

# Changing Theories

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<b>Strand</b>	Earth Patterns, Cycles, and Change
<b>Topic</b>	Investigating the solar system
<b>Primary SOL</b>	4.8 The student will investigate and understand the relationships among Earth, moon, and the sun. Key concepts include e) historical contributions in understanding the Earth-moon-sun system.
<b>Related SOL</b>	4.8 The student will investigate and understand the relationships among Earth, moon, and the sun. Key concepts include a) the motions of Earth, the moon, and the sun.

## Background Information

Our understanding of the solar system has changed from an Earth-centered model of Aristotle and Ptolemy to the sun-centered model of Copernicus and Galileo. Students should understand that our knowledge, even today of our own solar system, is constantly changing and somewhat limited. Much of what we believe today about our solar system is based on theory and may very well change as new discoveries are made. (This is the nature of science.)

## Materials

- Costumes (optional)
- Signs to hang around students' necks with an astronomer's name on each sign
- Props for each Astronomer:
  - Galileo: small telescope
  - Copernicus: abacus or calculator
  - Aristotle
  - Ptolemy
- Copies of the Astronomers' Biographies sheet for each student
- Reference materials, such as encyclopedias, trade books, or Internet sources

## Vocabulary

*Aristotle, Galileo, Ptolemy, Copernicus, Sun-centered model, Earth-centered model*

## Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

### Introduction

1. Have four student volunteers step outside the door to dress up in costume as each historical figure and place a sign with the astronomer's name around their necks. Each astronomer will hold their props.
2. Introduce your "Guests from History" one at a time having them walk in while you describe how they developed their theory and a bit about their theory from the Astronomers' Biographies sheet attached.
3. Tell the students they will be researching to find out more about each historical figure.

### *Procedure*

1. Pass out a copy of the Astronomers' Biographies sheet to each student.
2. Split the class into four groups and distribute research materials to each group, assigning each group a different astronomer.
3. Have the students use their research to assist with writing a speech pretending that they are the astronomer who is trying to convince the rest of the class that their model is correct.
4. Each student will need to write their own speech, but they can work together.
5. Tell students that they will be debating the other astronomers about the models, so they will want to research the other astronomers so that they can ask good questions to try to stump them.

### *Conclusion*

1. Group students together with one student who represents each astronomer. Have students share their prepared speeches and debate in small groups about the different models.

### **Assessment**

- **Questions**
  - What helped Galileo in his discovery?
  - What method did Copernicus use in making his discovery?
  - What is the difference between a sun-centered and an Earth-centered model?
- **Journal/writing prompts**
  - Explain a theory you have had that others did not believe. Make sure to describe how you tried to prove your theory and connect it to how Copernicus and Galileo must have felt when others refused to believe their theories.
- **Other**
  - Have students make a chart to compare each of the scientists' views.
  - Have students construct a timeline of historical contributions in astronomy from these four astronomers.

### **Extensions and Connections (for all students)**

- Have students use the Astronomers' Biographies sheet to cut apart and sort ideas under the correct astronomer.
- Visit a planetarium.

### **Strategies for Differentiation**

- Provide leveled research materials.
- Provide guided questions for research activity.
- Show a model to students demonstrating the different models.
- During group activities, assign roles for each student so that everyone is involved. You may need to assign specific roles to students to accommodate their individual academic needs.

# Astronomers' Biographies

Name: \_\_\_\_\_ Date: \_\_\_\_\_

<b>Aristotle</b>	<b>Ptolemy</b>	<b>Copernicus</b>	<b>Galileo</b>
Believed Earth was unmoving and the planets and sun revolved around it.	Believed Earth was unmoving and the planets and sun revolved around Earth in an orbit within other orbits	Believed Earth and all other planets revolved around the sun	Believed Earth and all other planets revolved around the sun
Earth-centered model	Earth-centered model	Sun-centered model	Sun-centered model
Used observation to develop theory	Used observation to develop theory	Used mathematics to develop theory	Used scientific observation to develop theory
Greek	Greek	Polish	Italian
			