



Model the Sun and Earth

How big is the Sun compared with Earth?

Description

Make scale models of the Sun and Earth out of paper mache.

Age Level: 10 and up



Materials

- one yellow balloon
- ruler
- thread of different colors (at least blue and green)
- newspaper
- two sheets of yellow construction paper
- two sheets of orange construction paper
- flour
- water

- pin or thumbtack
- liquid measuring cup
- dry measuring cup ($\frac{1}{2}$ cup)
- small pot
- spoon

Instead of colored thread and construction paper, you can use acrylic paint.



Time

Preparation: 45 minutes
Activity: 60 minutes + drying time
Cleanup: 15 minutes

Safety

Have an adult help you make the paper mache paste.
Be careful not to let the mixture boil over.

Step 1

Make the paper mache paste by combining $\frac{1}{2}$ cup flour and $2\frac{1}{2}$ cups water in a small pot. Bring the mixture to a boil for three minutes while stirring. Turn off the heat, stop stirring, and let the paste cool for about 30 minutes.



Step 2

Inflate a yellow balloon to an approximate diameter of 30 cm and knot it.



Step 3

Earth's diameter is 109 times smaller than the Sun's, so your model Earth should be $30 \text{ cm} / 109 = 0.3 \text{ cm}$ in diameter. Tear off a small strip of newspaper and crush it to the scaled size of Earth. Wrap the model tightly in blue and green thread.

Tip

If you don't have colored thread, you can paint the Earth instead.



Step 4

Tear newspaper into long strips 5 cm wide. Dip strips in the paper mache paste and cover the balloon completely with two layers of paper mache. Let the balloon dry completely, then cover in another two layers. Again let the balloon dry and cover it a third time, in another two layers. Let it dry overnight.



Step 5

Tear the construction paper into long strips 5 cm wide. Dip the strips in the paper mache paste and cover the balloon completely with one layer of paper mache. Let the balloon dry completely.

Tip

If you don't have colored construction paper, you can paint the Sun instead.



Step 6

Pop the balloon by inserting a pin or thumbtack through the paper mache.



Step 7

Place the Sun and Earth models next to each other. If the Sun and Earth were this size, can you estimate how far apart they would have to be to accurately model the real Sun and Earth?



Step 8

The answer is 33 meters apart! Go outside and separate the Sun and Earth models by 33 meters. Now you have an accurate scale model of the Sun and Earth in space!

Tip

Separate the Sun and Earth by 33 large paces, which is approximately 33 meters.



Step 9

If you want to make paper mache versions of the other planets in our solar system to scale, use this table.

Planet	Size (cm)	Color	Distance from Sun (m)
Mercury	0.1	Gray	13
Venus	0.3	Yellow	24
Earth	0.3	Blue, green	33
Mars	0.1	Red	50
Jupiter	3.0	Brown, yellow	170
Saturn	2.6	Yellow, orange	313
Uranus	1.1	Blue	629
Neptune	1.1	Blue	985

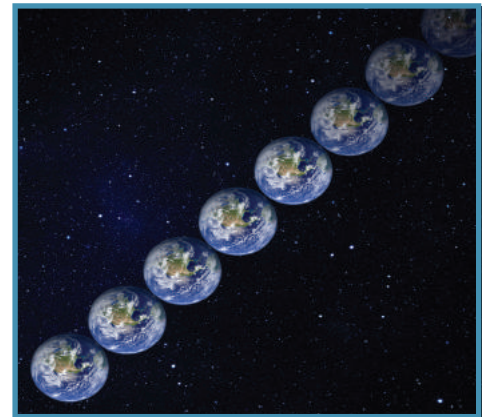
What's Going on?

The Sun is 1,391,900 km in diameter (you can measure it by doing the “Measure the Sun’s Size” activity found on the DIY Sun Science website). Earth is 12,742 km in diameter. The distance between them, on average, is 149,570,000 km. These large sizes and distances are sometimes difficult to imagine, so we can use accurate scale models to help us visualize them.



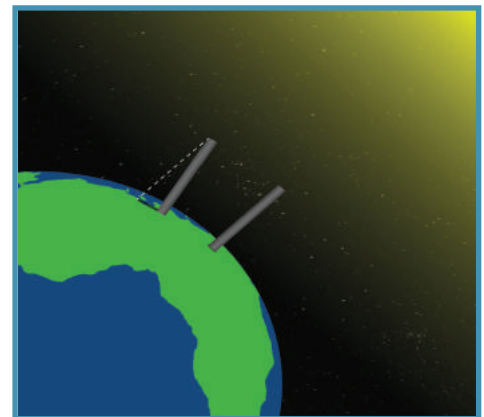
How far away is the Sun?

The distance from Earth to the Sun is so large that if we could make a row of Earths touching pole-to-pole, it would take over 11,000 Earths to reach from our planet’s surface to the Sun’s surface! Light travels at an extremely high speed of 299,792 kilometers per second, but the Sun is so far away, its light still takes over 8 minutes to reach Earth! If you could somehow fly a Boeing 747 jet through space, its speed is so much less than the speed of light, the jet would take about 17 years to reach the Sun! The distance from Earth to the Sun is so fundamental to astronomy, this distance is defined as one Astronomical Unit (AU).

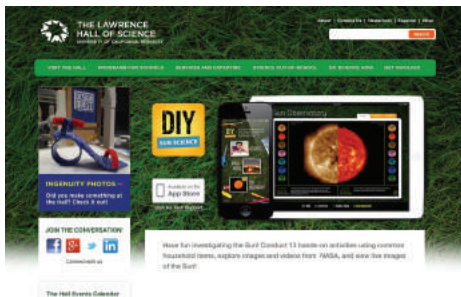


How big is Earth?

The distance from Earth to the Sun was first measured accurately in 1672 by Giovanni Domenico Cassini. The Greek astronomer Eratosthenes first measured Earth’s size accurately more than 2,000 years ago. He made this measurement by observing shadows at different points on Earth at the same time. This let him calculate how curved Earth is. He used the information to determine both Earth’s circumference and diameter.



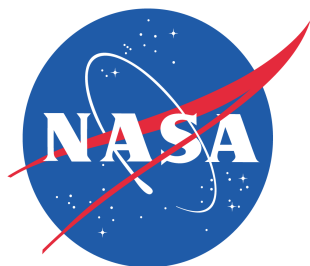
Learn More



For more info and other activities, visit:

LawrenceHallOfScience.org/do_science_now/diy_sun_science

Credits



This project was supported by NASA under award number NNX10AE05G. Any opinions, findings, conclusions or recommendations expressed in this program are those of the author and do not reflect the views of NASA.



THE LAWRENCE
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The DIY Sun Science app allows families and educators to investigate and learn about the Sun at home, at school, or anywhere you go! The app features thirteen hands-on investigations, as well as images and videos.

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Activity inspired by "Scale Model of Sun and Earth," NASA/Sun-Earth Day. Image 12, NASA. Image 13, NASA.