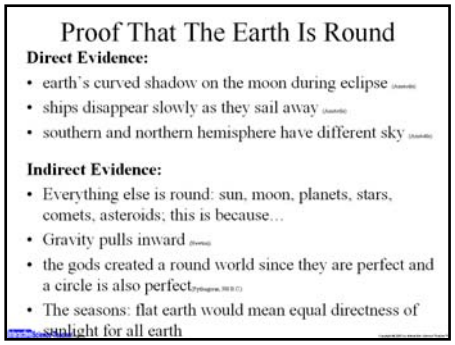
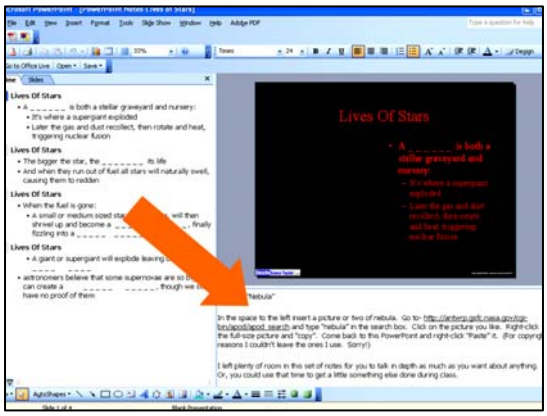
Notes-History Of Orbiting Theories

A fascinating look back and how some of the greatest minds wrestled with the concept of the earth's place in the universe.



Follow the directions in the notes area of the PowerPoint (see last page) to insert images.



Video Summary:

1. To get students in the right frame of mind, start with a tease by having them prove to you the world is round. Oh, and they can't claim any satellite photos.

Have them copy the points shown. Feel free to change and add to the list (listen to students- they might come up with a new one).

This is available as a Student Handout (see last page).

Direct Evidence:

- earth's curved shadow on the moon during eclipse (Aristotle)
- ships disappear slowly as they sail away (Aristotle)
- southern and northern hemisphere have different night sky (Aristotle)

Indirect Evidence:

- Everything else is round: sun, moon, planets, stars, comets, asteroids; this is because…
- Gravity pulls inward (Newton)
- the gods created a round world since they are perfect and a circle is also

perfect(Pythagoras, 500 B.C.)

- The seasons: flat earth would mean equal directness of sunlight for all earth

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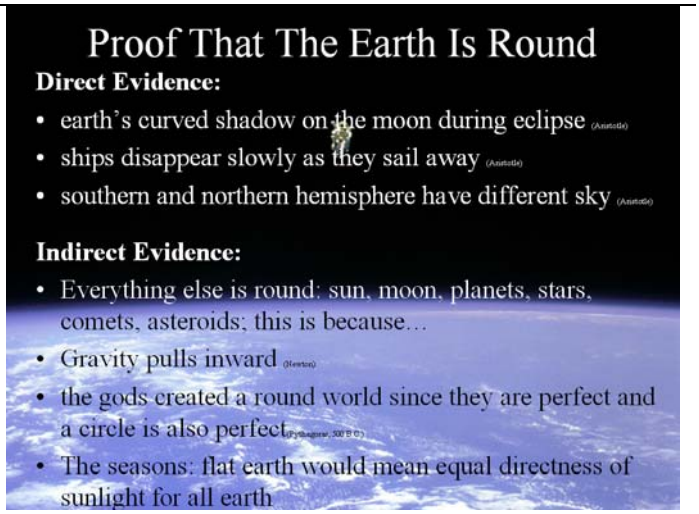
2. You can also get this as a PowerPoint (see last page).



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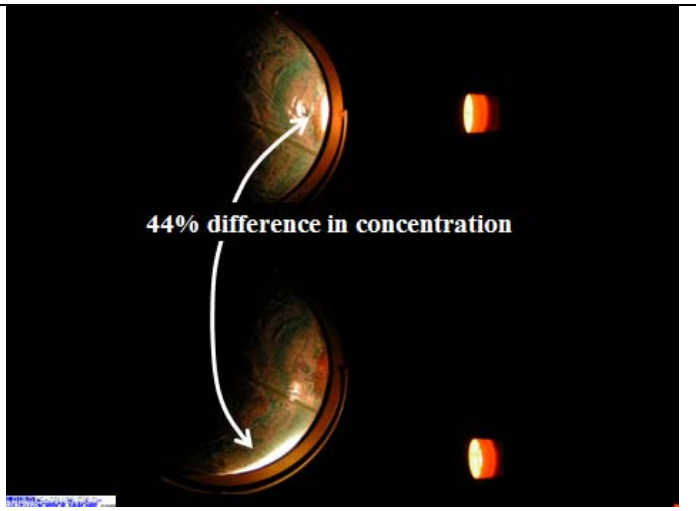
3. Since you're already discussing the world being round, you might throw in a quick reminder about what causes the seasons. This slide is from the lesson *Seasons- Two Reasons for the Four Seasons*.



