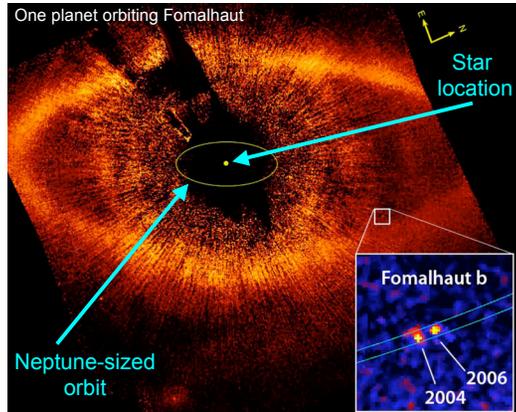


The First Images of Exoplanets

- New images show planets orbiting bright young nearby stars
- Although more than 350 planets are known to orbit other stars, none could be imaged until now



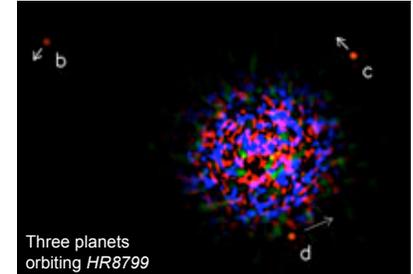
Hubble Space Telescope visible image of the star Fomalhaut (whose light was blocked), with a dust belt similar to the Kuiper belt. Inset: Images taken ~2 years apart show a planet moving around the star.

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<http://dps.aas.org/education/dpsdisc/>

Glowing Young Planets

- This star has three orbiting planets - the first imaged *planetary system!*
- Planets are much fainter than their parent star, so are difficult to image
- Why are *these* pictures possible?
 - Advanced observing techniques were used to block the star's light
 - Observations were repeated over years, confirming planetary motion
 - The planets are young and hot, and therefore glow more brightly than by reflected starlight alone



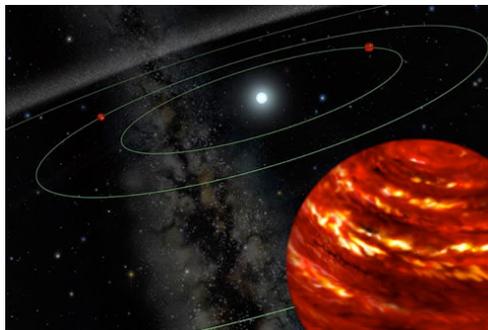
Keck Observatory infrared image of star HR8799 and three orbiting planets with orbital directions indicated by arrows. The light from the star was subtracted, but a lot of 'noise' remains.

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The Big Picture

- Previous exoplanet detections were indirect (used stellar motion and transit methods)
- These are the first pictures of planets around other stars
- Ever-improving images from Earth and space should allow us to detect smaller (more Earth-like) planets
- Images and spectra at different wavelengths will allow us to measure the composition of exoplanet atmospheres, and determine whether they are habitable.



Artist's conception of a planetary system orbiting another star.

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For more information...

Press Release / News Story

- New York Times - 11/13/2008 - "Now in Sight: Far-Off Planets"
<http://www.nytimes.com/2008/11/14/science/space/14planet.html>

Images

- Hubble image of Fomalhaut B
Taken from the source article by Kalas et al.
- Keck image of HR8799
Taken from the source article by Marois et al.
- Artist concept of another planetary system from Gemini Observatory
<http://tinyurl.com/geminiplanetfamily>

Source Articles (on-campus login may be required to access journals)

- Kalas et al., 'Optical Images of an Exosolar Planet 25 Light-Years from Earth', *Science*, **322**(5906), p. 1345 DOI: 10.1126/science.1166609.
<http://www.sciencemag.org/cgi/content/abstract/322/5906/1345>
- Marois et al., 'Direct Imaging of Multiple Planets Orbiting the Star HR 8799', *Science*, **322**(5906), p. 1348 DOI: 10.1126/science.1166585, 2008.
<http://www.sciencemag.org/cgi/content/abstract/322/5906/1348>

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