TEACHER RESOURCE

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

EXOPLANETS

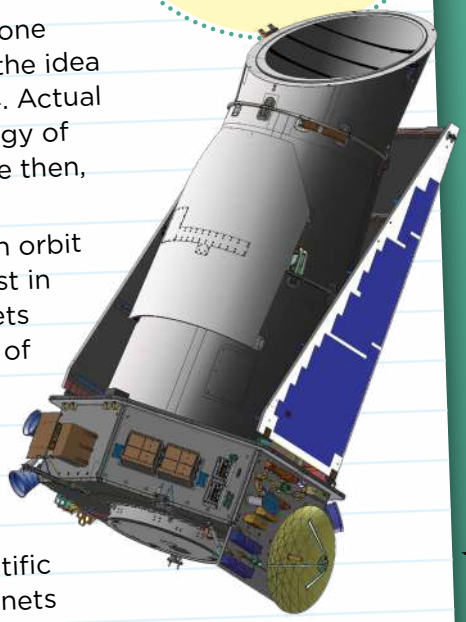
SCIENCE CONTENT/ CURRICULUM LINK
APPRECIATE THAT SCIENTISTS ASK QUESTIONS ABOUT OUR WORLD THAT LEAD TO INVESTIGATIONS AND THAT OPEN-MINDEDNESS IS IMPORTANT BECAUSE THERE MAY BE MORE THAN ONE EXPLANATION.

Exoplanet is short for 'extrasolar planet' – a planet that is outside our solar system not orbiting around the Sun but around some other distant star.

The existence of exoplanets had been suspected long before the first one was discovered. The Italian philosopher Giordano Bruno, put forward the idea that other stars could be the centre of their own solar systems in 1584. Actual detection of exoplanets, however, is difficult. Far beyond the technology of the 16th century. The first exoplanet wasn't discovered until 1991. Since then, over 2000 have been discovered.

Even with today's technology it is almost impossible to see a planet in orbit around another star. Exoplanets are simply too faint and easily get lost in the bright light coming from their parent star. Only a handful of planets have ever been seen. We only know of the other's existence because of the effects they have on their parent star.

One way of finding exoplanets is to look for stars that repeatedly shift slightly toward then slightly away from the Earth in response to the gravitational pull of one or more planets orbiting the star. This wobbling motion of the star is extremely small, completely invisible to the naked eye, but is often detectable with modern scientific equipment. This way of finding exoplanets is the *radial velocity method*.



Kepler Space Telescope. Image: Wikipedia Commons

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We can also look for stars that periodically drop in brightness in response to a planet passing in front of the star and blocking out a tiny amount of the star's light. This is the *transit method* of detecting exoplanets. As with the radial velocity method, the change this causes is minuscule and only detectable with advanced equipment. Certainly not with the naked eye!

There are a few other ways of detecting exoplanets such as *gravitational microlensing* and *polarimetry*. But in terms of number of planets discovered, the transit method and the radial velocity method have been by far the most successful, about 70% have been discovered by one of these methods. Many of these have been discovered in only the last few years thanks to the Kepler space telescope. Launched in 2009, Kepler makes use of the transit method to look for potential exoplanets. It has found several thousand candidates of which around one thousand are confirmed exoplanets.

Check out these other resources...

- Solar System resource – http://stardome.org.nz/wp-content/uploads/2015/03/Stardome-Education_Scale-of-the-Solar-System_Resource.pdf
- Crash Course – https://www.youtube.com/watch?v=7ATtD8x7vV0

DISCUSSION POINTS

- How do scientists find exoplanets?
- Where is the nearest exoplanet?
- How many planets in our solar system can you see with the naked eye?

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ACTIVITY

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HOW TO FIND AN EXOPLANET

To detect an exoplanet, astronomers look for dimming of light from a distant star. They use the strongest telescopes possible to see this tiny change in brightness all the way from Earth. The nearest exoplanet is suspected to be in orbit around Alpha Centauri B, 4.2 light-years away.

OUTSIDE

You'll need...

- A basketball (this represents a star about the size of Alpha Centauri B)
- A marble (this represents an exoplanet about the size of the planet that orbits Alpha Centauri B)
- Two volunteers

Instructions...

Step 1: Go to the largest space in your school. Put the class at one end of the area and the two volunteers at the other end.

Step 2: Give one volunteer the basketball and the other the marble.

Step 3: Put the student with the basketball at the very end of the field (opposite to the rest of the class), and the marble volunteer about one metre in front.

Step 4: Ask the student with the marble to walk in front of the basketball.

Step 5: The rest of the class at the other end of the field represent the Earth-bound astronomers, except they are much, much closer than astronomers are from any exoplanets. It should be a challenge to see the tiny marble pass in front of the basketball. In reality, if Alpha Centauri B were the size of a basketball, Earth would be approximately 8000 km away – roughly in Japan!

INSIDE

You'll need...

- A desk lamp or torch
- A round object, smaller than the light, like a marble, or ping pong ball.

Instructions...

Step 1: The torch represents the star the exo-planet orbits.

Switch on the light, and pass the round object in front of the light.

Notice that the object blocks the light slightly as it passes.

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

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