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4. It's also important as a foundation for students to understand the importance ancient civilizations placed on star positions.

What's The Big Deal?

- nearly everything is cyclic, repeating day after day, year after year
- which served as a way of timekeeping
- past cultures could then predict when to plant, harvest, sail, prepare for floods, and have festivals

- The appearance of the “dog star”, Sirius, meant there were 2 weeks until the floods
- Today we have calendars & watches so we don’t need the stars to tell us the season or anything else

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5. From stars we move onto constellations.

The Constellations

- humans must have order
- Stars with unusual patterns were thought to resemble animals
- These constellations helped civilizations recognize seasons easier (the appearance of Pisces and Aquarius, 2 water constellations, foretold stormy weather too hard for sailing)

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6. This is a screenshot from my PowerPoint showing a typical night sky (shown with the Stellarium program, which is a free download by the way).

When talking about constellations, I like to put up a shot of the night sky and then ask students to simply look at it and notice that their minds are noticing the unusual ones and looking for patterns, without being told to do any of this.

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7. Now we’ll start talking about people and events that would lead directly to what Copernicus would say in 1543.

Major Events

- <u>Aristotle (350 BC)-</u> argued that the Earth was round
- And that we had a GEO-CENTRIC solar system, which translates “earth-centered”
  - Why can’t you blame them for thinking that everything revolves

around earth?

- Fatal flaw (thank goodness!)- Venus and Mercury did not appear to revolve around earth (*retrograde motion*)

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8. More names and contributions.

More Contributions

- Eratosthenes (200 BC) used the sun's shadow to calculate earth's circumference (and was only 400 meters off)
- Hipparchus (150 BC)- successfully used a technique called "triangulation" to accurately measure the distance between the earth and the moon
- The Arabs- gave us star names like Betelgeuse and Aldebaran
- The Chinese- kept incredibly detailed records
  - thanks to them we know when the Crab Nebula first novaed (1054)

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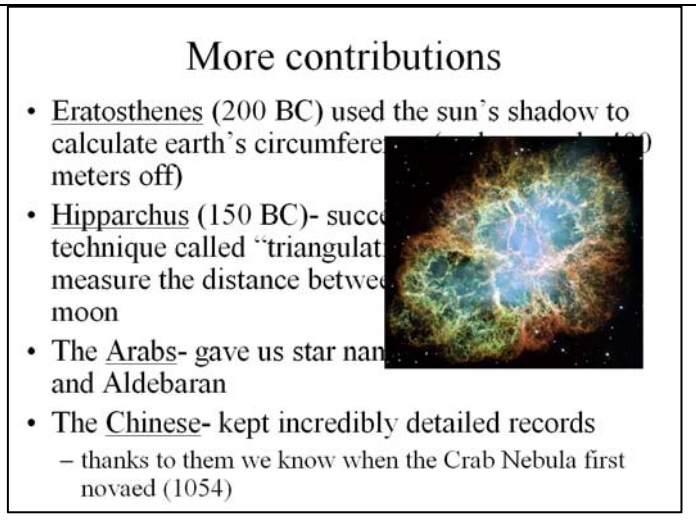
9. What the PowerPoint looks like with a picture of the Crab Nebula inserted.



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10. ..and finally the major breakthrough in 1543.

GEO-Centric Model In Trouble

- 1543 Copernicus proposed the first HELIO-

These notes remind us of the importance of working with a correct model. As long as you're using a wrong model, there will always be something wrong. Little things that nag will linger and not go away (like the orbits or Mercury and Venus). When you finally accept the true model, it's like you've taken a breath of fresh air, and now things just simply click. And now look what that lead to- Kepler and Brahe's advance, now that the issue is no longer what orbits around what.

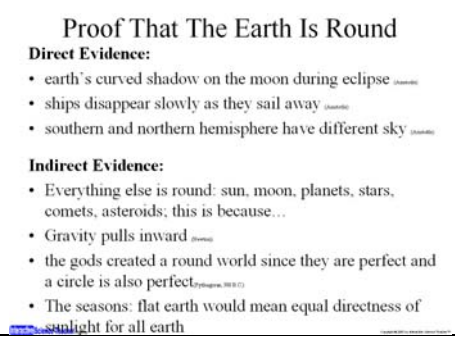
CENTRIC model of our solar system

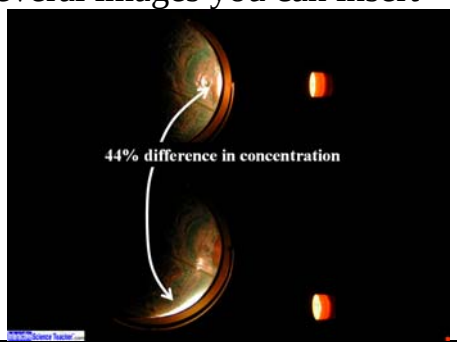
-translates "sun-centered"

