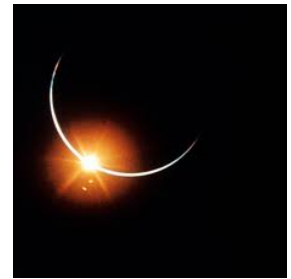Moon Phases
Investigating why eclipse don't always occur

**Directions**: *Write down the purpose and write done the answer to any of the questions in the procedures.*

**Purpose**: Why doesn't an eclipse happen every time there is a new moon or a full moon?

Hypothesis: A total solar eclipse doesn't occur every time there is a New Moon because….

Procedures:
1. Look to see that your desks have 5 total dots labeled Sun, A, B, C, and D. Each dot will represent a position of the Earth-Moon system as it orbits the Sun.

2. Get Student worksheet 3.2 from your teacher.

3. Position the SEM Board so that the rod of your globe is approximately over the dot labeled "A." Position the board so that rod #1 is closest to your "SUN" dot, as shown in the image to the right.

4. Hold the flashlight parallel to the table and over the "Sun" so that it shines on the small sphere. Move the small sphere (your Moon) from rod #1 around to rod #8. Shine the flashlight on the sphere each time. Which rod holds the new moon? Mark an "N" inside the *Moon* in Box A of Student worksheet 3.2 that shows a New moon.

5. Which rod holds the Full moon? Mark an "F" inside the Moon in Box A of Student worksheet 3.2 that shows a Full moon.

6. Put the sphere on the rod that holds the New moon. With the flashlight parallel to the tabletop and shining on the small sphere, examine Earth. Does the new moon cast a shadow on Earth? If an eclipse occurs at this position write on the student sheet the name of this type of eclipse, if no eclipse occurs write why one does not.

7. Put the sphere on the rod that holds the Full moon. With the flashlight parallel to the tabletop and shining on the small sphere, examine Earth. Does Earth cast a shadow on the Full moon? Does the new moon cast a shadow on Earth? If an eclipse occurs at this position write on the student sheet the name of this type of eclipse, if no eclipse occurs write why one does not.
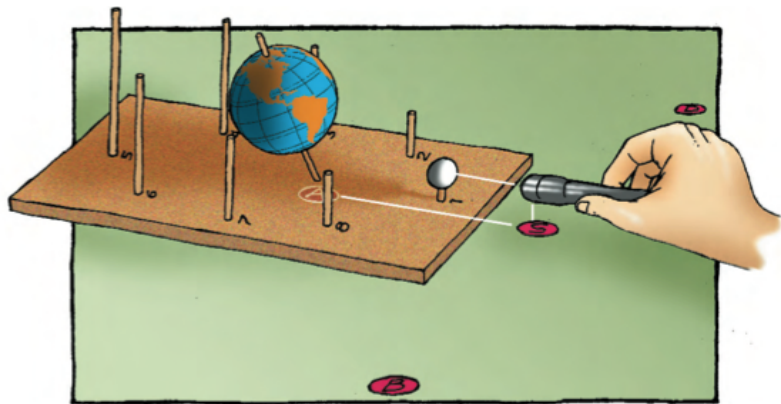
8. Now slide your SEM Board counterclockwise around your flashlight until the axis of your globe rests approximately over the dot labeled "B," as shown in image to the right. This models Earth's orbit around the Sun. How many months does Earth take to get from position "A" to "B" during Earths revolution around the Sun? (Hint: think about how long it takes to go from one season to the next). Record your answer on the Student worksheet 3.2.
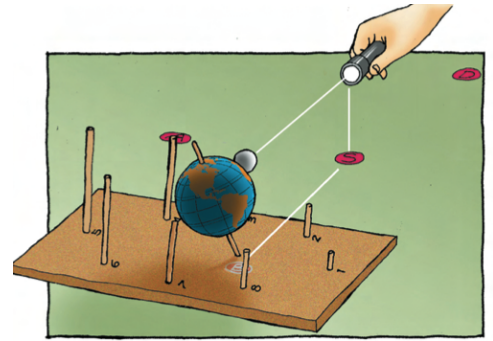
9. Put the small sphere on rod #3. Keep the flashlight over the dot labeled "Sun," but turn the light so that it shines on the sphere in its new position.

10. Move the small sphere (the Moon) from rod to rod. Shine the flashlight on the sphere each time. Which rod now holds the New moon? Mark an "N" inside the new moon in Box B on Student Sheet 3.2. Can you create a solar eclipse (cast a shadow on Earth) with your new moon? Write solar eclipse next to this New Moon.

11. Which rod now holds the full moon? Mark an "F" inside the full moon in Box B on Student worksheet 3.2. Can you create a lunar eclipse (cast a shadow on your full moon)? Discuss and record your observations. Write Lunar Eclipse next to this Full Moon.

