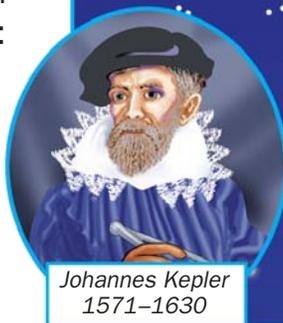




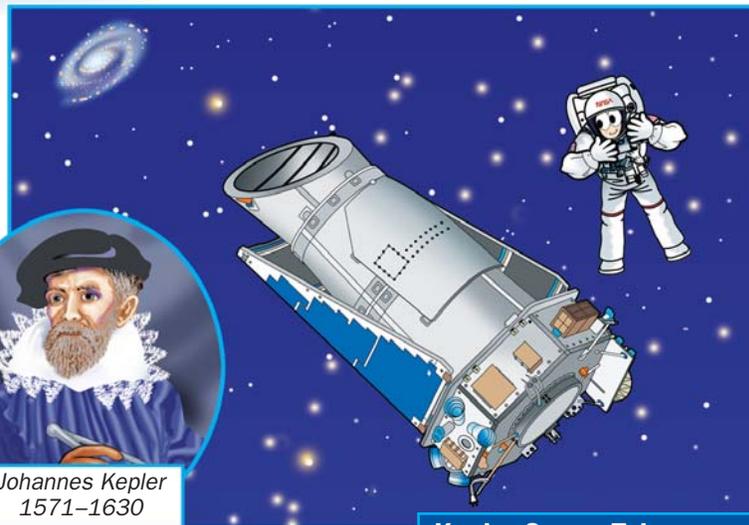
The Kepler Space Telescope

The Planet Hunter

Kepler (Kep-ler) is a space telescope (tel-e-scope). It was named after German scientist **Johannes Kepler**, who described the way planets **orbit** (or-bit) stars. Kepler launched in 2009 and began its mission: to look for planets orbiting stars outside our **solar system** (so-lar sys-tem). Such planets are called **exoplanets** (ex-o-plan-ets). So far, Kepler has found 74 exoplanets. But there may be thousands, and these are only in the one area of space Kepler is studying.



Johannes Kepler
1571–1630



Kepler Space Telescope

How Kepler "Sees" Planets

Planets orbiting distant stars are very hard to see. Kepler scientist Natalie Bathala says a far-away planet is as hard to see as a flea walking across a distant car headlight. But Kepler has a powerful light **sensor** (sen-sor) called a **photometer** (pho-tom-e-ter). It is pointed at the same patch of sky and "watches" continuously.

DID YOU KNOW??
Kepler's **field of view** contains more than 100,000 Sun-like stars.

It is able to detect the slight dimming of a star's light when a planet **transits** (tran-sits), or crosses in front of it. Scientists call this slight dimming a **blink**.



exoplanet transiting a star

Science says...
Telescopes help us see **distant** objects.

Are We Alone?

There are many questions scientists hope Kepler can help answer. Is it common for stars to have planets orbiting them? Are there other planets like **Earth**? Might those planets have life?

Part of Kepler's mission is to find planets that are similar to Earth. Scientists think planets that are similar to Earth are most likely to support life. These planets would be about the same size as Earth, so they would have similar **gravity** (grav-i-ty). An Earth-like planet would need to be close enough to its star to have liquid water. It would need to be at just the right distance from its star to be warm but not too hot. It would probably have an orbit that is close to Earth's 365 days. When a planet is close to its star but not too close, it is in the **habitable** (hab-it-a-ble) **zone**. In December 2011, Kepler found the first exoplanet orbiting its star in the habitable zone.

