The Spherical Earth

During the 15th century, some wealthy European countries began sending out ships to explore the world. The sailors, scientists, and mapmakers who went on these expeditions were thought to be very brave. This was because most Europeans assumed the Earth was flat, and that if ships sailed too far the crew would fall off the edge.

If that sounds silly to you, think about what the Earth and sky look like in your daily experiences. From the highest building or hilltop, as far as your eyes can see, the land stretches into the distance. If you live on the prairie, the line where the land meets the sky may look straight. If you live in hill country, the line may look jagged. But it doesn’t look curved. So it isn’t surprising that many people supposed the Earth must be flat.
The idea of a flat Earth seems to make sense, but the European explorers...

Fifteenth-century Europeans weren't the first Europeans to explore the world. For example, four thousand years earlier, the Egyptians were known to have sailed in search of a fabled land called Punt. To this day, nobody is sure where Punt was, but historians believe it may have been located on the east coast of Africa.

The answer began more than two thousand years earlier with ideas that went beyond the technological capabilities of the time.

The philosophers of ancient Greece didn't have advanced technology for making observations and measurements, but they did have well-developed thinking skills. These philosophers wondered how 15th-century explorers inferred that the Earth was spherical.

The answer began in the 5th century B.C., with the development of the spherical Earth concept by the philosopher Anaxagoras. He argued that the Earth was a sphere because it cast a circular shadow on the moon during a lunar eclipse.

The idea of a flat Earth appears to make sense, but the European explorers...

Flat Earth or Spherical Earth?
Inferring a Spherical Earth

Activity

Focussing

These three philosophers from ancient Greek history will be your hosts for this Activity. After you meet them, read what they have to say in the What You Will Do section. Then answer the questions that follow.

Pythagoras, here. That's "Pith-agor-as," if you need some help pronouncing it. I was teaching in southern Italy at the time when I suggested the idea of a spherical Earth, about 530 B.C. I'm remembered for my studies of mathematics, too. You'll probably hear my name in math class in a year or two.

I'm Anaxagoras—pronounced "A-nax-a-gore-as." I lived in Athens, Greece around 450 B.C. In addition to my ideas about the Earth being spherical, I also believed that the moon shines because light from the sun reflects from its surface. Later scientists have proved me correct.

Greetings. My name is Eratosthenes, pronounced "Era-toss-then-ez." I lived from 276 B.C. to 196 B.C. And I was the librarian of a magnificent library in Alexandria, Egypt. A book in this library helped me conduct an experiment to determine whether the Earth is flat or spherical.
Curved, I inferred that the Earth must be spherical. Since the dark area is really the Earth's shadow, I realized that the Earth is curved. I was the first known person to realize that curvature of the Earth.

Do you see in the photo that the dark area on the Moon should disappear if the Earth is flat, while the whole ship should disappear if the Earth is flat, like the Moon?

When this happens, part of all of the Sun's light is blocked by the Earth. The Moon's shadow is cast on the Moon.

Disappearance of part of the Moon is an eclipse. When the Earth blocks out the Moon, the whole Moon is seen in its true shape. When sunlight is blocked by the Earth, the whole Moon is seen in its true shape.

I decided that the Earth must be spherical like them, too. Since the Sun and the Moon are curved and spherical, I inferred that the Earth is curved.

I said to myself, "If the Earth is flat, the whole ship should disappear from view at different times, with the tiniest part of it disappearing."

I came up with my idea about the Earth being spherical by watching ships.

What you will do
In one of the books in my library, I had read of an interesting event that occurs in southern Egypt. At noon on the longest day of the year, when the Sun is at its highest point in the sky, a vertical stick casts no shadow.

I wondered whether the same would be true in northern Egypt, where I worked. So, on the longest day of the year, I placed a stick vertically in the ground and waited. But when noon hour came, I observed that my stick cast a noticeable shadow.

So, I said to myself, "If the Earth is flat, a stick in northern Egypt should do the same thing as a stick in southern Egypt." In other words, neither stick should cast a shadow. But since my stick in northern Egypt did cast a noticeable shadow, I inferred that the Earth is curved. Since spheres are also curved, I decided that the Earth must be spherical.
1. What did Pythagoras observe that convinced him that the Earth was spherical?

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(use a diagram in your answer)

2. What did Eratosthenes observe that convinced him that the Earth was spherical?

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3. What did Anaxagoras observe that convinced him that the Earth was spherical?

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Inferring a Spherical Earth