

IN SEARCH OF THE EDGE
An Inquiry into the Shape of the Earth
and the Disappearance of Andrea Barns

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and the Disappearance of Andrea Barns

STUDY GUIDE

a companion to the film

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FILM CREDITS

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With

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George Vanderkuur

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Titles

Metamedia

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INTRODUCTION:

IN SEARCH OF THE EDGE is a comprehensive documentary film, 26 minutes in length, proving fairly conclusively that the global earth doctrine is little more than an elaborate hoax. At once both absurdist and matter of fact, it presents a carefully constructed argument from a well researched point of view.... **the earth is flat.**



The film is designed as an educational tool to help kids learn to think for themselves. As our senses are dulled by a daily barrage of media information, the tendency is to accept everything at face value. Since the news tells us something is so, it must be so, even though we all know, intellectually, that the news - and that extends to documentary programming - is someone's interpretation of the facts. But nevertheless, there it is on television, so we believe it, regardless of how the facts have been interpreted. By presenting a vigorous case to the viewer, supporting a theory that every school child knows to be false, in a 'scientific' and entertaining way, IN SEARCH OF THE EDGE challenges the viewer to stand up and say "Wait a minute. That's baloney".

THE STORY BEHIND THE FILM:

The intention from the beginning was to make a film that attempted to prove in convincing fashion, something that everyone knew was false. Proving that the earth was flat seemed to be a challenging subject.

The first step was to research flat earth societies and the development of various theories regarding the shape of the earth. Once the research was complete, the interview subjects were chosen, a crew was booked and filming began. The men answered the questions in their own words using their own ideas and if the film is a success it's largely due to the charm and inventiveness of these three men; George Tinkess, a retired teacher, Dr. Leo Ferrari, a university professor and one-time head of the Canadian Flat Earth Society, and George Vanderkuur, a scientist and currently headmaster of a private secondary school. They are all, by the way, globularists in real life.

To tie the interviews together a story was written about a fictional woman who devoted her life to convincing the world that the earth was indeed flat - Andrea Barns was born. Stock footage and still photographs that supported her story were found and animation was drawn to illustrate some of the arguments. To make the film as convincing as possible an on-camera host was used rather than just a voice-over narrator. But, just so it wouldn't be too convincing, there were clues dropped in throughout the film. Some examples of these clues are; the cows in the middle of the blizzard in Andrea's second Antarctica trip and the story of Andrea's brother going into the transportation business.

The host's on-camera segments, including reaction shots to be cut into the original interviews, were filmed at a totally different time and place after the rest of the film had been edited together. Much of the music is a little on the pretentious side to underscore the serious nature of the film and the sound effects are a combination of real sounds for credibility and cartoon-type effects to give the viewer a few more clues. And that's it. Hopefully the film accomplishes what it set out to do.



ANDREA BARNES:

KEY DATES IN HER LIFE:

1898



Andrea is born into an Ontario farming family. She's a bright child and spends most of her time growing up, learning about the world around her.

1914



On her sixteenth birthday Andrea makes her first attempt to get to the edge, setting off alone by skis across Antarctica. The extreme conditions force her to turn back.

1929



Andrea goes aloft in a dirigible to prove that the earth doesn't spin. She claims that she's successful, but the stock market crash steals the headlines.

1937



Andrea makes her second attempt, this time with a plane and a full expedition. Again, extreme weather conditions force her to turn back.

1961



On December 3rd, 1961 Andrea sets off single-handedly by snowmobile across the barren ice of Antarctica. On December 18th, the weather turns against her. A week later, on Christmas Day, radio contact is lost. Andrea is never seen again.

1990



A researcher stationed in Antarctica to study weather patterns finds the snowmobile, camera and most importantly the note, signed by Andrea, that claims that she had been to the edge.

VIEWING ACTIVITIES:

ACTIVITY NOTES:

Our feeling is that the film should be screened for the students **with as little introduction as possible**. Seeing it cold and then being encouraged to react to what they've seen can produce lively and spontaneous discussions.

To help develop listening skills and focus the students on the content of the film we've included three sets of viewing activities. The first one is comprised of one or two word answer questions and is most suited for intermediate level students. The second activity also requires one or two word answers but is somewhat more challenging and is recommended for senior students. The final activity is comprised of short answer questions which require a little more thought. It is recommended that this activity be completed on a second viewing of the film.

