Learning Experience #1

I can explain how scientists gather data and evidence about our universe.

If you scored a 3.5 or lower on your formative assessment, write a 2-3 sentence reflection on what mistakes or misunderstandings caused you to not meet the goal. Once you've completed your reflection, complete the following activity in your spiral.

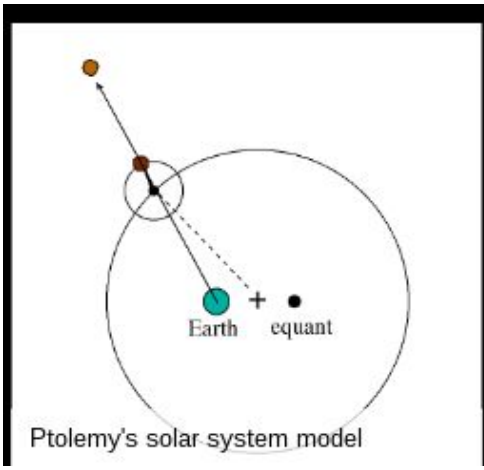
Our current understanding of the solar system has developed over centuries of studies by many scientists, and that through continued scientific investigations and advances in data collection, we will continue to refine our understanding of the solar system.

Sort the cards provided so that they are in chronological order. Copy and complete the following table in your spiral:

Time Period	Technology Used	Scientists and Discoveries
Before 1600		
1600 - 1699		
1700 - 1799		
1800 - 1899		
1900 - 1999		
2000 - present		

When you've completed the activity, you may retake the exit ticket.

Year: 140



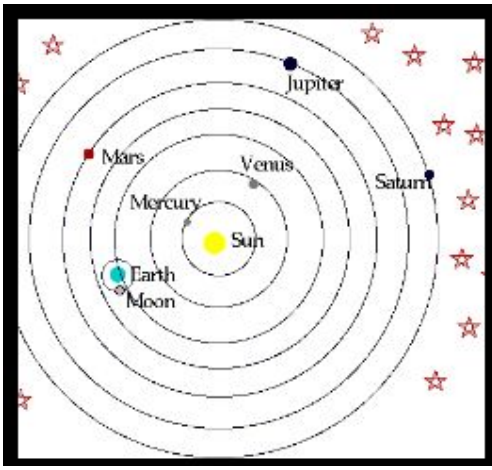
Ptolemy's solar system model

PTOLEMY

Ptolemy's Solar System Model: Ptolemy gave us one of the first glimpses of the movement of celestial planets and objects. His observations, based upon earlier Greek models, offered the first explanation of planetary movement.

In Ptolemy's model, the earth was the center of the universe (geocecentric universe). The sun and the other planets rotated around it. Each one of them had their own orbit (a curved path described by a planet, satellite, spaceship etc., around a celestial body--dictionary.references.com). The stars and other celestial bodies rotated around them as well.

Year: 1543



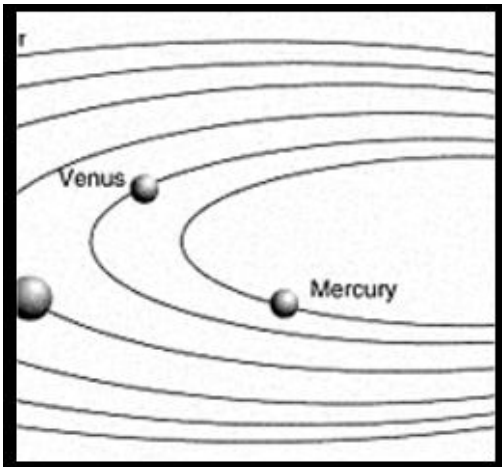
NICHOLAUS COPERNICUS

Copernicus's Solar System Model: Copernicus changed the idea of the solar system drastically. He was the first person to believe that the solar system was heliocentric. His views were denounced by the church and he was viewed as a heretic.

Copernican System:

The sun has now become the center of the universe. The earth and the other planets rotate around the sun. The orbit of the planets is still circular. Copernicus was the first person to create a complete and general solar system model.

