Welcome to Class 2: Science History, Pseudoscience and Theory

Remember: sit only in the first 10 rows of the room

Did people in Columbus's time think the Earth was flat?

What is pseudoscience and how do you identify it?

Remember: sit in the first 10 rows of the room only

I registered my PRS transmitter on blackboard, brought it to class today, turned it on, and set it to channel 80 (Go, 80, Go)

1. Yes, I'm certain
2. Not sure
3. What's a PRS?

Remember: sit only in the first 10 rows of the room

Let’s get to work..

Everyone join a group with from 3 to 5 people.

Discuss then answer the following question as a group on paper:

Why would people of early cultures watch and record the motion of `the heavens’?

Importance of astronomy to early cultures

1. Why would seasons be important?
2. Why would tides be important?
3. How might time be kept through astronomy?
4. Why might astronomy be important for religion?
5. Did early people devise models for the universe?
6. Were early people helped by aliens?

List methods used by the ancient Greeks which paved the way for modern science

- Individually, in your notes for two minutes, write a list of their methods and philosophies.
- In your group take a few minutes to compare and discuss what you each wrote.

Which method of the early Greeks is not accepted by modern scientists?

1. Mathematics
2. Challenge ideas
3. Pure thought
4. Debating
5. Observing facts

Why did the Greeks accept a (wrong) geocentric model for the universe?

Their observations lead them to think….

Parallax, clouds/birds, etc. : The earth wasn't moving.

The heavens should be harmonious, perfect, simple….

A priori expectations: the `heavens' must move in perfect circles. Isn't this `Occam's Razor'?

Did the Greeks know the Earth was a sphere (not flat)?

Yes. They even knew the diameter to a few percent. (They were the experts that invented geometry)

What was so great about Ptolemy's model?

1. Retrograde motion
2. Sun centered
3. Predicted eclipses
4. Elliptical orbits
5. Correct distances

What drove Copernicus to develop his new model?

1. New observations
2. Inaccuracies of the Ptolemaic model
3. It made better predictions
4. Mathematical simplicity

In your group, answer these:

- What was the name of Copernicus's book?
  - *De revolitionibus orbium coelestium* (On the Revolution of the Heavenly Spheres)
- When was it published?
  - 1543, Just days before Copernicus's death
- Why did he wait so long to publish it?
  - He feared it would appear absurd
- Why wasn't the model immediately accepted?
  - It held onto old beliefs (orbits with circles) and thus was not very accurate.
- Why is Revolution now synonymous with change?

In your group: Write down TWO distinct definitions for: REVOLUTION

rev·o·lu·tion [rev-uh-loo-shuhn] **Origin:** 1350–1400; Middle English from late Latin *revolutio(n-)*

1. an overthrow and replacement of an established government or political system by the people governed.
2. *Sociology*. a radical and pervasive change in society and the social structure, esp. one made suddenly and often accompanied by violence.
3. a sudden, complete or marked change in something: the present revolution in church architecture.

But also: an instance of revolving:
Motion in orbit or a circular course of around an axis or center
The single completion of an orbit or rotation.

Answer as a group (PRS): Which definition for Revolution came first?

1. Radical Change
2. Motion or orbit

(lets go back and define) Astrobiology

Astrobiology is a newly recognized science which merges other traditional fields of astronomy, chemistry and biology.

Its efforts concentrate on:

1. Studying the conditions supporting the origin and existence of life.
2. Searching for these conditions beyond Earth.
3. Searching for evidence of life elsewhere

The Search for ExtraTerrestial Intelligence (SETI)

SETI is a collective name for activities to identify signals from intelligent life. This requires ET to create detectable, *artificial* signals.

Its efforts concentrate on:

1. Selecting frequency and direction of electro-magnetic radiation to do a search.
2. Building telescopes and powerful algorithms to sort out an ETI signal from cosmic noise.

Who pays for this research?

- The NASA and the National Science Foundation (Federal Government) funds research in astrobiology.

- The SETI Institute, which is privately funded, supports and funds equipment and searches for ET intelligence.

  (NASA did support ETI searches until 1994)

You wish to build a new spectrometer to study light from nearby stars and determine if it has planets orbiting it. Where would you ask for money?

1. NSF (Federal Gov't)
2. SETI (private)

You wish to build a radio telescope to point at nearby stars, to search for unnatural radio pulses

1. NSF (Federal Gov't)
2. SETI (private)

In your groups, fill in the blank boxes:

Science	Pseudo Science
	Uses unnatural, spiritual or mystical events to explain observed phenomenon.
Creates and tests models of nature to explain observations as simply as possible	
	Theories do not develop or change, models can not make predictions or are able to be tested.

Some characteristics of Pseudoscience

- Claims which can not be tested or verified
- Reliance on confirmation rather than refutation
- Lack of openness of testing by others
- A lack of progress in `theory' development

Science or Pseudoscience?

Plate tectonics
Alchemy
Osteopathic Medicine
Phrenology
Astrology
Big Bang Cosmology
Cold Fusion
Consider various sightings:
    Big Foot, Mermaids, Giant Squid, UFOs

What is NOT true about a scientific theory?

1. Can be proved wrong
2. Can be proved right
3. Makes predictions
4. It is a model to explain phenomenon

Spread out in the room.

Put all your materials on the floor and place your PRS clicker on the table in front of you.

Take care that others can not view your selection

1. Prehistoric, ancient people were good astronomers but did not _____

1. Observe and predict eclipses
2. Predict seasons
3. Model the universe
4. Observe and predict tides
5. Use sun dials.

2. Which method of the early Greeks is not accepted by modern scientists?

1. Mathematics
2. Challenge ideas
3. Pure thought
4. Debating
5. Observing facts

3. Copernicus's model was not widely accepted at first because _____

1. It didn't work well
2. It was against the Church teachings
3. Few could read Latin
4. Few could read Polish

4. Which method below is a hallmark of pseudoscience?

1. Models can predict
2. Rigid, Unchanging theories
3. Strives for simplicity
4. Models open for outside testing
5. Explains without unnatural events.

5. Which of these newer sciences is now considered pseudoscience?

1. Big Bang cosmology
2. Chemistry
3. Plate Tectonics
4. Osteopathy
5. Phrenology

To do list for next class

- Refer to the class syllabus
- Read assigned pages in textbook and review study questions on objectives list
- Register and bring PRS transmitter to class
- Bring textbook to class (not mandatory)