

## A Special Position for the Sun?

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The availability of the Hipparcos and Tycho star catalogues enables the distribution of stars in the Sun's neighbourhood to be investigated with greater precision than before. It is found that within a radius of thirty eight light years there appears to be a space round the Sun where the number of stars per unit volume is less than average.

### Introduction

One would not expect the spatial distribution of stars to be different round the Sun from elsewhere. Yet that does seem to be the case as will be described below. Hipparcos - the European Space Agency's astrometric mission - operated for four years from November 1989 to March 1993, returning high quality scientific data. The availability of the resulting catalogues in electronic form enables a study to be made of the distribution of the stars in our neighbourhood. This study was prompted by another line of research which suggested a 38 light year radius, which is presented here. Both the Tycho and Hipparcos catalogues were used, the latter taking precedence.

### Star Distribution near the Sun

The Hipparcos satellite did not measure stellar distances directly, but parallaxes are given in the catalogues from which distance is readily computed. In order to gain an impression of the relation of the Sun to nearby stars a two-dimensional presentation is desirable, which is

achieved by suppressing the declination of each star. This is illustrated in Figure 1 where  $\delta$  is declination,  $\Omega$  right ascension,  $r$  radius, and  $S$  is the position of a star. Light shading indicates the equatorial plane and cross-hatching the plane normal to the equator in which the radius vector of the star is rotated. This projection produced diagrams showing the stars as dots on the equatorial plane, each at its actual radius and in its actual direction (right ascension). Figure 2 shows the result, which immediately suggests that there is an unexpectedly low stellar density in the neighbourhood of the Sun (in terms of star-count, not mass). Since this might be an artefact of the above method of projection, Figure 3 shows a typical similar diagram for a location 20 light years from the Sun (The "Plot offset" parameters shown indicate the centre of the plot with respect to the Sun, given as right ascension, declination and radius respectively). Several such diagrams were constructed which supported the suspicion that the Sun is in a special position with an unusually low stellar density.

To check the idea further a cube was constructed circumscribed by the original 38 light year sphere and divided into cubical cells each with sides of 6.3 light years, to give 343 cells in total. The number of stars in each cell was counted and a "stalactite" graph of the result is shown in Figure 4. In order to show the low density cubes clearly the graph is truncated at the top at a count of 100 or more stars per cell. The ordinate is star count and the abscissa cell number in order of increasing distance from the Sun. The cell marked  $S$  is that for the Sun with 3 stars, and is clearly the lowest. The cell marked  $A$  is a close

competitor containing 15 stars and a stellar plot for this location is shown in Figure 5. Other cells adjacent to the Sun with a low count share in the gap round the Sun as the latter is greater than 6.3 light years.

The results confirm that the stellar density near the Sun is lower than elsewhere in our near galactic neighbourhood, and exhibits an interesting symmetry.

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## Biography

N.C. Thomas was born in 1941 in Peterborough, England and was trained as an electrical engineering officer in the Royal Air Force, and served until 1979. His current research concerns the development of a new paradigm for science based on the interaction of ordinary space and negative space, yielding a new theory of gravity and light among other topics (see <http://www.anth.org.uk/NCT>).