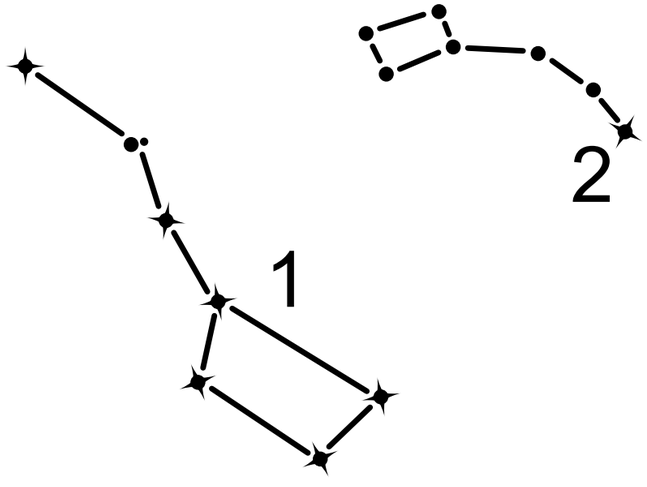
SUPERNOVA
STAR TOUR WORKSHOP

This guide is meant to help you discuss some of the biggest topics in physics with the workshop participants. By taking a look at some of the most extreme objects in the cosmos, such as supernovae and black holes, you can naturally discuss some otherwise abstract issues, such as the existance of simultaneity, the nature of time and the fate of the universe.

The tour can be used with the Supernova Constellation Cards but equally, you could give out other types of star charts. It is recommended that you use planeterium software (like the excellent, and free, Stellarium) to provide visuals.

Finally, the guide is just that - a starting point for disucssing very big ideas. If the conversation begins to diverge from the tour, that's a good thing. Allow the workshop to flow naturally, even if it means missing out some constellations.

THE BIG DIPPER
& LITTLE DIPPER



You're going to refer to this simple view of the constellation. The participants will have it on their cards

The Big Dipper is the most well-known of all star patterns, although is actually not a full constellation - it is part of the constellation “Ursa Major”. The two constellations have had much significance in history as they help us find the North Star.

1 The Big Dipper has the shape of a frying pan, although is more traditionally known as “The Plough” after the simple style of farming plough that would be pulled by a horse.

Q: Is the shape above really meant to look like a saucepan?

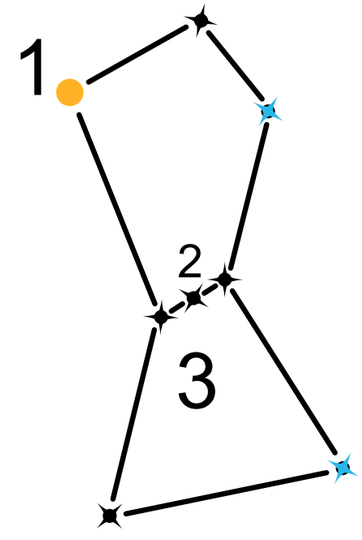
A: Not really. Constellations are just memory aids - they are a way of helping you to quickly find specific stars in what would otherwise be a big mess of dots in the sky.

2 This star at the end of the Little Dipper (properly known as Ursa Minor) is Polaris, the north star.

Q: Where is Polaris in space?

A: If you drew and imaginary line straight out of the north pole, and carried it on for hundreds of light years, eventually it would nearly hit Polaris. Only ‘nearly’ though as Polaris isn’t quite dead above the Earth’s north pole. And in fact, since the Earth wobbles very slowly, Polaris won’t always be the Earth’s ‘pole star’.

ORION



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Orion is a very distinctive constellation and easy to spot in the winter sky by finding Orion’s Belt (2). One of the stars is also likely to be the next close example of a supernova explosion visible to everyone on Earth.

1 Betelguese is a very bright, orange looking star in the top left corner of Orion. It’s a red supergiant, meaning it will soon explode in a process known as supernova.

Q: Betelguese is 500 light years away from Earth. What does that mean about it’s current state?

A: It could have exploded any time in the last 500 years and we wouldn’t know it yet.

2 Orion’s Belt is an asterism - which just means a pattern or feature that’s easy to spot in the night sky. Spotting these three stars is the easiest way to find Orion.

Q: Are these stars actually near to each other?

