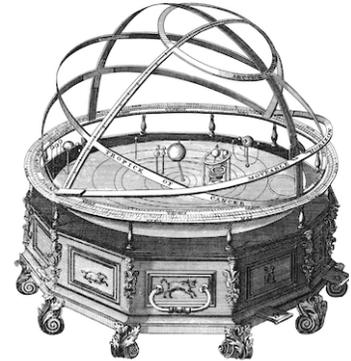


## It's Only a Paper Moon

An orrery is a mechanical device that models the motion of planets and moons in our solar system. The image shows an orrery created by John Rowley who was an English instrument maker in the 18<sup>th</sup> century. An orrery can help you understand the relative motion of planets around the Sun and moons around planets.



The orbit of the Earth around the Sun and the Moon around the Earth occur on a regular cycle and can be thought of as a giant clock. In fact, for thousands of years, people have used the movement of the Moon and Sun to keep track of time such as when to celebrate holidays and plant crops.

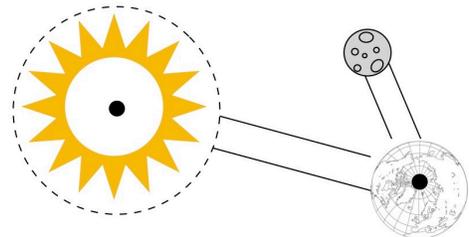
In this activity, you will make a simple orrery that illustrates the motion of the Earth around the Sun and the Moon around the Earth. This model of our solar system is known as *heliocentric*. *Helios* is the Greek word for the Sun and *heliocentric* means that the Sun is at the center of the solar system. As the planets orbit around the Sun, the Sun can be thought of as stationary and does not move relative to planets and moons.

### Materials

- Orrery template printed on card stock
- Crayons or colored pencils
- Scissors
- Single paper hole punch
- Brads

### Instructions

1. Carefully cut the shapes from the template. There should be 4 pieces.
2. Color the Sun, Earth, and Moon.
3. Use the hole punch to make holes in the pieces where they are marked by an X. There should be 5 holes.
4. Assemble the pieces using two brads (indicated in the figure with the black circles).



The orrery models two ways that objects move in the solar system. Revolution is the type of motion where one object moves in an orbit around another. Rotation is the motion where an object spins on an axis. The orrery models the revolutions of the Earth around the Sun and the rotation of the Earth on its axis.

1. The Earth rotates on its axis as it revolves around the Sun. Using the orrery, demonstrate the rotation and revolution of the Earth. How many times will the Earth rotate on its axis during one complete revolution around the Sun?
2. The Moon rotates on its axis as it revolves around the Earth. In the orrery, note that the same side of the Moon faces the Earth as it revolves around the Earth. How many times does the Moon rotate on its axis during one complete revolution around the Earth?
3. Place the Moon on the opposite side of the Earth from the Sun so that they form a line. If you viewed the Moon from the Earth, what phase of the Moon would you see? Explain your answer.
4. Place the Moon directly between the Earth and the Sun so that they form a line. If you viewed the Moon from the Earth, what phase of the Moon would you see? Explain your answer.