Year: 1600



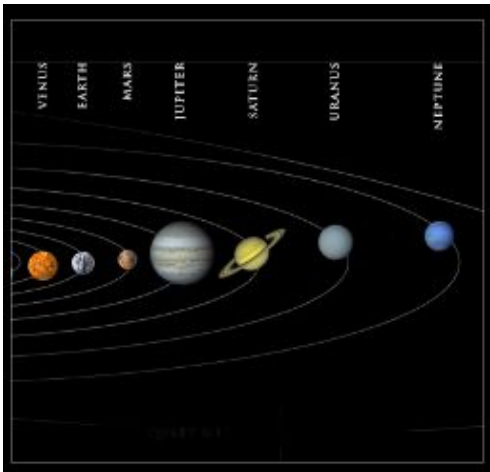
JOHANNES KEPLER

Kepler's Solar System Model: While studying the Copernican Solar System Model, Kepler noticed that Mars and Venus appeared differently at different times, proving that the orbits of these planets could not be circular.

Kepler Solar System Model:

The sun is still the center of the universe, and the planets still rotate around it. However, the planets now orbit in an elliptical (a plane curve such that the sums of the distances of each point in its periphery from two fixed points are equal--dictionary.reference.com) manner. Because of the elliptical pattern, the sun is offset inside these ellipses. A revolution (a procedure or course, if in a circuit, back to a starting point--dictionary.reference.com) is no longer stable--sometimes the planet moves faster or slower depending on how closer or far away it is from the sun.

Year: 1650



ISAAC NEWTON

Newton's Solar System Model: Newton's model looks the same as Keplers, however, he explained why the orbits of the planets are ellipses, and why the revolutions have changed.

inertia (the property of matter by which it retains its state of rest or velocity along a straight line as long as it is not acted upon by an external force--dictionary.reference.com) gives the planet the initial motion while gravity (force of attraction by which terrestrial bodies tend to fall toward the center of the earth--dictionary.reference.com) pulls the planet toward the sun. The result is a motion between the direction of the two forces that creates an elliptical orbit.

1608 -- Hans Lippershey, a German-Dutch lensmaker once said that he wanted to make an instrument "for seeing things far away as they were nearby." He was the first person to ever think of the telescope.

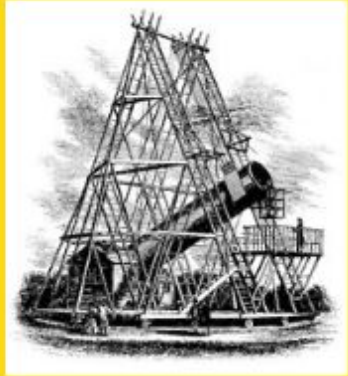
1609 -- On hearing about this new instrument, Italian physicist Galileo Galilei builds his own. He improved Lippershey's design and using his new telescope the following year, he discovers the four largest moons of Jupiter (Io, Ganymede, Callisto and Europa), sunspots on the surface of the Sun, the phases of Venus and physical features on the Moon - such as craters!

1630 -- German priest and astronomer Christoph Scheiner builds a telescope based on a design that astronomer Johannes Kepler made in 1611. Kepler's design improves on Galileo's by replacing the concave lens with a convex lens (a lens that bulges outwards). This helped to reduce spherical aberration. Astronomers find spherical aberration quite annoying as it means that they do not get perfect images when they look through their telescopes. Imagine having distorted vision!

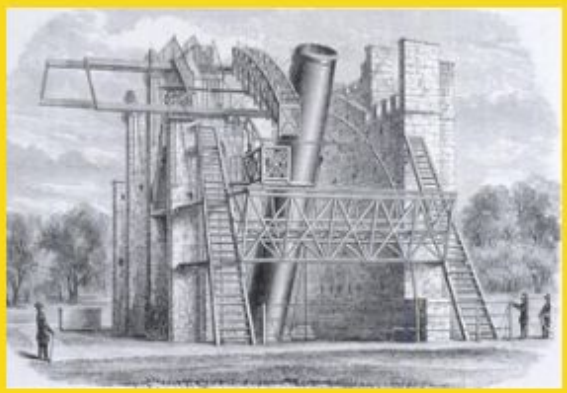
1655 -- Inspired by the observations of Jupiter made by Galileo, Dutch astronomer Christian Huygens builds the most powerful telescope ever and uses it to view the planets in our Solar System. He spotted a bright moon in orbit around Saturn and called it "Saturni Luna." All astronomers used this name until 1847 when John Herschel (famous astronomer William Herschel's son) decided that the moon should be called Titan. Huygens studied Saturn much more with his telescope and discovered the true shape of the planet's rings in 1659.