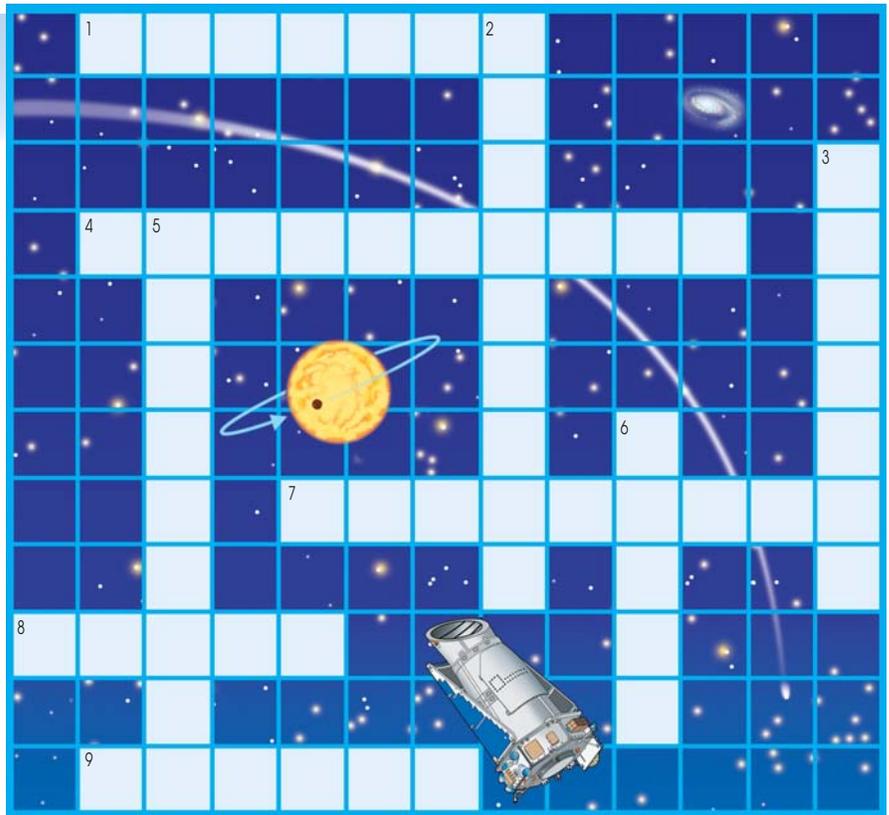
DID YOU KNOW??
The **habitable zone** around a star is often called the **Goldilocks zone**: It is "just right" for life.

DID YOU KNOW??
The stars Kepler observes are hundreds to thousands of **light years** away. A single light year is about **6 trillion** miles.



Vocabulary

Complete the crossword puzzle.



Across

- to cross in front of a star
- Kepler's light sensor is called a ____
- space object around a star outside our solar system
- to circle a star
- German scientist Johannes ____

Down

- instrument to see distant objects
- force that attracts objects toward Earth
- zone that is just right for life
- this planet is able to support life



Weekly Lab

How does Kepler find planets around distant stars?

ADULT SUPERVISION REQUIRED

ATTENTION TEACHERS: Please read the Teaching Notes before beginning this activity.

You need: a lamp with a frosted incandescent bulb, modeling clay, string, safety goggles

