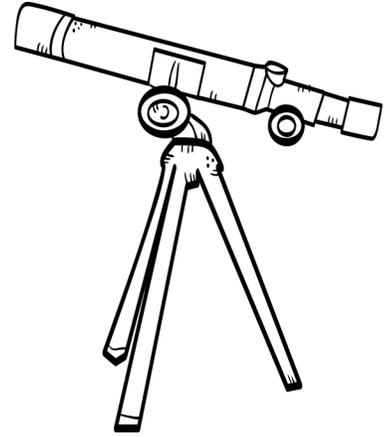


Understanding Stars, Comets & Other Wonders of Space

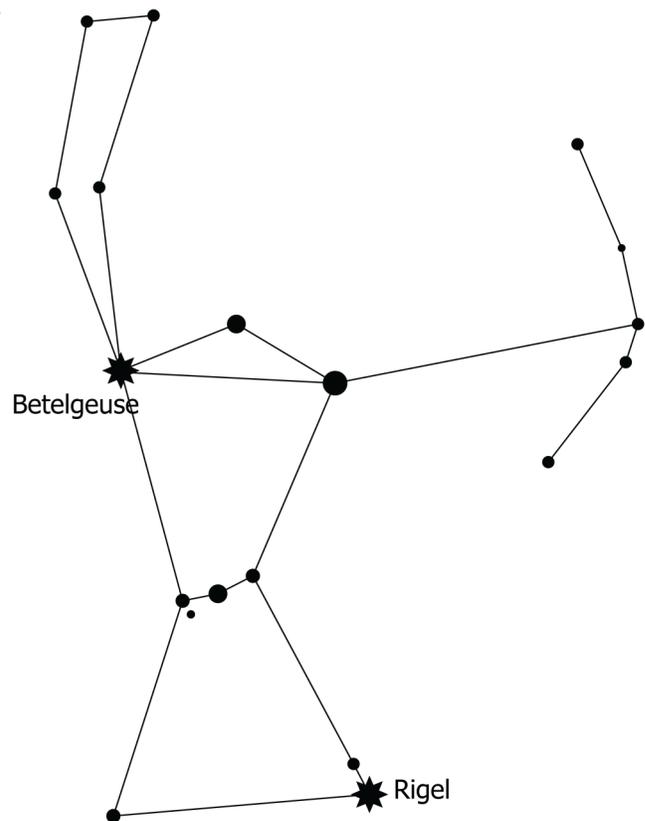
Our universe is full of amazing things to study, and scientists still haven't found or understood them all yet. You know about moons and planets, but do you know about nebulas, supernovas, asteroids, meteors, and black holes? Those are a few of the wonders we're going to take a closer look at in this unit.



We'll start by looking at the difference between stars, planets, and moons. After all, when you look at a picture of the universe, it's hard to see much difference between one dot and another. But stars can do something planets and moons cannot do. Stars produce their own light and heat, but all planets and moons can do is reflect light. Stars have a special and complicated process called **nuclear fusion** where they join atoms together and convert some mass to energy. That's why our sun is called a star, but we call Earth a planet.

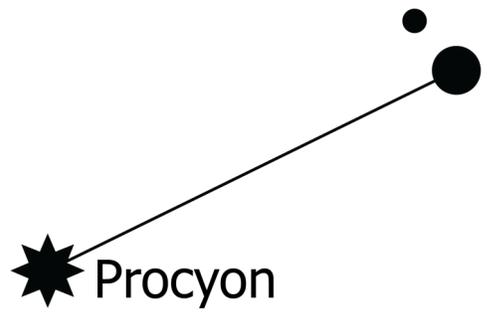
Scientists have ways to classify stars based on their brightness, temperature, and size based on the amount of energy they produce. They don't go by how bright the star is in the sky, though, because that can change depending on where in the world you are. They analyze the light coming from the stars and study it to determine how bright the star actually is.

Most of the time, the brightest stars are also the hottest and largest stars. The hottest are classified as **blue stars** and are class O, B, or A stars. Two class B blue stars you can see in the sky are Spica and Rigel. You can find Spica in the constellation Virgo, and its surface temperature is almost 33,000 °F (18,300 °C). Remember, the term **constellation** just means a group of stars people have connected in a special pattern, usually to look like a person, animal, or creature from a myth. You can find Rigel in the constellation Orion. It has a surface temperature around 19,300 °F (10,700 °C) and gives off about 40,000 times more light than our sun does.

