First Rocky Exoplanet Detected

- Most known exoplanets are large and have low densities - similar to jovian planets in our solar system.
- A space telescope recently discovered a planet with radius only 70% larger than Earth’s.
- Ground-based observations show the planet’s mass is less than 5 times Earth’s.
- Together, the observations reveal that the planet’s density is similar to Earth’s - the first confirmation of a “rocky” exoplanet.

Artist’s conception of the view of the rocky planet’s parent star (Corot-7) from above the surface of the planet (Corot-7b). Image from ESO / L. Calcada.
How Can We Find a Planet’s Density?

- Density = Mass / Volume

- The planet’s mass was determined using the radial velocity method: The planet gravitationally ‘tugs’ on the star, shifting the wavelength of light the star emits back and forth. The amount of shift indicates the planet’s mass.

- Volume = \( \frac{4}{3} \pi R^3 \)

- The planet’s size was determined using the transit method: The amount of light measured from a star decreases when a planet passes in front. The amount of decrease indicates the planet’s size.

Discoveries in Planetary Science  
http://dps.aas.org/education/dpsdisc/
The Big Picture

• After discovering hundreds of exoplanets resembling our jovian planets, astronomers have found the most Earth-like planet to date

• Although planet Corot-7b’s density is close to Earth’s, differences abound: it orbits its star in ~20 hours (faster than any known exoplanet) - so close that its rocky surface may be molten

• With the existence of Earth-like planets now demonstrated, astronomers have reason to hope that the Kepler mission will discover more

Detection of more rocky exoplanets (‘Super-Earths’) like those in this artist’s depiction should come rapidly, thanks to dedicated space telescopes and improving ground-based detection capabilities. Image from D. Aguilar, Harvard Smithsonian CfA.
For More Information...

Press Releases
- Space.com - 09/16/09 - “First Rocky World Confirmed Around Another Star”
  http://www.space.com/scienceastronomy/090916-rocky-exoplanet.html
- European Southern Observatory - 09/16/09 - ‘First Solid Evidence for a Rocky Exoplanet’

Images
- Artist depiction of Corot-7 system courtesy European Southern Observatory / L. Calcada
- Detection method cartoons - 2006 Pearson Education Inc., publishing as Addison Wesley
- Transit and radial velocity data plots adapted from source articles below
- Artist depiction of Super-Earth courtesy David Aguilar, Harvard Smithsonian CfA

Source Articles (on-campus login may be required to access journals)
  http://www.aanda.org/index.php?option=article&access=doi&doi=10.1051/0004-6361/200913096