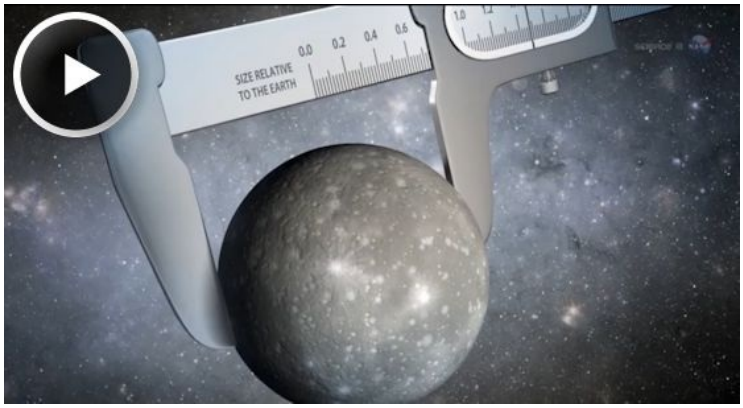
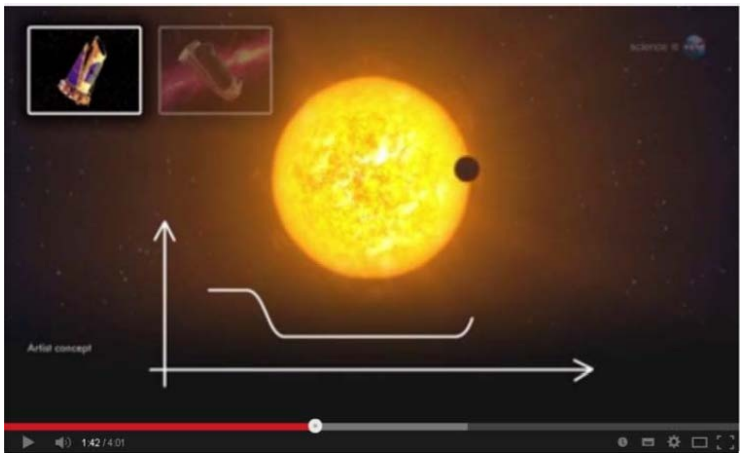
MEASURING EXOPLANETS



Barely 30 years ago, the only planets astronomers had found were located right here in our own solar system. The Milky Way is chock-full of stars, millions of them similar to our own sun. Yet the tally of known worlds in other star systems was exactly zero.

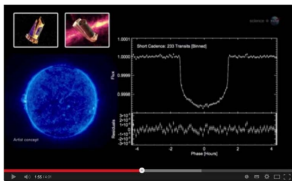
What a difference a few decades can make.

As 2014 unfolds, astronomers have not only found more than a thousand "exoplanets" circling distant suns, but also they're beginning to make precise measurements of them. The old void of ignorance about exoplanets is now being filled with data precise to the second decimal place.

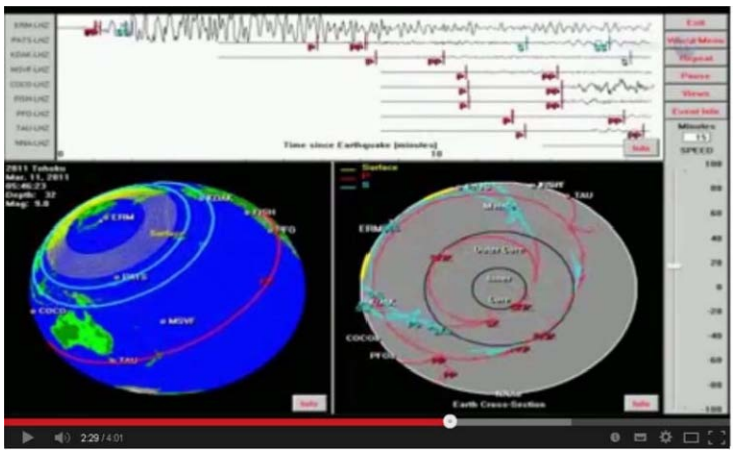


A team at the University of Washington in Seattle, recently measured the diameter of a "super Earth" to within an accuracy of 148 miles total or about 1 percent — remarkable accuracy for an exoplanet located about 300 light years from Earth. To size up the planet, named Kepler 93 b, they used data from NASA's Kepler and Spitzer Space Telescopes.

First, Kepler discovered the planet. As seen from Earth, Kepler 93 b passes directly in front of its parent star, causing the starlight to dim during the transit. That dimming, which occurs once per orbit, is what allowed Kepler mission scientists to find the planet in the first place.



Next, both Spitzer and Kepler recorded multiple transits at visible and infrared wavelengths. Data from the observatories agreed: Kepler 93 b was really a planet and not some artefact of stellar variability. By looking carefully at the light curve the size of the planet relative to the star could be calculated.



At that point, the only missing piece was the diameter of the star itself. The precision with which we measure the size of the planet is linked directly to the measurement of its star, and there a technique called asteroseismology is emplyed. Most people have heard of seismology, the study of seismic waves moving through the Earth. Asteroseismology is the same thing, except for stars: The outer layers of stars boil like water on top of a hot stove. Those convective motions create seismic waves that bounce around inside the core, causing the star to ring like an enormous bell. Kepler can detect that "ringing," which reveals itself as fluctuations in a star's brightness. By analyzing the seismic modes of the star it is possible to deduce its radius and mass to an accuracy of a percent,

The new measurements confirm that Kepler-93 b is a "super-Earth" sized exoplanet, with a diameter about one-and-a-half times the size of our planet. Previous measurements by the Keck Observatory in Hawaii had put Kepler-93 b's mass at about 3.8 times that of Earth. The density of Kepler-93 b, derived from its mass and newly obtained radius, suggests the planet is very likely made of iron and rock, like Earth itself.

Although super-Earths are common in the galaxy, none exist in our solar system. That makes them tricky to study. The NASA team has shown, however, that it is possible to learn a lot about an exoplanet, even when it is very far away.

From NASA Notes AK