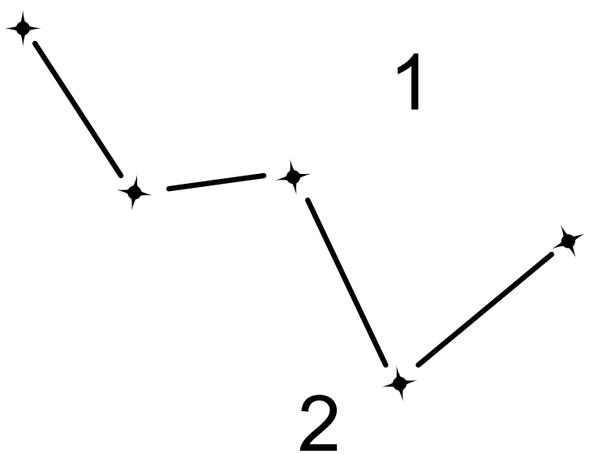
A: No. Two of them are actually relatively close to each other, but the centre stars is actually 800 light years further away - a huge distance.

3 The Orion nebula is an enormous cloud of gas and dust in space. It’s called a ‘stellar nursery’ because many stars are formed here.

Q: Which is bigger, the Earth or this nebula?

A: It may seem unbelievable but the Orion Nebula is around 20 light years across. That means it takes 20 years for light to get from one side to the other. Not only is this hugely bigger than a single planet, the entire solar system could fit into this cloud many millions of times.

CASSIOPEIA



You're going to refer to this simple view of the constellation. The participants will have it on their cards

Cassiopeia is a very distinctive group of stars in the sky. If you’re having trouble finding other constellations, it’s good to start by finding the very clear ‘W’ of shape of Cassiopeia and go from there.

1 In this region of space above the ‘W’ shape are two supernova remnants: Cassiopeia A and Tycho’s Supernova remnant. The latter of these is named after Tycho Brahe who observed the actual supernova in 1572 - the remnant is the still on-going shockwave .

Q: If Tycho’s Supernova was first seen in 1572, how is it still possible to see the continuing explosion today?

A: Supernovae are so enormous that is takes many thousands of years for the whole process of explosion to happen.

2 Just below the ‘W’ shape is the nebula known as the Pacman Nebula. It’s called this because it’s shape and colour make it look like a giant picture of Pacman in space.

Q: Why do astronomers name nebulae after like this?

A: Pretty much because it’s fun! Quite often, the names are unofficial. Since the universe is so huge, it’s not difficult to imagine that there is a nebula out there that resembles anything you can think of.

CYGNUS

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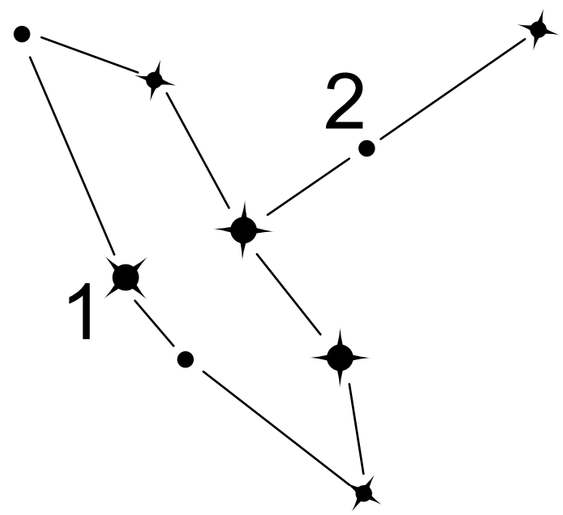
Cygnus is constellation best seen in the summer, in the East, in the hours after sunset. A section of the constellation is sometimes known as the “Summer Cross” and its brightest star, Deneb, makes up one third of the Summer Triangle.



1 This star is Deneb, one of the brightest stars in the sky and a Blue Supergiant. The blue colour is due to the intense amount of energy being given off, due to the star’s large mass.

Q: Which is hotter, red or blue?

A: A blue star is generally hotter than a red star - this seems counterintuitive because in daily life we talk about blue being a ‘cool’ colour and red ‘warm’. But in reality, the hotter an object is, the more blue its colour will become.

2 In the area around this star is a black hole known as Cygnus X-1. It is significant for being the first ever black hole to be discovered. You cannot ‘see’ this black hole with your eyes, it was instead spotted with an X-ray telescope.

Q: In science fiction, black holes are often used for time travel. Could this really work?

A: Black holes really do distort the flow of time. So do any large bodies, like a planet or star, but black holes are so dense that the effect is more pronounced. We now understand that time does not flow at the same speed for everything in the universe, however, whether you can travel backwards in time is still a matter of debate.