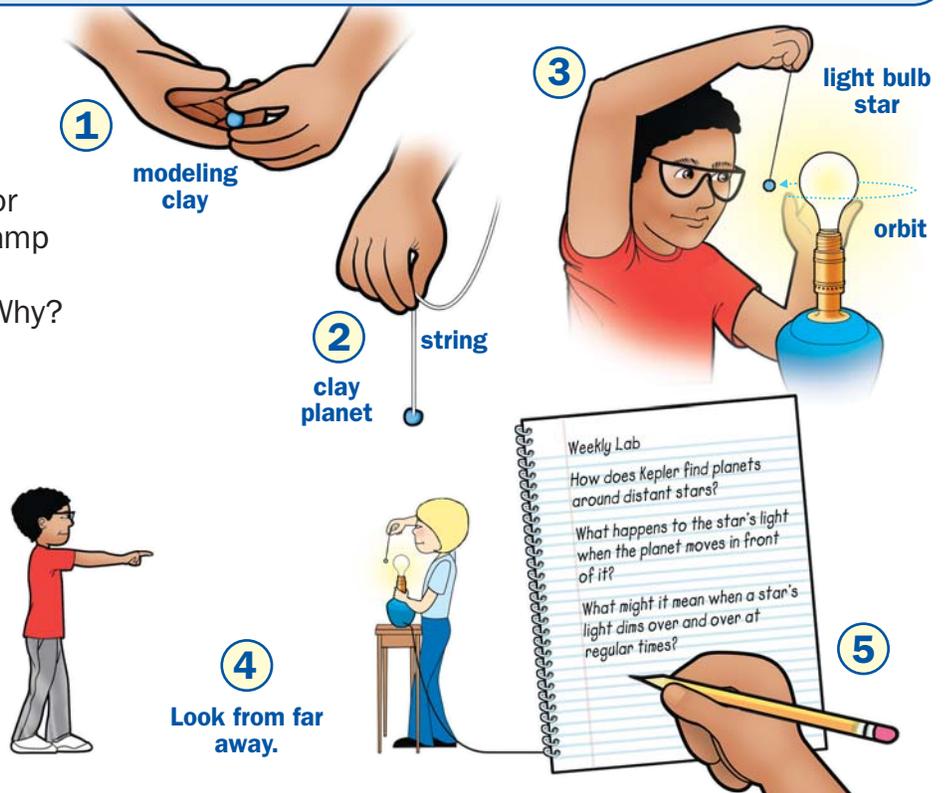
Step 1: Make a planet out of the modeling clay.

Step 2: Stick the planet on the end of a piece of string.

Step 3: Move the planet in a circle or **orbit** (or-bit) around the lit lamp bulb (star). Can you see the planet in front of the star? Why?

Step 4: Move as far away from the lab as you can. Is it harder to see the planet? Why?

