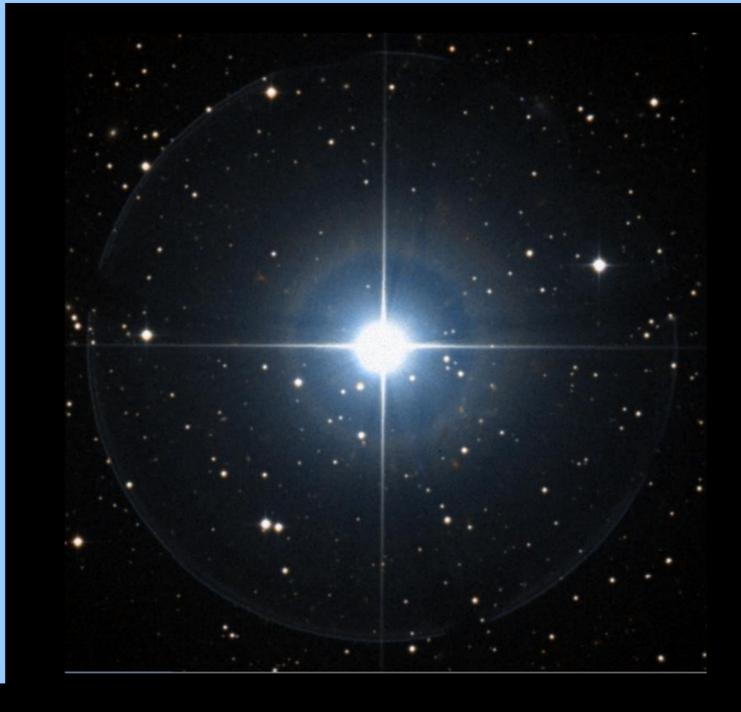
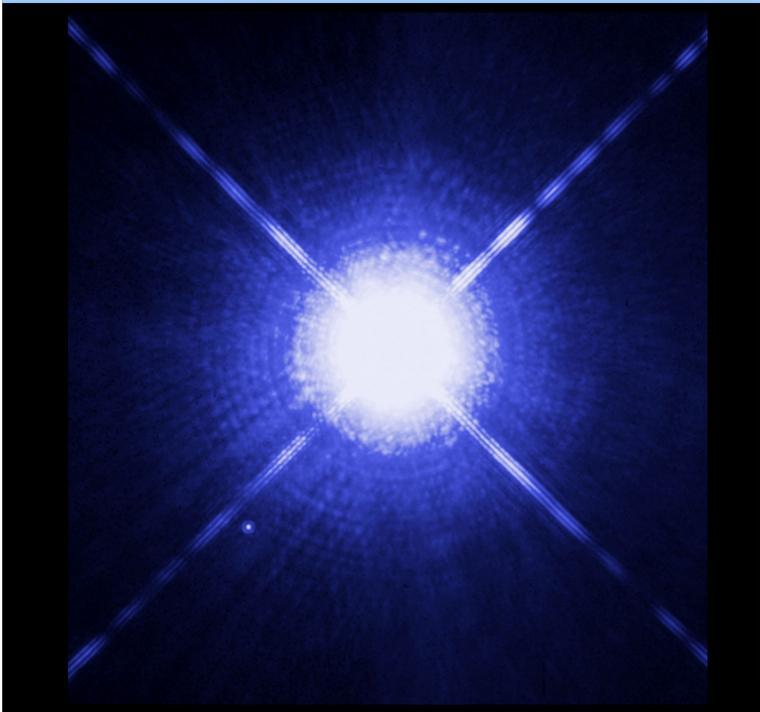


Planet or Pla-NOT?



Can you figure out which of the stars shown here have planets around them? Some do, some don't -- and you can't always tell just from a cursory glance. So just how do astronomers find other planets?

Take a a look at these stars, **think about it**, then look on the other side to check yourself and find out.



Planet or Pla-NOT?

Hello, neighbor

Star names: alpha Centauri A & B
 Star masses: 1.1 and 0.9 times the mass of our Sun
 Distance: 4.3 light years
 Planets: None (so far)

Alpha Centauri A and the stars that orbit around it (Alpha Centauri B and the tiny Proxima Centauri) are the closest stars to the sun. Astronomers have not yet seen any big "wobbles", so there aren't any Jupiter-sized planets there, but right now astronomers are making more precise measurements, and in a few years we will know if Alpha Centauri has any Earth-sized planets.

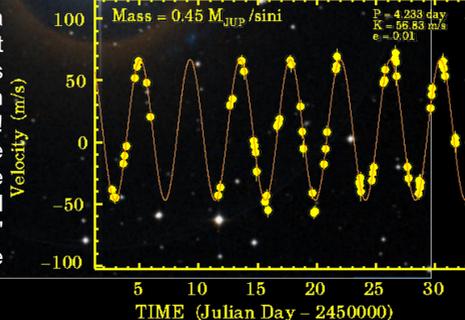


Too close for comfort

Star name: 51 Pegasi
 Star mass: 10% more massive than our Sun
 Distance: 48 light years
 Planets known: 1
 Planet's mass: half the mass of Jupiter

The giant planet orbiting the star 51 Pegasi was the first planet discovered around a sun-like star, but it's not what astronomers expected.