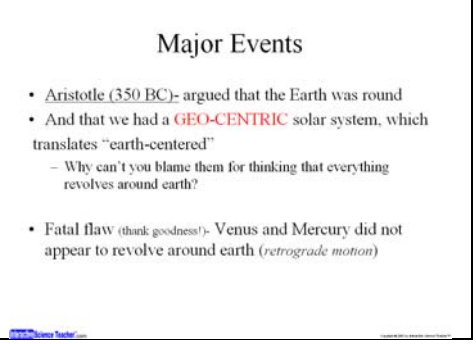
- Galileo (1600)- observed the phases of Venus
- Kepler uses Brahe's (1600) data to figure that the planets orbit the sun not in perfect circles but in ELLIPSES

Come back and visit InteractiveScienceTeacher.com to upgrade this lesson with:

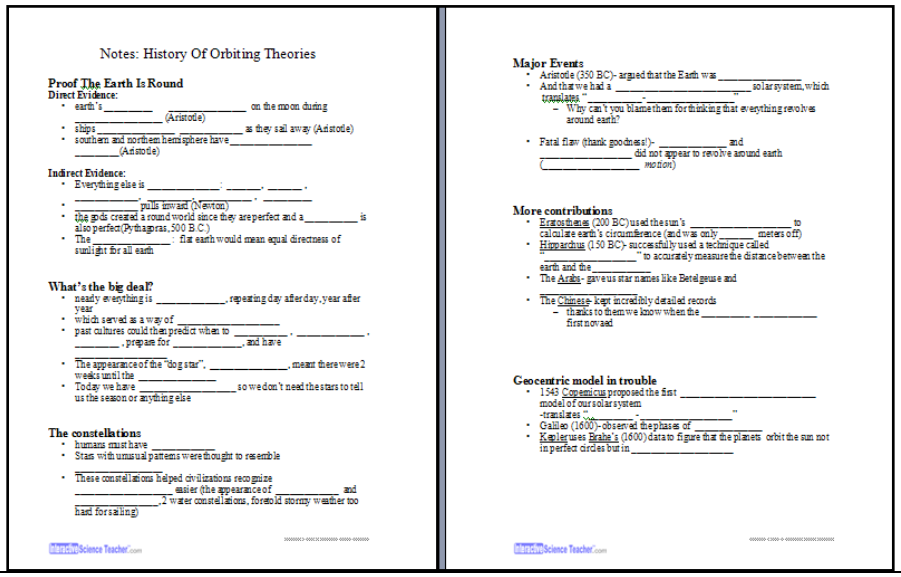
PowerPoint- lead your students through the lesson click-by-click
-includes links to several images you can insert







Student Handout



Notes: History Of Orbiting Theories

Proof The Earth Is Round
Direct Evidence:
- earth's _____ _____ on the moon during _____ (Aristotle)
- ships _____ _____ as they sail away (Aristotle)
- southern and northern hemisphere have _____ _____(Aristotle)

Indirect Evidence:
- Everything else is _____: _____, _____, _____, _____, _____ pulls inward (Newton)
- the gods created a round world since they are perfect and a _____ is also perfect(Pythagoras, 500 B.C.)
- The _____: flat earth would mean equal directness of sunlight for all earth

What's the big deal?
- nearly everything is _____, repeating day after day, year after year
- which served as a way of _____
- past cultures could then predict when to _____, _____, _____, prepare for _____, and have _____
- The appearance of the "dog star", _____, meant there were 2 weeks until the _____
- Today we have _____ so we don't need the stars to tell us the season or anything else

The constellations
- humans must have _____
- Stars with unusual patterns were thought to resemble _____
- These constellations helped civilizations recognize _____ easier (the appearance of _____ and _____, 2 water constellations, foretold stormy weather too hard for sailing)

Major Events
- Aristotle (350 BC)- argued that the Earth was _____
- And that we had a _____ solar system, which translates "_____ _____"
  - Why can't you blame them for thinking that everything revolves around earth?
- Fatal flaw (thank goodness!)- _____ and _____ did not appear to revolve around earth (_____ motion)

More contributions
- Eratosthenes (200 BC) used the sun's _____ to calculate earth's circumference (and was only _____ meters off)
- Hipparchus (150 BC)- successfully used a technique called "_____" to accurately measure the distance between the earth and the _____
- The Arabs- gave us star names like Betelgeuse and _____
- The Chinese- kept incredibly detailed records
  - thanks to them we know when the _____ _____ first noved

Geocentric model in trouble
- 1543 Copernicus proposed the first _____ model of our solar system -translates "_____ - _____"
- Galileo (1600)- observed the phases of _____
- Kepler uses Brahe's (1600) data to figure that the planets orbit the sun not in perfect circles but in _____