Accompanying the activities are teachers' answer sheets for those not familiar with the material. It should be noted that the answers are always given '**according to the film**' and some information within the film has been intentionally distorted. Where necessary and appropriate, additional clarification has been provided.

IN SEARCH OF THE EDGE: Viewing Activities

Activity #2

1. On what day was Andrea Barns last heard from?

2. What was she trying to prove?

3. From what three things did we hope to learn more about the earth?

4. What two cities in Egypt were involved in Eratosthenes' experiments?

5. According to Ptolemy the earth is.....

6. What causes light rays to bend so we can't see the hulls of ships at sea?

7. Two explorers who pushed out the boundaries of the known world are.....

8. Who first claimed to have circumnavigated the globe in 1522?

9. What was Andrea opposed to ?

10. What was required to bring attention to Andrea's argument?

11. 'Zetetic Astronomy' became the standard authority for what group?

12. If the earth were round, according to the film, how far below the horizon should the boat be at a distance of six miles?

13. What film technique was used to increase the speed of the clouds?

14. What speed is the earth spinning around the sun?

15. How long does it take to travel through non-space?

16. What event destroyed Andrea's chances of achieving her goal?

IN SEARCH OF THE EDGE: Viewing Activities

Activity #3

1. What did Andrea Barns set out to do? _____
2. Given that the earth is flat, why must it also have depth? _____
3. Describe the shape of the earth as outlined by the film's host. _____
4. What is the major flaw in Eratosthenes' experiment? _____
5. What was Copernicus' bizarre theory? _____
6. How does gravity prevent us from seeing the bottom of ships at sea? _____
7. Why was it hard to persuade sailors to join the expeditions of the original explorers? _____
8. What was the goal of the experiments Parallax did at the canal? _____
9. What makes the earth look curved from space? _____
10. What was Andrea trying to prove with the dirigible? _____
11. Why did Andrea never achieve her lifelong goal? _____
12. Contrary to what the film says, how many things can you think of that would prove the earth is round and not flat? (Write on the back if you need more room.) _____

Teachers' Answers

Activity #1

1. Where did Andrea's 1961 trip occur?

Antarctica.

2. What is the earth surrounded by?

A barrier of ice.

The shape of the earth generally accepted by most 'flat earthers' is that of a circular dish with the north pole at the centre and the south pole spread evenly around the outside

3. What city did the first expedition leave from?

London.

There was no such expedition. Afton Marcella is a fictional character.

4. What did Leonardo da Vinci design in the fifteenth century?

A flying machine

Leonardo da Vinci (1452-1519), a Florentine painter, architect and sculptor, as well as a pioneer in many branches of science, was one of the leading figures of the Renaissance. Among his many other achievements he actually designed a number of flying machines. However none ever flew.

5. What is Halley best known for?

The comet named after him.

Edmund Halley (1656 -1742) was one of the most famous astronomers of his era. He was the first to calculate the orbit of the comet named after him.

6. What happened on the day Copernicus' book was published?

Copernicus died.

Nicolas Copernicus (1473-1543) was the first to realize that the earth is not the stationary centre of the universe, but rather that it revolves on its axis and in turn revolves around the sun. Previous to this, accepted thought, based primarily on religious beliefs maintained a sharp

*distinction between heaven and earth, with the earth as the centre of the universe. At the time the church was very strong and resistant to new ideas. Copernicus knew that those in power would suppress him so at first he only shared his discovery with his peers. But they encouraged him to publish his findings. Ultimately he relented, but by the time his book, **The Revolutions of the Heavenly Spheres** was finally published, Copernicus was on his deathbed.*

7. When was Andrea Barns born?

1898.

8. What basic construction tool helps prove the earth is flat?

Plumb bob.

For a detailed explanation please see page 25.

9. Who proved that light rays bend in gravitational fields?

Einstein.

Albert Einstein (1879-1955), one of the greatest theoretical physicists of all time, did prove that light rays bend in high gravitational fields, but not to the degree suggested in the film. For a complete explanation please see page 26.

10. How old was Andrea on her first trip?

Sixteen.

11. Name the canal where Parallax did his experiments?

Old Bedford Level.

For more information see question 11 on page 14.

12. What name is given to the theory of continents moving?

Continental Drift.

The theory of continental drift was first put forward by a German meteorologist by the name of Alfred Wegener, in 1912. It holds that the continents gradually move on the molten material below them. It has only been during the latter part of this century that the theory has gained universal acceptance.