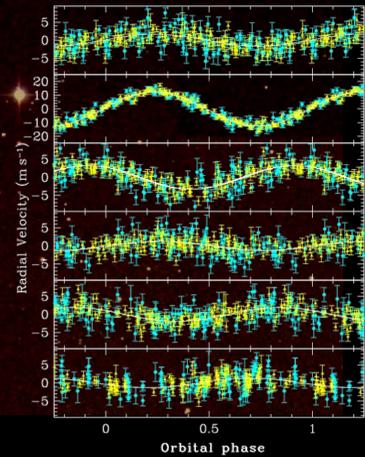
It's a big planet, with a mass like Jupiter, but it's located six times closer to its star than Mercury is to the Sun! Astronomers have since found many more such planets, and call them "Hot Jupiters" because of their size and high temperatures.



Cosmic Controversy

Star name: GJ 581
 Star mass: only 30% the mass of our Sun
 Distance: 21 light years
 Planets known: 4 - 6
 Planet masses: 2 - 16 times the mass of Earth

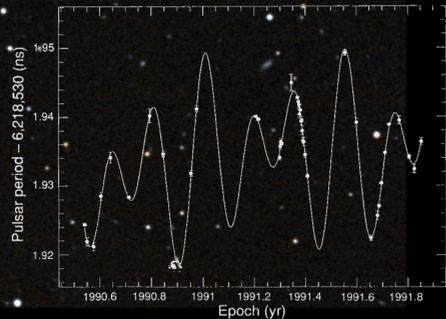
This is a small, cool red star with a lot of planets -- but astronomers don't agree on just how many! One team says they see complicated wobbles from the star that means there are 6 planets, one Earth-sized and in the "habitable zone", where temperatures are just right for liquid water. Another group, though, claims that they don't see this planet's same wobbles in their own measurements: they say there are only 4 planets! This shows just how hard it is to find planets like Earth!



Deep-fried Planets

Star name: PSR 1257+12
 Star mass: 40% more massive than our Sun
 Distance: 1000 light years
 Planets known: 3
 Planet masses: <1 - 4 times the mass of Earth

These were the first planets discovered in another solar system, but it's nothing like ours. The star "PSR 1257+12" is a pulsar: a spinning cinder the size of Santa Monica left over from the explosion of a huge star. The pulsar spins and sends out beams of radio waves like a lighthouse: scientists measure exactly when the beams reach Earth, and from tiny delays realized there were three planets orbiting and tugging at the star.

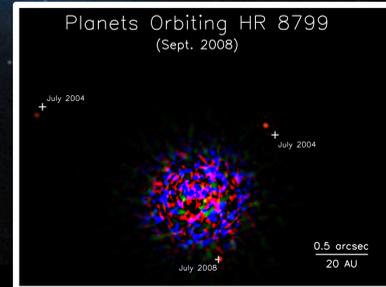


How do astronomers find planets? Usually by *indirect* means -- like the back-and-forth wobble that an orbiting planet causes in its star -- and hardly ever by just taking a picture of the planet. Even then, the best "pictures" we have of other planets are just colored points of light. Astronomers are finding smaller and smaller planets around more and more stars; maybe soon we'll find one like Earth!

Ready For My Close-up

Star name: HR 8799
 Star mass: 50% more than our own Sun
 Distance: 128 light years
 Planets known: 3
 Planet masses: 7-10 times the mass of Jupiter

At right is the first picture of a multi-planet solar system, where you can actually see the faint planets. By carefully blocking out most of the star's light, astronomers were able to see fainter objects much closer to the star than was possible before. The closest-in planet in this system is still farther from its star than Neptune is from our Sun, so there's plenty of room in this system for more planets to be discovered. Stay tuned!



Smashed planets?

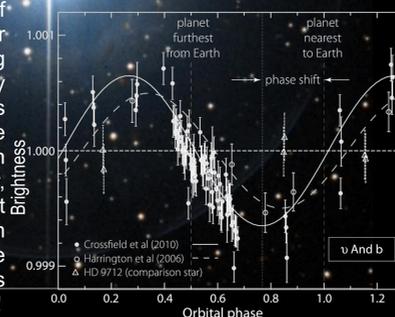
Star name: Sirius A & B
 Star mass: twice the mass of our Sun, and about the mass of our Sun
 Distance: 9 light years
 Planets: None (so far)

Sirius is the brightest star in the night sky because it is one of the closest stars to Earth. There are actually two stars here -- one much larger and hotter than the Sun, and a much fainter "white dwarf" left over when a star like our sun used up its fuel and died. Sirius B was discovered over 150 years ago -- as it orbits around it makes Sirius A wobble noticeably. No planets here, but there is some dust around the white dwarf that could be leftover debris from planet or asteroid collisions.

Trifecta

Star name: upsilon Andromedae
 Star mass: 30% more than our Sun
 Distance: 45 light years
 Planets known: 3
 Planet masses: 0.7 - 14 times Jupiter

There are three planets orbiting this star, and astronomers can "see" them three different ways. First, the planets were discovered because the tug of their gravity make the star wobble, and a star's changing motion means a slightly changing color. Astronomers also used the Hubble Telescope to actually see the star's position change as it wobbles. Finally, astronomers saw that about 0.1% of the infrared light from the star actually comes from the innermost planet, which glows red hot. Now, that's a hot Jupiter!



Welcome home!

Star name: Sun
 Star mass: 300,000 times the mass of Earth
 Distance: 8 light-minutes
 Planets known: 8 (plus dwarf planets and asteroids)
 Planet masses: from 5% to 300 times Earth

Our sun is also a star, and we know of eight planets that orbit it. Can you name them all? You can see most of them in the night sky, but Uranus and Neptune are too faint to be seen -- they weren't discovered until astronomers started using telescopes. Uranus was discovered by accident, and soon astronomers realized that "wobbles" in its orbit meant there must be another planet whose gravity tugged at it. Thus Neptune was the first planet to be discovered without actually seeing it, just due to the pull of its gravity alone!

