

Alien Planets

Space Telescope Finds Hundreds of New Worlds

They're out there in the depths of space. There are giant ones, small ones, weird ones, and most likely ones we can't even imagine.

We're talking about planets, of course. For years, astronomers have speculated that the sun is not the only star with planets circling it. Now, thanks to the Kepler space telescope, they have proof that our Milky Way galaxy could actually be teeming with planets of all sizes and types. Scientists call planets orbiting stars other than our sun extrasolar planets, or exoplanets for short.

Kepler Spans the Sky

The Kepler space telescope was launched on March 7, 2009. It is named after Johannes Kepler, the 16th-century German astronomer who discovered the laws of planetary motion. The telescope, which orbits the sun between Earth and Mars, is the most advanced and sensitive optical telescope ever constructed. It is so light sensitive that, if it were pointed back toward Earth at night, it would be able to detect when one person in a small town turned off a single porch light.

Kepler's mission, however, is not to detect porch lights. The spacecraft has one mission only—exoplanet hunting. For nearly two years, it has been peering at approximately 100,000 stars in a portion of the Milky Way. On February 2, NASA, the U.S. space agency, released its findings from Kepler's sky search conducted between May and September 2009. The telescope had discovered 1,235 possible exoplanets orbiting 997 stars. The find includes 68 about the size of Earth and 54 planets in what scientists call the Goldilocks zone—the zone around a star that permits liquid surface water, considered an essential condition to produce life.



AP Images

This artist's rendition shows the Kepler space telescope on the hunt for planets.

How to Find an Exoplanet

As sensitive as it is, Kepler cannot see the planets themselves. The stars it is looking at are from a few hundred to a few thousand light-years away. A light-year is the distance that light, traveling at 186,000 miles per second, covers in a year. That distance comes to approximately 5.9 trillion miles.

Kepler uses what scientists call the transit technique. The telescope is able to measure the very slight drop in starlight that occurs when an orbiting object passes in front of a star. Once Kepler registers an object passing around a star (usually after three passes), teams of scientists on Earth begin to focus on the object and try to analyze it.

Ground-based telescopes at the W. M. Keck Observatory in Hawaii, for example, are used to determine a possible planet's mass. Astronomers do that by measuring a star's wobbles—the tiny back-and-forth movements caused by the pull of a planet's gravity. Once size and mass are determined, as well as the type of star an exoplanet orbits, astronomers can make an educated guess as to what the planet is composed of. Sometimes the planet can be rocky, such as Earth, or gaseous, similar to Jupiter or Saturn. Or it may be some other type of exoplanet altogether.

Hot Jupiters and Rogue Planets

It takes time and a lot of work for astronomers to verify that what Kepler notices is, indeed, an exoplanet, and what kind of planet it might be. That is why it has taken two years to confirm many of Kepler's discoveries.

So far, Kepler has led to the discovery of a number of different types of exoplanets:

- hot Jupiters—large planets like Jupiter mainly made up of gas; they orbit their stars as closely as Mercury orbits our sun;
- super-Neptunes—gas planets similar to Neptune that also orbit close to their stars;
- rogue planets—planet-sized objects that have been ejected from their star systems and are no longer bound to their stars by gravity.



Detlev Van Ravenswaay/Photo Researchers, Inc.
This is an artist's rendition of a hot Jupiter, an exoplanet made mostly of gas.

Kepler-10b

In January, 2011, NASA scientists announced that they had discovered, for the first time, an Earth-like rocky exoplanet rather than a gas giant. The exoplanet, which they named Kepler-10b, orbits a sun-like star 560 light-years from Earth. Unfortunately, Kepler-10b is unlikely to support life, as it is 60 times closer to its star than Earth is to the sun. It is also 1.6 times denser than Earth—roughly the density of an “iron dumbbell,” says astronomer Natalie Batalha, the leader of the Kepler team. Some believe that Kepler-10b may have originated much farther from its star and moved inward. If the planet supported life in the past, say astronomers, there is no way it could now. Still, Kepler- 10b will go down in the history books as the most Earth-like exoplanet ever discovered—so far.

