my study of the M giants (Branham 2008) I show that the Smith-Eichhorn correction seems to leave little residual parallax error.

What about the quality of the data? I have already commented on the high quality of the Hipparcos proper motions (Branham 2009b). Tangential velocities calculated from proper motions, therefore, should also be high quality. The radial velocities, however, come from disparate sources incorporated into the Wilson and the Strasbourg Data Center catalogs. My study of the F giants showed lower homogeneity in the radial velocities. One could perform a similar analysis with the G giants, but this seems otiose. The data are what they are and must be used as they are. The radial velocities, moreover, are not used alone but multiplied by the parallax in the equations of condition. A runs test shows that the radial velocities are of somewhat lower quality than the tangential velocities, but of acceptable quality. See the § 6. The runs test measures how often a variable, distributed about the mean, changes sign from plus to negative or negative to positive. The changes of sign, the runs, have a mean for n data points of $n/2 + 1$ and a variance of $n(n - 2)/4(n - 1)$. An advantage of the runs test over other tests for randomness resides in its being nonparametric, making no assumption about the normality of the data, although to actually calculate probabilities for the observed runs one does assume approximate normality. For a detailed description of the runs test see Wonnacott & Wonnacott (1972, pp. 409–411).