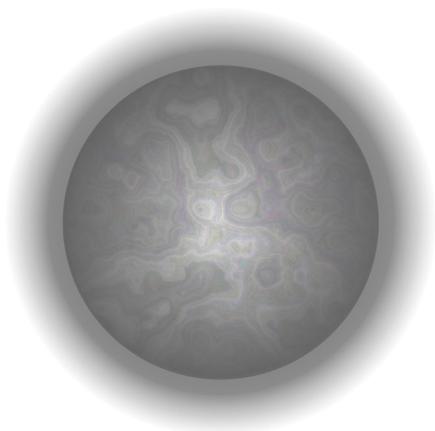
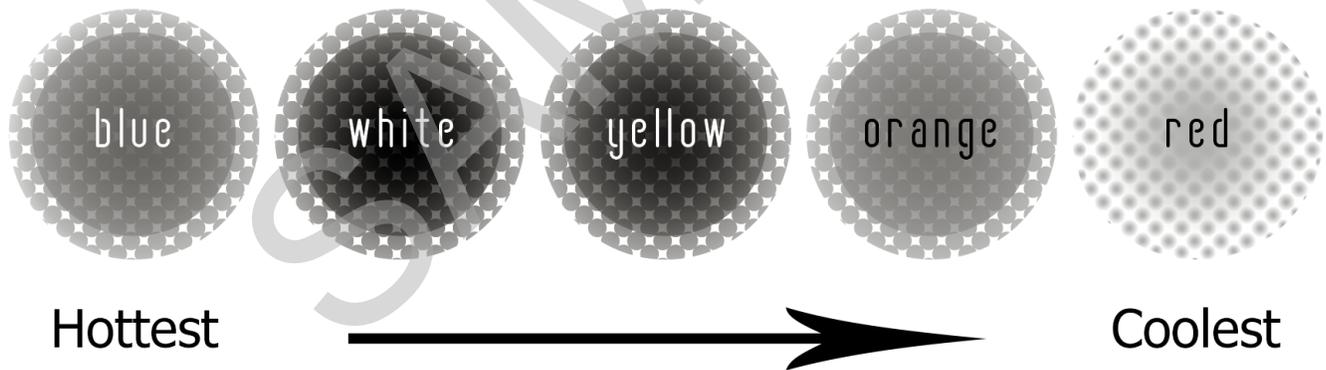
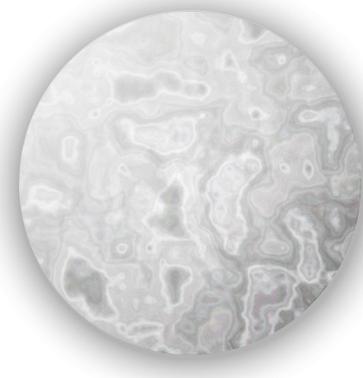


The next set of stars are white (class F), yellow (class G), or orange (class K). They are not quite as hot as the blue stars. Procyon in Canis Minor is about 11,000 °F (6,000 °C) on its surface. Our sun is about 10,000 °F (5,500 °C) on its surface and is a yellow, or class G star.

Stars are also classified by their size, which is determined by the amount of energy they release. This scale is given in Roman numerals. The largest stars are a I, which is called a supergiant. The smallest stars are a VII, which is called a white dwarf.