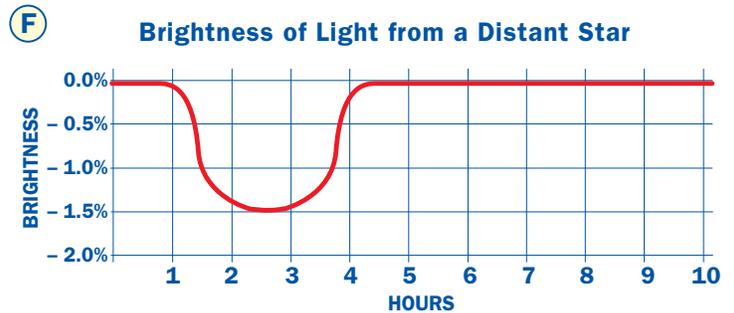
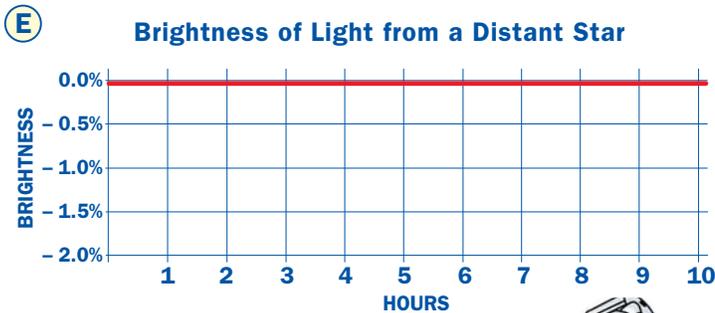
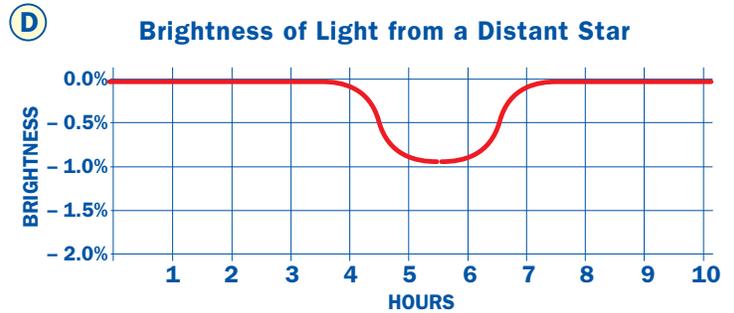
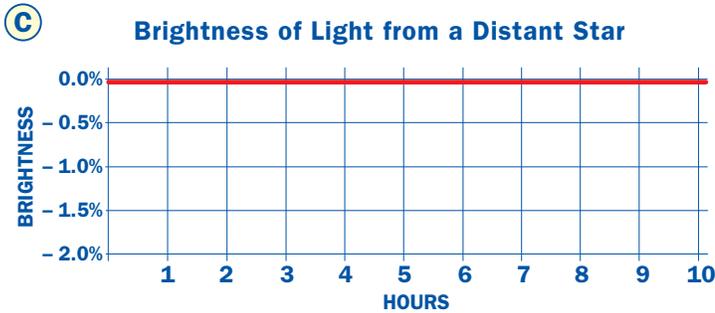
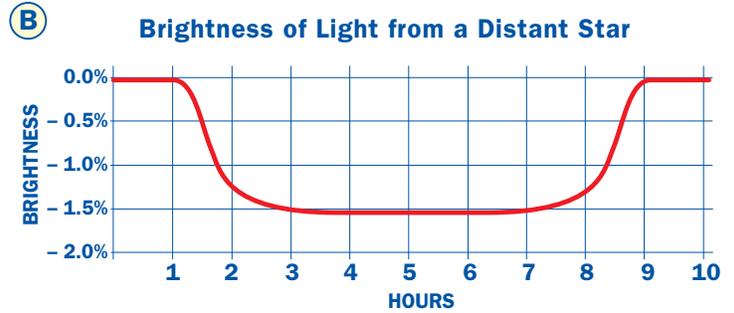
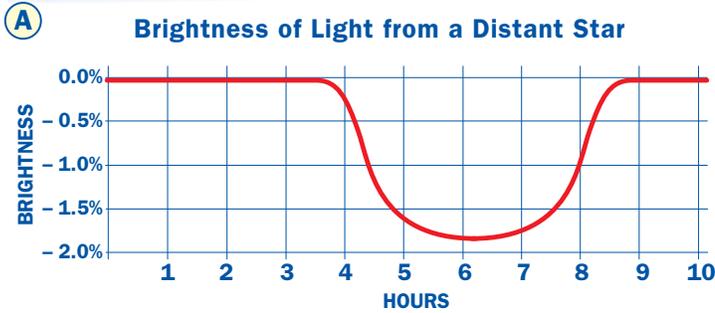
Step 5: What happens to the star's light when the planet moves in front of it? Write down the answer in your science journal. What might it mean when a star's light dims over and over at regular times? Write down the answer.





Math

The graphs measure the brightness of light from a distant star. Answer the questions.



1. What does it mean when the graph goes down?
2. What does it mean when the graph stays the same?
3. Which graphs might show a planet crossing, or transiting, the star? How can you tell?



4. Which graphs indicate no planets in orbit? How can you tell?
5. Which graph shows a planet transiting over the longest time period? How can you tell?

DID YOU KNOW??

Kepler has a **95-megapixel digital photometer**. A really good photographer's camera might have 10 megapixels.