12. Repeat these steps with the dots labeled "C" and "D." Keep the flashlight over the dot labeled "Sun" but face it toward the sphere each time. Discuss your observations each time. Record the "N" and "F" in Boxes C and D on Student worksheet 3.2 each time.

13. Look at the image to the right. How does the Umbra shadow compare to the Penumbra shadow? Compare both size and darkness of shadows. Write your answers down.
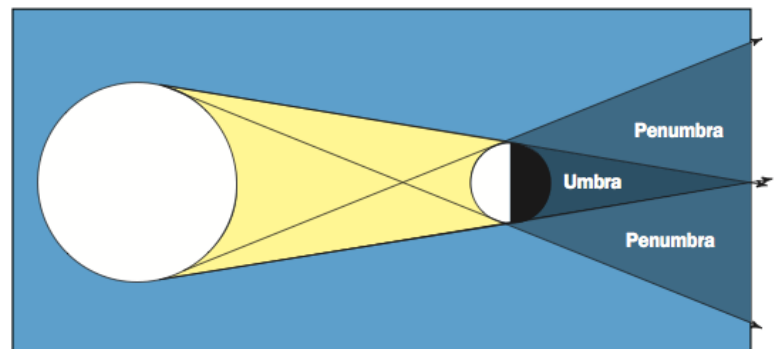
14. Keep your SEM Board over dot "D". Place the tip of the toothpick on your globe to show where your city or town is located. Shine the Mini Maglite on your globe. Move the small white sphere from rod to rod. Examine the umbra and penumbra of a shadow cone in picture above. Can you see the umbra and penumbra of the Moon's shadow on the globe? Is your city experiencing a total solar eclipse, partial solar eclipse, or no eclipse? What countries are experiencing a total solar eclipse? Rotate (spin) your globe to examine the "path of totality." (Which is the path of the eclipse). Is your city in this path? Discuss and record your findings with your group.

15. **Check your worksheet in with Ragaller**

Analyzing the Data: (use Student worksheet 3.2)

1) In which box or boxes would Earth cast a shadow on the Moon?
2) During a Lunar Eclipse what is the Moon phase?
3) In which box or boxes would the Moon cast a shadow on the Earth?
4) During a Solar Eclipse what is the moon phase?
5) Why wasn't there a Solar eclipse in box C position 5?
6) Why wasn't there a Lunar Eclipse in Box A position 1?
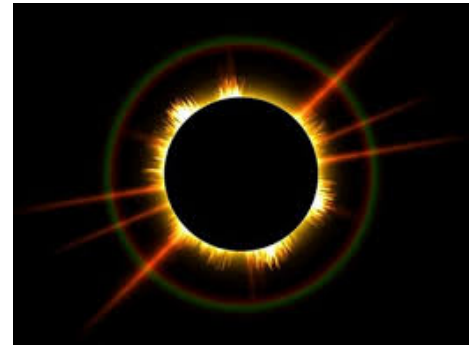
Use the data table 16.1 and 16.2 (Below) to answer the following questions:

7. What is a pattern you see in Table 16.2?

8. On Feb 7 what moon phase occurred?

9. On Feb 7 what tide occurred?

10. What moon phase or phases does a Spring tide occur during?

11. What type of tide occurs during Quarter moon phases?

12. Which type of tide occurs when the Sun, Earth and Moon are in a straight line?

13. Which type of tide occurs when the Sun, Earth and Moon aligned to make a right angle (quarter moon)?

Table 16.1			
Date	**Moon Phase**	**Date**	**Moon Phase**
Jan 10	New	April 5	New
Jan 17	1st Quarter	April 13	1st Quarter
Jan 24	Full	April 21	Full
Jan 31	3rd Quarter	April 29	3rd Quarter
Feb 7	New	May 6	New
Feb 14	1st Quarter	May 13	1st Quarter
Feb 21	Full	May 20	Full
Feb 28	3rd Quarter	May 28	3rd Quarter
March 6	New	June 4	New
March 13	1st Quarter	June 11	1st Quarter
March 20	Full	June 18	Full
March 29	1st Quarter	June 26	3rd Quarter

Table 16.2			
Date	**Tide**	**Date**	**Tide**
Jan 10	Spring	April 5	Spring
Jan 17	Neap	April 13	Neap
Jan 24	Spring	April 21	Spring
Jan 31	Neap	April 29	Neap
Feb 7	Spring	May 6	Spring
Feb 14	Neap	May 13	Neap
Feb 21	Spring	May 20	Spring
Feb 28	Neap	May 28	Neap
March 6	Spring	June 4	Spring
March 13	Neap	June 11	Neap
March 20	Spring	June 18	Spring
March 29	Neap	June 26	Neap