Location of Proxima Centauri

Name: _____ Form: _____ Date: _____

To complete this worksheet also refer to the pages at:

Astronomy

Stars and Nebulae

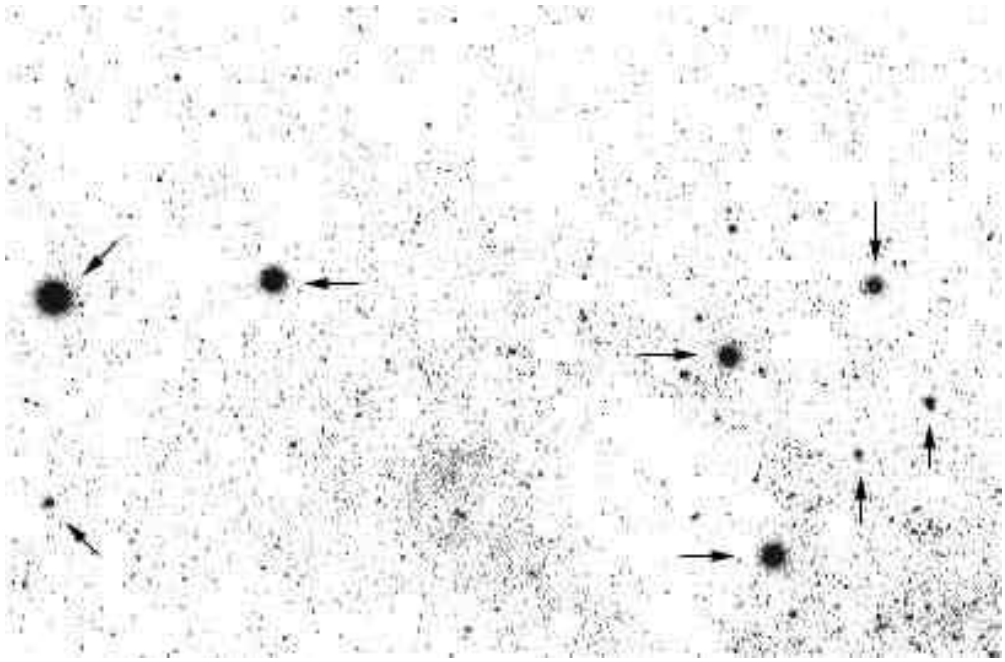
Motion of Proxima Centauri

1. The negative image on the right corresponds to the Context Photo 1 in the *Motion of Proxima Centauri* pages.

a. Mark the 'beams' of the Southern Cross.

b. Label the indicated stars.

c. Mark with an arrow the approximate location of Proxima Centauri.



2. What are the Hipparcos, Tycho and Guide Star catalogs? How and why were they compiled?

3. Sketch the approximate borders of the DSS 1° square photo on the image above.

4. Estimate the number of stars visible within the DSS 1° square marked on context photo 1.

5. Estimate the number of stars that are visible in the high resolution DSS 1° square photo.

Note: These exercises introduce students to the following concepts and resources: angular distances, star position (astrometric) catalogs, the Digitised Sky Survey , star charts, star charting software, positive and negative photos of stars and the movement (proper motion) of stars.

Motion of Proxima Centauri

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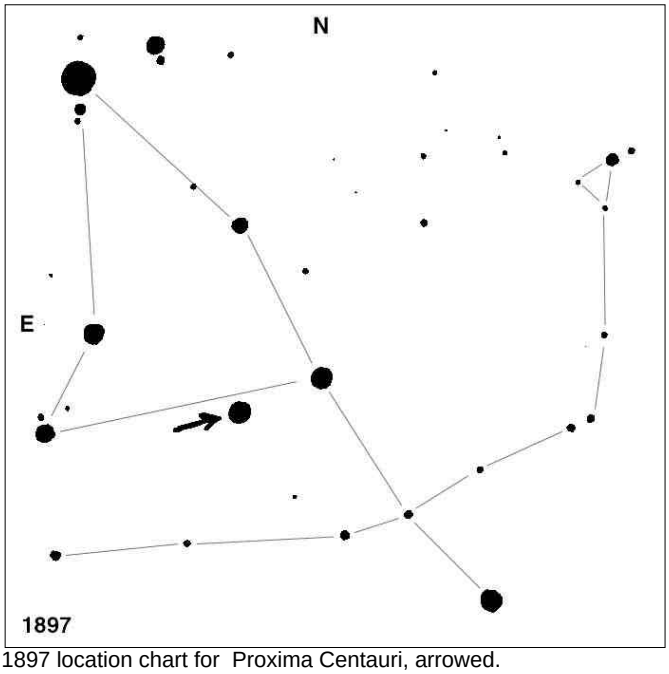
Proxima Centauri is the third known member of the Alpha Centauri system, the closest star system to the Sun. Alpha Centauri itself is a double star - a pair of closely spaced Sun sized stars that orbit each other with an 80 year period. The pair is 4.3 light years from the Sun. Proxima Centauri is travelling through space with the Alpha pair and may be orbiting it with a period of around a million years. Proxima Cen is about one sixth of a light year from the Alpha Cen pair and is slightly closer to the Sun (4.2 light years). From Earth, it lies approximately 2° (four Moon widths) from Alpha Cen. It is an 11th magnitude red dwarf, one of the least luminous star types known - much smaller than the Sun, with just enough gas to begin nuclear burning. It is a flare star and rapidly fluctuates in brightness by as much as a magnitude in a few minutes. Its movement through space is being monitored in an effort to discern whether it has planets.