Writing in Science

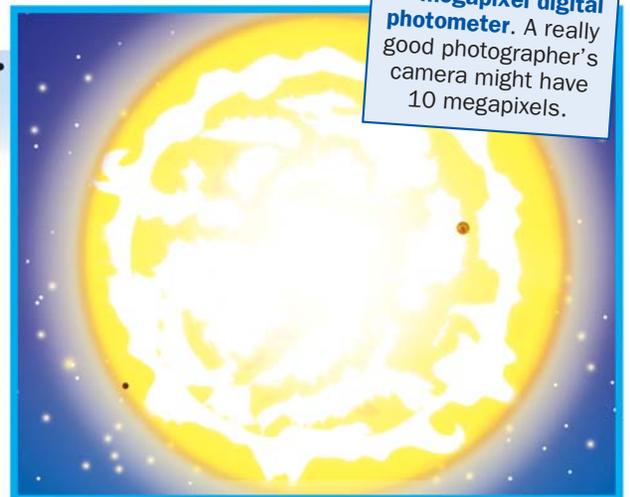
Answer the questions in your science journal.

Writing in Science

1. Why are exoplanets hard to find?

2. How can light brightness graphs help find planets around other stars?

3. Why do scientists look for other planets?



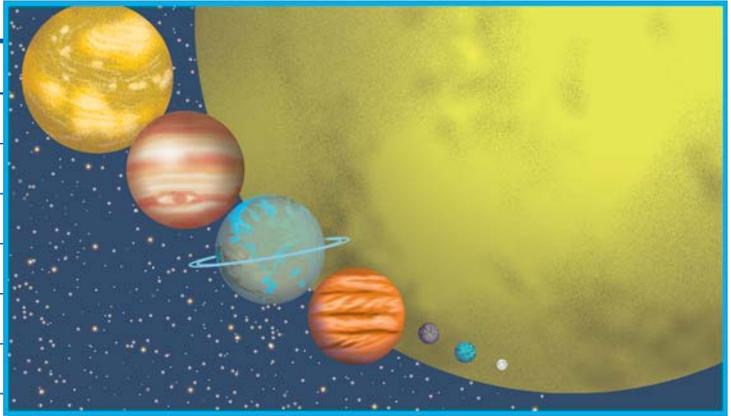
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Challenge

Study the table and use it to answer the questions. Write the answers in your science journal.

Planet Name	Size Compared to Earth	Days to Orbit Star
Earth	same	365
Jupiter	11 times larger	4,330
Kepler-9b	9 times larger	19
Kepler-11b	2 times larger	10
Kepler-18b	7 times larger	3.5
Kepler-22c	2 times larger	290
Kepler-30c	14 times larger	60
Kepler-34b	70 times larger	288



1. Which planets in the table are most similar in size to the gas giant Jupiter?
2. Planets with short orbits are closest to their stars. Planets with longer orbits are farther away. Which planet is closest to its star? Which is farthest away?

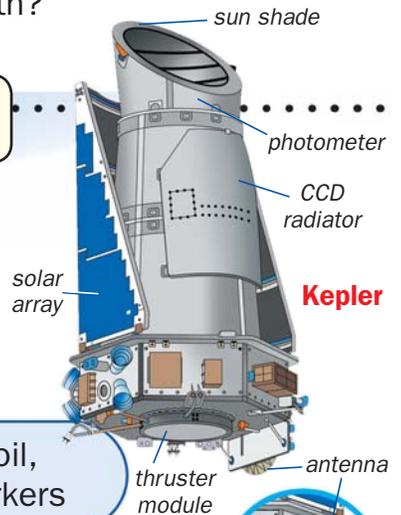
3. Kepler-11b is not much bigger than Earth. Do you think it is in the habitable zone?
4. Which planets have orbits similar to Earth's? Might they be in the habitable zone?
5. Which planet in the habitable zone is most similar to Earth? How does it differ?



Bringing It Home

Look at the labeled picture. Do some research to find out what the various parts of the Kepler telescope do. Use materials suggested here or others to make a model of the Kepler telescope. After you've finished your model, explain its parts and what they do, to a partner. How is your model different from your partner's model?

Adult Participation Recommended



You need: various materials such as paper tubes, cardboard, paper, foil, plastic jar lids, beads, paper clips, etc.; scissors; glue; markers