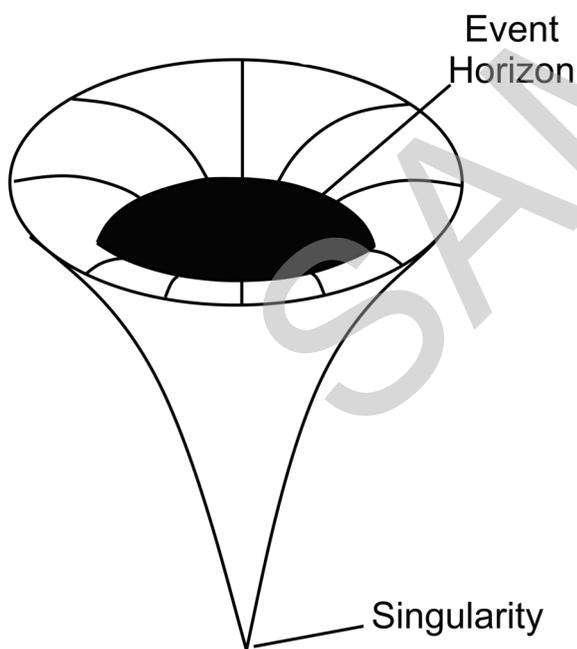
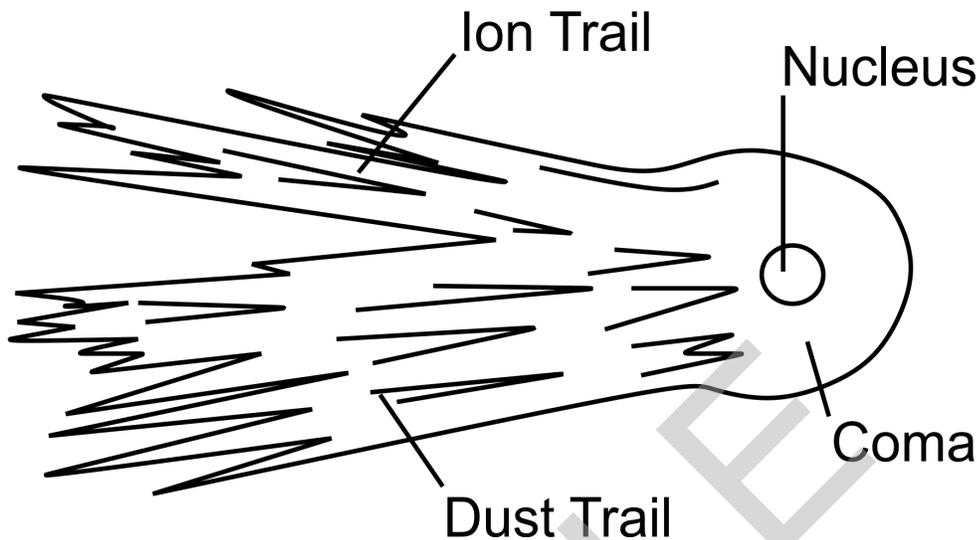


Stars that follow the pattern where a star is brighter, hotter, and bigger or dimmer, cooler, and smaller are called **main sequence stars**.



But there are some stars that break these rules. Two of these stars are Antares and Betelgeuse. Their temperatures are even cooler than the class K stars, which should make them an orange or a dull red class M star. But they are very bright and large. This makes them red giants, or red supergiants.

As a comet heats up, the ice in the nucleus starts to crack and release gas. This cloud of gas is called the coma. Then radiation pushes some of the dust away from the coma and forms the dust tail. While this is happening, solar wind changes some of the gas into charged particles called ions and forms the ion trail.



Do you remember at the beginning of the unit how we said that stars use a complicated process called nuclear fusion to join atoms together? Well, eventually, a star can run out of the fuel it needs for this process. When it does that, the star starts to collapse. A **black hole** forms when the star collapses so completely that only the tiniest point, called the **singularity**, is left. All the matter concentrates down into this single point. We've never been able to study a singularity because it is so dense and powerful that not even light can escape it. We have been able to start studying the surface of a black hole. This is called the **event horizon**. The first picture of an event horizon was announced on April 10, 2019.

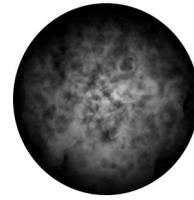
Antares and Betelgeuse are very bright but are cooler than class K stars. They are what kind of star? Draw a circle around it.



White dwarfs

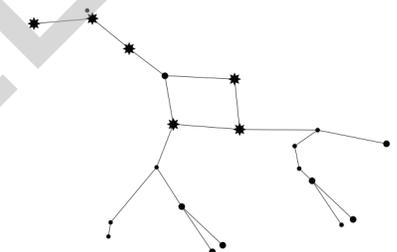
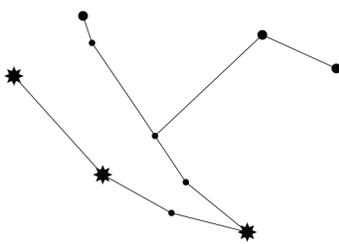


Red giants/red supergiants



Supernovas

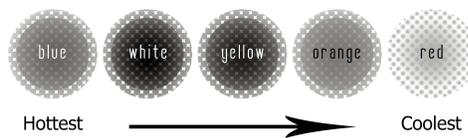
Which of the following constellations is Ursa Major? Draw a circle around it.



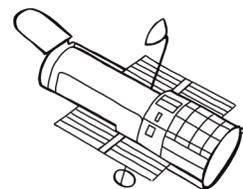
Which of the following includes a nucleus, coma, ion trail, and dust trail? Draw a circle around it.



Comet



Main sequence star



Hubble Space Telescope

Which of the wonders of space was your favorite to read about and why?

Review Answer Key

On the following diagrams, label the stages of a meteoroid, the parts of a comet, and the parts of a black hole.