Proxima Cen was discovered in 1897. It's position then is marked on the chart below. The star can also be seen in the photograph, taken in 1976, 79 years after its discovery. Note that most stars in the photograph are very distant – their motions are almost imperceptible over the course of a century. Proxima Cen, the exception, is moving rapidly across the sky.



1897 location chart for Proxima Centauri, arrowed.

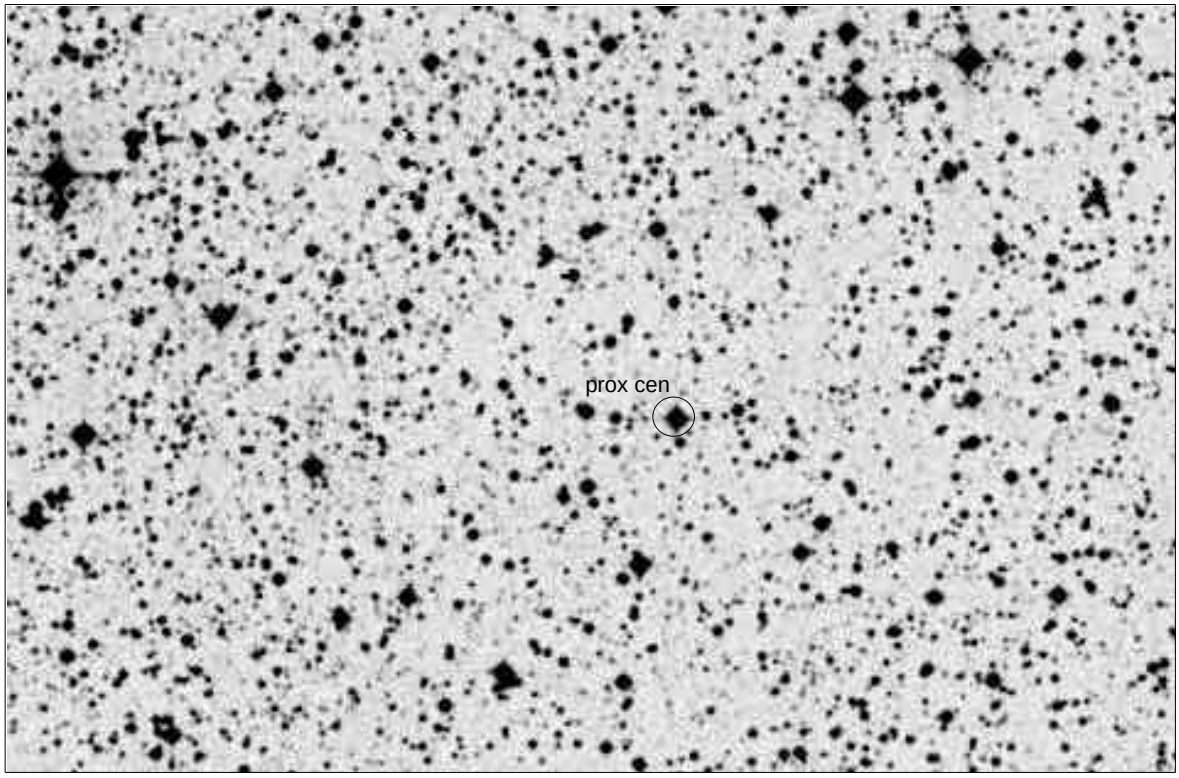
Tasks:

1. Compare the chart with the photo. Note that the chart protrays only some of the brighter stars. Locate on the photo, the stars that appear on the chart and join them with the indicator lines shown on the chart.
2. Mark on the photo where Proxima Centauri was in 1897 .
3. Draw on the photo the path Proxima Centauri is following.
4. Measure in arc seconds the distance moved by Proxima Centauri between 1897 and 1976. Calculate its proper motion in arc seconds per year.

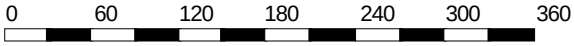
$$pm = \frac{\text{arc seconds moved}}{\text{number of years}}$$

$$=$$

5. Calculate where Proxima Centauri would be now. Mark on the photo the position at which you would expect to find it.



1976 Digitised Sky Survey photo with Proxima Centauri circled.



Scale: seconds of arc

References:

1. 1897 Star Chart from Burnham, *Celestial Handbook*, Revised and Enlarged Edition, Dover, NY, 1978.

2. 1976 photo from Digitised Sky Survey. The position of Proxima Centauri is as marked in Murdin, Allen and Malin, *Catalogue of the Universe*, CUP, 1978

File: proxima_cen_motion.pdf
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