

Teacher's Guide – Nobel Prize in Physics 2019 Michael Mayor and Didier Queloz – An exoplanet orbiting a solar-type star

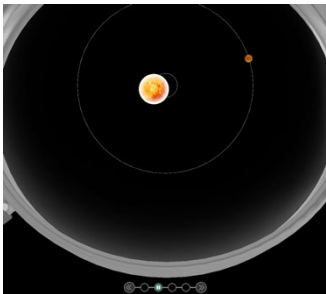
1) The star 51 Pegasi



Here you see the Earth at the bottom edge, with the moon above it to the left side. Right above the Earth, you see a constellation called Pegasus (use the right-hand menu to shut off/turn on the constellation highlight). In the rectangular part of the constellation, a small point of light is visible. You can only see it with the naked eye if the night sky is really dark.

This star is called 51 Pegasi and resembles our own star – the sun. In 1995 two astronomers, Michael Mayor and Didier Queloz, discovered a planet orbiting this star. In 2019 they were awarded the Nobel Prize in Physics for their discovery.

2) The first exoplanet



By using “View menu” in the lower part of your screen, you can click your way backward and forward in the visualization. In View 2 you zoom in on 51 Pegasi and see from above how the planet moves in orbit around the star. We also see how the star follows a small orbit. This is because it is affected by the gravitational force of the planet. The planet and the star rotate around a common centre of gravity.

3) Blueshift/redshift



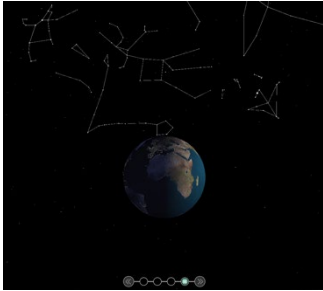
Use “View menu” to move to View 3. Here we see the star from earth, moving back and forth in the direction of our line of sight. The speed of this movement (radial velocity) can be measured, since it affects the wavelength of the light beams that we are looking at. So even though we cannot see the planet directly, we can understand that it is there.

It is similar to the Doppler effect, that occurs when a sound source is moving towards or away from us. When the star is moving towards us, its wavelength becomes shorter and the light becomes bluer. When it is moving away from us, its wavelength becomes longer and the light is redder.

The difference is tiny, but using today’s technology which the 2019 Laureates helped develop we can measure the difference and also calculate the mass of the planet. Aside from this method,

researchers also use the passage method where you observe how the light from a star decreases when a planet passes in front of it. Together with the radial velocity method, it gives us information about the planet's atmosphere, size and density.

4) Back on earth



In View 4 we see a final scene showing the earth and the moon, with various constellations in the night sky. If you want to continue using the visualisation, use “View menu” to move where you want.