13. If the earth is spinning, all the continents should be located where?

At the Equator.

The earth would have to be spinning much faster

14. What event happened in October 1929 that changed world history?

than it is with much less friction underneath the continents for centrifugal force to have any effect on where the continents are located.

The Stock Market crashed.

In October 1929 the New York Stock Exchange crashed. The market had been buoyed up by speculation and credit buying following a period of prosperity throughout the twenties. Sagging confidence triggered a flurry of selling that ultimately led to a worldwide depression.

15. Which direction does the earth move to explain sunrise and sunset?

Up and down.

This is, of course, incorrect. For a complete explanation see page 30.

16. Name three things that move from space into non-space.

Sun, moon and stars.

There is no such phenomenon as non-space.

17. How did Andrea travel on her second expedition to Antarctica?

By aircraft.

18. From what the note said, where do you think Andrea had been?

The edge of the earth.

Activity #2

1. On what day was Andrea Barns last heard from?

Christmas Day, 1961.

2. What was she trying to prove?

That the earth is flat.

3. From what three things did we hope to learn more about the earth?

The sun, the moon and the stars.

4. What two cities in Egypt were involved in Eratosthenes' experiments?

Syene and Alexandria.

Syene is now known as Aswan. Eratosthenes (276-195 B.C.) was a Greek mathematician who

had been educated in Athens but called to Alexandria to be the librarian in the museum there. He is best known for his ingenious measurement of the earth's circumference. It was generally accepted by scientists of the time that the earth was round, but they didn't know how large it was. Eratosthenes, by measuring the angle of shadows cast by the noon sun on the summer solstice in both cities, calculated that the difference in the angles was 7°12', or about 1/50th of a full circle. From that he was able to determine that the circumference of the earth was approximately 24,500 miles (40,000 kilometres).

5. According to Ptolemy the earth is.....

Flat, circular and the central body in the universe.

This is not correct. Ptolemy (100-170 A.D.), a Greek astronomer, published THE ALMAGAST, around 150 A.D. In it, he put forth a geocentric view of the earth that was generally accepted until Copernicus' time. Ptolemy theorized that the earth was a stationary sphere at the centre of the universe and that all else rotated around it. In his theory the sky, supported on an axis through the earth, was a hollow concentric sphere carrying the stars. This sphere travelled in a daily rotation from east to west causing the stars to rise and set. This sphere also carried the moon, the sun and the five bright planets.

6. What causes light rays to bend so we can't see the hulls of ships at sea?

Gravity.

While it has been proven that light bends in high gravitational fields, the amount of deviation would be so little as to be almost unmeasurable. Please see explanation page 26.

7. Two explorers who pushed out the boundaries of the known world are.....

Drake and Magellan.

8. Who first claimed to have circumnavigated the globe in 1522?

Magellan's crew.

Ferdinand Magellan (1480-1521) actually died in a skirmish in the Philippines and never

completed the circumnavigation. The fact that they had actually sailed completely around the world was confirmed by their log book which was one day out on their return.

9. What was Andrea opposed to ?
10. What was required to bring attention to Andrea's argument?
11. 'Zetetic Astronomy' became the standard authority for what group?
12. If the earth were round, according to the film how far below the horizon should the boat be at a distance of six miles?
13. What film technique was used to increase the speed of the clouds?
14. What speed is the earth spinning around the sun?
15. How long does it take to travel through non-space?
16. What event destroyed Andrea's chances of achieving her goal?

The use of globes in schools.

She would have to make a trip to the edge and bring back proof.

Anti-globularists.

Zetetic Astronomy was published in 1888 by 'Parallax', whose real name was Samuel Birley Rowbotham. He performed hundreds of experiments throughout the latter half of the nineteenth century trying to prove that the earth is flat. The book (the word 'Zetetic' means 'I'll find out for myself') was the result of his work.

16 feet.

Please see explanation on page 27.

Time lapse photography.

The normal speed for movie cameras is 24 frames per second. If an event is recorded at a faster speed and projected at 24 frames per second the image will be in slow motion. Conversely, if the camera is run at slower than 24 frames per second and the image is projected at standard speed the motion will be sped up.

67,000 mph (108,000 kph).

No time.

At the present time non-space is considered science fiction.

The researcher opened the back of the camera, exposing the film inside.

Activity #3

1. What did Andrea Barns set out to do?
2. Given that the earth is flat, why must it also have depth?
3. Describe the shape of the earth as outlined by the film's host.
4. What is the major flaw in the Eratosthenes' experiment?