1666 -- After studying the reflection of light through prisms, Sir Isaac Newton decides that the problem of chromatic aberration cannot be solved. He makes an improved version of the reflecting telescope.

1789 -- Bath (UK) Orchestra Director and astronomer William Herschel builds a Newtonian based reflector telescope which is a gigantic 12-metres. It was the first of the giant reflector telescopes.



1845 -- "Leviathan of Parsonstown" at Birr Castle in Ireland was built in this year by the Third Earl of Rosse, William Parsons. It was the largest telescope ever built until the twentieth century. Parsons was the first person to see spiral arms on a galaxy!



1937 -- Inspired by sky survey work by Karl Jansky, American engineer Grote Reber takes the telescope into a whole new dimension: the radio telescope. Reber created an instrument that could basically see radio waves - waves that are invisible to our eyes.

1990 -- NASA and ESA's Hubble Space Telescope, the first telescope to be launched into space. Above the turbulence of the Earth's atmosphere, Hubble gives us a very clear view of the stars and planets right to this very day!

2009 -- The Herschel Space Observatory is launched. Bearing the name of astronomer, William Herschel, this space observatory is able to look into the really cold regions of space with its far infrared vision!

2010 -- The Gran Telescopio Canarias is built on the island La Palma in the Canary Islands of Spain on the top of a volcanic peak 7,438 feet above sea level. It is the largest telescope of our time.

Gran Telescopio Canarias

Learning Experience #3

I can research, critique, and communicate scientific theories about how the solar system was formed.

If you scored a 3.5 or lower on your formative assessment, write a 2-3 sentence reflection on what mistakes or misunderstandings caused you to not meet the goal. Once you've completed your reflection, complete the following activity in your spiral.

Scrutiny and criticism are very important parts of the scientific process. The publishing of significant findings by scientists is just one of many steps in the inquiry cycle. However, many people mistakenly believe that the publication of scientific ideas is the end of the cycle. How the scientific community responds to claims made by scientists is a key feature of the nature of science. The science community examines science articles carefully for errors in procedure and errors in logic before deciding that they are valid. Watch the two videos linked to the Astronomy Page of our website. Copy and complete the table below in your spiral:

Purpose: Does the author express a clear purpose for his/her scientific reasoning?	
Statement of Problem: State in your own words the question being pursued by the author?	
Procedure: Are there errors in the methods outlined by the author? What changes, if any, would you make to the experimental design?	
Data: To what degree is the data collected accurate, clear, and relevant to the question under study?	
Results: To what degree does the data generated support the claim(s) being made? What scientific theories and concepts support the reasoning?	
Conclusion: What are the implications and consequences of this research?	
Point of View: What is the author's point of view? How is the point of view expressed by the author scientific? From what other points of view could the investigation be done?	
Communicate your final thoughts - Is the nebular hypothesis credible? Should scientists continue research in this area? Justify your answer.	

When you've completed all practice exercises, you may retake the exit ticket.

If you have received 4's or higher on ALL common formative assessments (exit tickets)

Use Star Chart to fill out the following table:

Object	Classification	Distance from Earth	Diameter	Surface Gravity	Planetary Satellites
Sun					N/A
Mercury					
Venus					
Earth	Planet	N/A	12,742 km	1 g	1
Mars					
Jupiter					
Saturn					
Uranus					
Neptune					
Pluto					

Analyze your data in the chart, and make conjectures based off of the patterns you find.
Remember:

- Analyze means to:
  - ❑ Break into parts
  - ❑ Find patterns, connections, and relationships
- A Conjecture is when you:
  - ❑ Make predictions of what you think is true every time based on the patterns, connections, and relationships you found in your analysis