

STARDOME OBSERVATORY & PLANETARIUM FACTS, RESOURCES AND ACTIVITIES ON...

STAR BRIGHTNESS

Even the faintest stars are not the same brightness as each other, when zooming in on the 'Jewel Box' in the Southern Cross (Hubble Space Telescope). Credit: ESO.

Looking up at the stars at night we notice that they range from quite bright to very, very faint. Our automatic instinct is to assume the stars have different brightnesses, and not to think about how far away they are from us.

But if we remember that our Sun is a star, and it appears hugely brighter than night time stars, then the distances to stars must also affect how bright they seem to us.

Two stars that appear the same brightness at night may in fact be a faint star quite close and a bright star very far away.

For example, the nearest star to our Sun is Alpha Centauri, which is 4.3 light-years* distant. If our Sun were at that distance, it would appear over 38 billion times fainter than in our daytime sky! In fact, it would be as faint as Procyon in the night sky, which is the main star of the constellation Canis minoris (The Small Dog) near the great constellation of Orion.

Many stars are not single stars, like our Sun, but binary or multiple star systems. Their brightness is the sum of the brightness of the component stars.

Some stars change brightness in a regular pattern. These are called variable stars. There are many reasons why these stars don't shine steadily like the Sun.

In astronomy, star brightness is measured on a magnitude scale, where larger numbers indicate fainter stars and negative values are very bright objects.

How bright celestial objects appear in the night sky is termed their 'apparent magnitude'. Their actual brightness is termed their 'absolute magnitude'.



Absolute magnitude is a calculation of a star's intrinsic brightness by adjusting its apparent magnitude to be at a standard distance**

Our Sun has an apparent magnitude of -26.7 , but at the standard distance has an absolute magnitude of 4.8 . This is nearly as faint as Tupu-a-nuku (also known as Pleione in the Pleiades), the faintest star in Matariki (the Seven Sisters).

* One light-year is a distance of ~ 9.5 km trillion.

** The distance of 10 parsecs (32.6 light-years) is used, where a parsec is a parallax arcsecond.

The Sun is 400,000 times brighter than the Full Moon.

Check out these other resources...

- ➡ Brightest stars in the night sky: https://en.wikipedia.org/wiki/List_of_brightest_stars
- ➡ Star charts: <http://observe.phy.sfasu.edu/SFAStarCharts/SFAStarChartsPro.pdf>
- ➡ Stardome monthly star charts: <https://www.stardome.org.nz/astronomy/star-charts/>
- ➡ RASNZ charts and information: <http://www.rasnz.org.nz>

How many stars aren't visible where you live because of light pollution?

Is a planisphere (star wheel) better than using star charts?

DISCUSSION POINTS



STARDOME OBSERVATORY & PLANETARIUM

STAR BRIGHTNESS

When you are outside on a clear night and gaze up at the stars, take some time to look at them carefully and see how much the stars are brighter or dimmer than each other.

To view the stars:

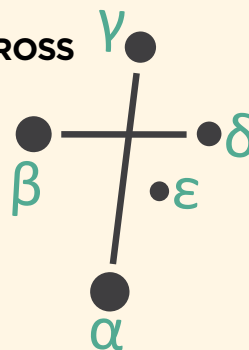
- ⇒ Make sure you select a nice dark, safe, position away from the glare of lights from neighbours, the street, passing vehicles, etc.
- ⇒ Allow 5-10 minutes for your eyes to adapt to the darkness. This is especially important after being inside with house lights and watching TV.
- ⇒ Your eyes will need this time to adapt each time you leave a lit area at night.
- ⇒ Use a red light, or a white light covered with red cellophane, to maintain dark adaptation.
- ⇒ Children should go outside to look at the stars at night only when supervised by a responsible adult.
- ⇒ Don't give up if it's cloudy. If it's very cloudy, check every 20-30 minutes for a break in the clouds. If it's just a little cloudy, stay outside and wait for breaks in the clouds to reveal the hidden stars.
- ⇒ If it's a clear night, don't delay or postpone looking at the stars. It's more than likely to be worse viewing the next night(s)!

- ★ See how many stars you can see on a moonless night compared with a night with the bright Moon in the sky.
- ★ Use an app, a star chart or a planisphere to find and identify the bigger and brighter constellations in the sky, e.g.:
 - Orion
 - Centaurus
 - Gemini
 - Southern Cross
 - Scorpius
- ★ How many stars can you see in the Pleiades star cluster (Matariki).
- ★ Can you see the five brightest stars of the Southern Cross?
- ★ Repeat these observations using a pair of binoculars.

POINTERS



SOUTHERN CROSS



Star name(s)	Apparent brightness	Distance (light-years)
Alpha (α) Centauri (Rigel Kent; Toliman)	-0.27	4.3
Beta (β) Centauri (Hadar)	0.6	390
Alpha (α) Crucis (Acrux)	0.8	320
Beta (β) Crucis (Mimosa)	1.3	280
Gamma (γ) Crucis (Gacrux)	1.6	88
Delta (δ) Crucis	2.8	375
Epsilon (ε) Crucis	3.6	228

Star charts are usually reversed, with black stars and a white sky, and show brighter stars as larger symbols and graduated smaller symbols for fainter stars.

The nearest star to the Sun, Proxima Centauri, is too faint to see without binoculars or a telescope.

THE BRIGHTEST STAR IN THE NIGHT SKY IS SIRIUS (ALPHA CANIS MAJORIS), NEAR ORION.



Take a photo of your activity and send it to us. We'd love to see it! education@stardome.org.nz