To prove to the world that the earth is flat.

If there was no depth wobble would occur.

A circular dish surrounded by a barrier of ice.

How would he know what the sun was doing in two places that are 530 miles apart?

Eratosthenes' experiment was valid and was aimed at determining the circumference of the globe - which he did quite accurately - not proving that the earth was round. He knew that both measurements were taken at the same time because they were both done on summer solstice at noon when the sun was at its highest point.

5. What was Copernicus' bizarre theory?

The earth is a round ball that circles the sun.

The Ptolemaic system, commonly accepted at Copernicus time, was based on the theory the earth was round but maintained it was the centre of the universe and that the sun, the moon and all the planets revolved around it. Copernicus was the first to realize that the sun and not the earth was the centre of the solar system .

6. How does gravity prevent us from seeing the bottom of ships at sea?

Light rays bend in strong gravitational fields so the light rays coming from the lower parts of the ship hit the water before reaching the shore.

While it has been proven that light bends in high gravitational fields, the amount of deviation would be so little as to be almost unmeasurable. Please see explanation on page 26.

7. Why was it hard to persuade sailors to join the expeditions of the original explorers?

They were afraid the ships they were sailing in would fall off the edge of the earth.

8. What was the goal of the experiments Parallax did at the canal?

To prove the surface of the water was perfectly flat.

For a more complete explanation of his experiment please see page 27.

9. What makes the earth look curved from space?

The light taking a curved path from the earth, because of the strong gravitational field of the earth, makes the earth appear curved.

See question #6 on page 15.

10. What was Andrea trying to prove with the dirigible?

She was trying to prove that the notion the earth spins is absolute nonsense.

Andrea assumed that if the dirigible remained completely static, the earth would rotate underneath her if the earth was a globe that spins. When it didn't, she maintained that she had proved her point. The problem with her argument is that all motion is relative. Since the atmospheric envelope that surrounds the earth rotates with it, then naturally anything that is supported (motionless) by that atmosphere would not move in relation to the earth's surface. On the other hand if she had attempted to maintain her position relative to the sun - a feat that would have been quite impossible in a dirigible - then the earth would very definitely have rotated underneath her.

11. Why did Andrea never achieve her lifelong goal?

Andrea perished while trying to bring back pictures from the edge.

12. Contrary to what the film says, how many things can you think of that would prove the earth is round and not flat?

This is a difficult question because most of what we know about the shape of the earth we know because it has been told to us, not because we have experienced it for ourselves. Plus, logical arguments can be presented to dispute many commonly accepted scientific assumptions.

AFTER VIEWING ACTIVITIES:

MEDIA STUDIES / CRITICAL THINKING:

Points to Discuss in Class:

- Power of the media
 - Newspaper/Magazine
 - Television News/Radio
 - Films
- Media as a tool of propaganda
 - Advertising
 - Wartime
 - During political crisis
- Building arguments to prove something known or suspected to be false
- Manipulative use of the media
 - Big Business or Politicians will sometimes throw up smoke screens.
 - In the film, Andrea's exploits are overshadowed by other significant events in history
 - Often in real life, politicians and lawmakers will use furor/concern over some issue to distract attention from another issue.
- Editing techniques
 - Interviews are done with one camera, so questions are filmed later and edited in.
 - Cutaways are used to edit - and consequently shape and distort - interview material.
- **Don't believe everything you hear, see or read.**

"Satellites, as they cross the earth, they will then go into this non-space region. They will instantly be able to reappear back where they started, by taking a non-space route. The moon does this, the sun does this, and stars even do this at a very, very slow rate, moving from space into non-space, then reappearing back where they started from."

Activities:

- Write a newspaper account of Andrea's last trip. Half of the group write from the perspective of someone that supports Andrea's cause and the other half write from the perspective of someone that does not support her cause.
- Do a public opinion poll or survey to find out **how** people know for **themselves** (not what they've been told) that the earth is round. How do polls affect the way we perceive things?
- Analyse a story in a newscast/newspaper, then rewrite it from another point of view. Be sure to investigate the five 'W's'; who, what, where, when and why.
- Work in small groups to analyse how we know truth from fiction and reality from contrived reality. Collect anecdotes about incidents where individuals or groups have been misled by public information, product advertisements, etc.
- Write a brief account of a time when you wanted to question the information that was presented to you in a news medium. What were two of the questions you wanted to ask? What was it that struck you as false? What prevented you from questioning it?
- When you are watching TV, how do you **read** the personalities of the people presenting the information to you? What do you look for in terms of the individual's reliability, truthfulness, trustworthiness? What type of TV personalities strike you as being the most honest? Watch the person with the sound turned off. Do you still feel the same way about them? It has been said that the way to see who will win a televised political debate is to watch it with the sound turned off. Compare your notes with those of a classmate. Where do you agree and disagree?
- Produce a one minute promo for the film. Tape it (either video or audio cassette). Add music.
- Analyse the styles of the interviewees in the film. Describe the images projected by each. Who was the most effective and believable? Why?
- What devices were used in the film to make it more convincing? How effective were they?
- How was the editing used to make the film more convincing?

- Come up with a script proposal for a film to counter the arguments used in the film.
- What events in 1961 may have contributed to the lack of media coverage of Andrea's disappearance?
- Make a list of all the arguments used in support of the flat earth theory. List also the rebuttals to the arguments in favour of the global earth theory. Use your list to classify the items into the following categories: truths, half-truths, lies, whoppers, statistics. A suggested conclusion is to share findings with the group.
- Build a case for the existence of Andrea Barns. If Andrea Barns existed today, how would things be different in terms of media coverage and the technology available to her?
- Analyse the way that Andrea Barns is presented to us in the film. Why are we disposed to believe in her as an individual? How does this make us more inclined to believe the story of her life's work? How inclined would we be to believe the thesis of the film without the example of Andrea Barns?
- Adopt an insupportable theory and make a documentary radio program (or write the script for one) to support that theory. An example might be: Wearing blue jeans stunts your growth etc.
- Write a review of the film suitable for publication in:
 - The Flat Earth Society Newsletter
 - Your local daily or weekly newspaper
 - A radical political magazine
 - A national news magazine
 - MAD Magazine
 - Popular Science
 - Scientific American
 - International Film Revue

"If you're at the equator and you wanted to shout to warn somebody, it's quite possible that they could never hear you because... the sound could never catch up to the person, who's of course, being carried away by the earth."

LANGUAGE ARTS:

- Write a script for a radio play, a one-act stage play or a short story dramatizing one of Andrea's exploits.
- Imagine that we were visited by Galileo today and that this film represented the current theories. Write the speech he might give to dispute these theories.
- The Great Debate.
 - Resolved, the earth is shaped more or less like a large pancake.
 - Resolved, there is no such thing as news; there is only fiction.
- If there was such a thing as non-space as it's described in the film, how would it affect society? How could man make use of non-space?
- Write a one-act stage play dramatizing a mutiny on board Columbus' ship, perpetrated by sailors frightened that the ship is doomed to sail off the edge of the earth(that they feel they will soon reach).
- Why did Andrea Barns go alone in 1914? Why did she wait until 1961 for her final attempt? Write a story filling in the missing details of Andrea's life that would answer these questions.
- Write:
 - The last few entries in Andrea's diary.
 - A rap song or poem telling Andrea's story.
 - An essay describing what things would be like on a flat earth.
 - A newspaper account of the discovery of Andrea's snowmobile.
 - An obituary for Andrea Barns.
- Finish the following presentation:"Good evening, ladies and gentlemen. Subsequent to her disappearance, I have tried to track Andrea Barns. You'll be interested in the following....."
- Describe the last three photographs that Andrea took at the edge.
- You are the editor of a newspaper. Your publisher has taken a stand for/against the film's arguments. Write an editorial supporting/ disputing the arguments. Keep it to 200/300 words.
- Write an exposition explaining one of the quotes. (see page 32)

SCIENCE / ENVIRONMENTAL SCIENCE / GEOGRAPHY:

- Break into small groups. Select one theory from the film. State the theory promoting belief in the flat earth, then refute the theory, without the use of outside resources. Make a presentation to the class.
- Design an experiment to prove that the earth is round.
- Discuss how the earth being flat would impact society. How could man benefit from it? What problems could it cause?
- Support or refute non-space as it is described in the film.
- Design an experiment to prove that gravity bends light.
- List two fallacies found in the film and tell why you don't believe them.
- List your three favourite theories as presented in the film and support or refute each of them.
- Ask the students to support the view that the earth is round **from their own experience**.
- If the earth were flat, how would you account for the following?
 - Tides
 - Eclipse of the sun, moon
 - Sunset/Sunrise
 - Day - Night
 - Vernal, Autumnal equinoxes
- Our knowledge of science is always changing. For example, as recently as the sixties the theory of continental drift was not generally accepted. What did people believe before that?
- How might life be different on a flat earth?
- Explain how it would be physically impossible for the earth to be flat.