Continuing the Search

Many astronomers think that it is only a matter of time before Kepler locates Earth's twin revolving around a star that may even be close to us. The space

telescope has surveyed only a tiny fraction of the stars in the Milky Way. Once an Earth-like exoplanet is discovered, however, finding out whether it has all the ingredients for life will be a new hurdle. It will require costly new telescopes, including one capable of scanning such planets for evidence of oxygen, water, and carbon dioxide. Such a huge scientific mission will be expensive, but many scientists believe the exploration should continue at any cost.

"We are at a very special moment in the history of mankind," Cornell University astronomer Martha Haynes told The Associated Press.

Name: _____ Date: _____

1. To which planet do scientists compare Kepler-10b?
 - A Mars
 - B Earth
 - C Jupiter
 - D Neptune

2. The Kepler space telescope was launched on March 7, 2009. What is an effect of this occurrence?
 - A Scientists have discovered hundreds of exoplanets in the Milky Way.
 - B Johannes Kepler has recently been interviewed by several television stations.
 - C Earth's twin has been located revolving around a star in the Milky Way.
 - D Astronauts are traveling to several super-Neptunes to conduct research.

3. What can you conclude after reading the passage?
 - A In the near future, astronauts will be able to visit Kepler-10b.
 - B Most exoplanets have oxygen, water, and carbon dioxide.
 - C Scientists will continue to search for Earth-like exoplanets.
 - D Many astronomers agree that exoplanets aren't worth studying.

4. Read this sentence from the passage: "For years, astronomers have speculated that the sun is not the only star with planets circling it."

In this sentence, the word **speculated** means

 - A stopped a mission that was unsuccessful
 - B competed with members in the same group
 - C formed a belief without hard evidence
 - D persuaded others to believe false information

5. The primary purpose of this passage is
 - A to list the features of stars in the Goldilocks zone
 - B to discuss NASA's plans for the future of astronomy
 - C to describe the mission of the Kepler space telescope
 - D to explain why so many different types of exoplanets exist

6. What are exoplanets?

7. The author writes that Kepler-10b is “unlikely to support life because it is 60 times closer to its star than Earth is to the sun.” Why might the author draw this conclusion?

8. The question below is an incomplete sentence. Choose the word that best completes the sentence.

Astronomers determine an exoplanet’s size and mass _____ making an educated guess as to what the planet is composed of.

- A because
- B although
- C before
- D however

9. Answer the following questions based on the sentence below.

In January 2011, NASA scientists announced they had discovered an Earth-like rocky exoplanet by using the Kepler space telescope.

Who? _____

(did) What? announced they had discovered an Earth-like rocky exoplanet

How? _____

When? _____

10. **Vocabulary Word:** teeming: to be filled with things.

Use the vocabulary word in a sentence: _____

Teacher Guide & Answers

Passage Reading Level: Lexile 1140

Featured Text Structure: Cause/Effect – the writer presents the reason an event happened and its results

Passage Summary: “Alien Planets” describes how the Kepler space telescope has found hundreds of possible planets orbiting stars other than our sun.

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6. What are exoplanets?

Suggested answer: Exoplanets are planets that orbit stars other than our sun. [paragraph 2]

7. The author writes that Kepler-10b is “unlikely to support life because it is 60 times closer to its star than Earth is to the sun.” Why might the author draw this conclusion?

Suggested answer: The sun, which is a star, is a ball of extremely hot gas. If Kepler-10b is 60 times closer to its star than Earth is to the sun, it would likely be much too hot for life to exist. [paragraph under subhead “Kepler-10b”]

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10. **Vocabulary Word:** teeming: to be filled with things.

Use the vocabulary word in a sentence: answers may vary.