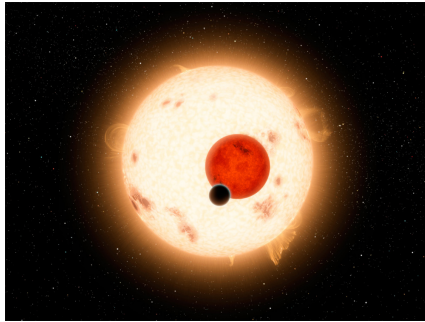


A Planet Orbiting Two Suns

- About 1000 planets have been discovered outside our own solar system
- But do planets form *only* around single stars? About half of all stars form in groups of two or more.
- NASA's Kepler spacecraft has detected a Saturn-sized planet orbiting *two* stars - the first discovery of a 'circumbinary' planet

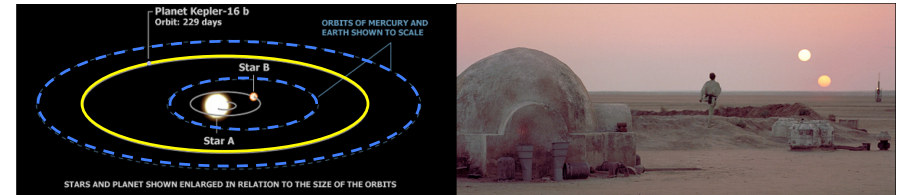


Artist conception of planet Kepler 16b (the dark object in the foreground) and the binary stars it orbits (one similar to our own Sun). All three objects eclipse each other in Kepler observations, demonstrating that they move in nearly the same plane.

Discoveries in Planetary Science

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

The View from 'Tatooine'



(Left) Geometry of the Kepler 16b stellar system. Two stars move about their center of mass, while Kepler 16b orbits both stars. (Right) Kepler 16b is Saturn-like, but the view from its cloud tops could be similar to the view imagined from the planet Tatooine in the movie Star Wars.

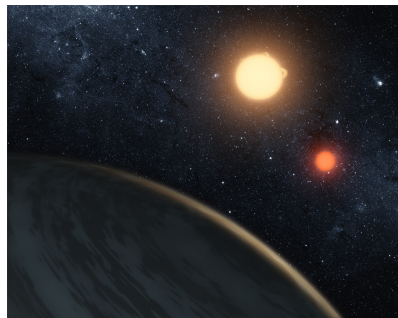
- Movies have imagined the view from circumbinary planets. Are they realistic? Yes!
- The planet circles both stars, which circle their mutual center of mass
- Though unlikely, the planet may keep one face toward the Suns, with the other face always dark
Two Suns would move back and forth in the sky for those on the correct side. In some places one Sun could occasionally set.
- If the planet rotates faster it would have two sunrises & sunsets each day
Which Sun rose first could vary. The Suns would move at different and variable rates through the sky. They would sometimes eclipse each other. There would still be night.

Discoveries in Planetary Science

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

The Big Picture

- Binary systems are quite common. If Kepler 16b is 'typical' then there may be many more planets in our galaxy than previously estimated
- This planet and its Suns move in a single plane, suggesting the planet formed 'in place', rather than being captured. But models of planet formation have trouble making planets as close to binary stars as Kepler 16b – perhaps it migrated inward after formation?
- Kepler 16b provides yet another example of how science is catching up with the imagination of science fiction



Systems with two or more stars slightly outnumber single star systems in our galaxy. What fraction of them have planets? Do the planets occupy habitable zones around their central stars?

Discoveries in Planetary Science

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

For More Information...

Press

- Space.com – 09/15/11 – "Planet Like 'Star Wars' Tatooine Discovered Orbiting 2 Suns"
<http://www.space.com/12963-tatooine-planet-2-suns-star-wars-kepler-16b.html>
- Sky & Telescope – 09/15/11 – "A Planet Orbiting Two Suns"
<http://www.skypandtelescope.com/community/skyblog/newsblog/129909203.html>
- NASA – 09/15/11 – "NASA's Kepler Mission Discovers a World Orbiting Two Stars"
http://www.nasa.gov/mission_pages/kepler/news/kepler-16b.html

Images

- Slide 1 image courtesy NASA / JPL-Caltech, R. Hurt
http://www.nasa.gov/mission_pages/kepler/multimedia/images/Kepler-16_transit-art.html
- Slide 2 image courtesy space.com and Lucasfilm LTD
<http://www.space.com/12964-alien-planet-star-wars-tatooine-kepler-16b-infographic.html>
<http://blogs.physicstoday.org/thedayside/2011/09/>
- Slide 3 image courtesy NASA / JPL-Caltech, T. Pyle
http://www.nasa.gov/mission_pages/kepler/multimedia/images/Kepler-16_planet-pov-art.html

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

- Doyle et al., "Kepler-16: A Transiting Circumbinary Plant", *Science*, 333, doi:10.1126/science.1210923, 2011.
<http://www.sciencemag.org/content/333/6049/1602>

Prepared for the Division for Planetary Sciences of the American Astronomical Society by David Brain and Nick Schneider
dpsdisc@aas.org - <http://dps.aas.org/education/dpsdisc/> - Released 06 October, 2011

Discoveries in Planetary Science

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