ADDITIONAL ACTIVITIES:

- Assemble a collage of drawings representing the various theories of the shape of the earth.
- Sketch pictures of 3 of the photographs that Andrea took and were ultimately lost.
- Design two posters for the film. Have one promote the film as a serious documentary and have the other promote the film as a spoof or satire.
- Construct two three dimensional models of the earth, one flat, one round.
- Create a picture diary of Andrea Barns' various exploits.
- Draw a picture or map showing your interpretation of a flat earth. Then, draw a picture or map of what you think the earth would look like if it were shaped like a cone or an ellipse.
- Our view or perception of the world has been changing constantly since the beginning of time. How can you see it changing in the future?
- Discuss how the public or political climate has changed or not changed over the years in terms of the perception of new ideas.
- Research historical views of the shape of the earth. Make a short oral presentation to the group.
- What effect did the Spanish Inquisition have on the growth of knowledge during the fifteenth century? What effect did this have on man's perception of the earth he lived on?
- Undertake research to show how people's perception of their environment has shaped history. For example, how did the Europeans' **perception** of their environment effect the discovery of North America?
- Make a time chart or graph outlining the main theories connected with the development of man's knowledge of the shape of the earth.
- Plot all the places mentioned in the film on a map or globe.

EXPLANATIONS:

The arguments used in the film supporting the flat earth are repeated on the next few pages followed by an explanation of why the argument is inaccurate (in italics).

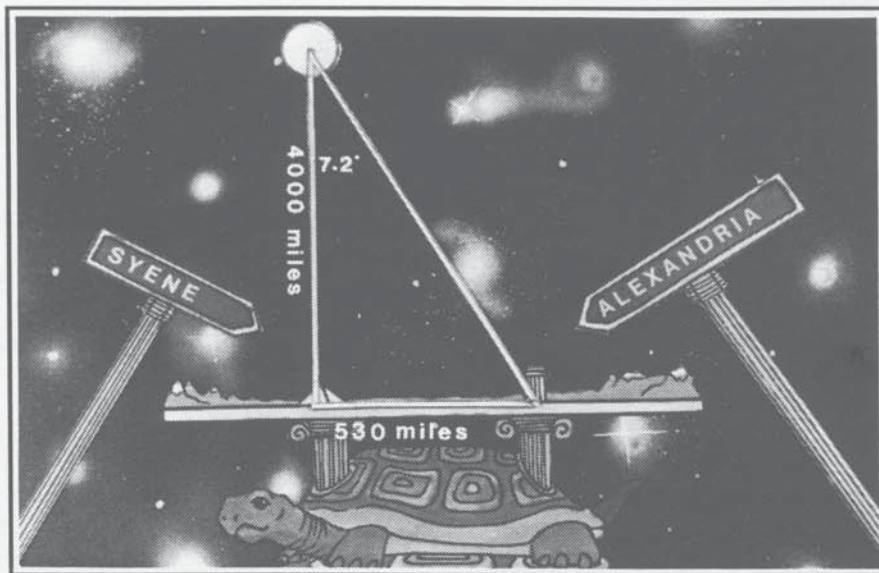
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1. Eratosthenes measures the angle of the sun's shadow

"Two thousand years ago an Egyptian scholar by the name of Eratosthenes... was supposed to have proved that the earth was a sphere of some four thousand miles radius..... Eratosthenes one day noticed that the sun was directly overhead in Syene, whereas, he noticed that on the same day at the same time, ah, mid day that is, the sun made an angle of 7.2 degrees to the vertical at Alexandria, which was some 530 miles away..... How did Eratosthenes..... know what the sun was doing on the same day, in two places which are 530 miles apart?..... One can take all this same data, knowing that the earth is flat..... In one place you have the sun directly overhead, and at another place at the same time, 530 miles away, let us suppose that it does make an angle of 7.2 degrees to the vertical, we have a right angled triangle, which it can be easily shown, the sun is some 4000 miles up in the sky..... "

Explanation

The key factor in Eratosthenes' argument is that the sun is very far away, so far away that its rays are essentially parallel. This would not be the case if the sun were only 4000 miles away. Also, if the sun were only 4000 miles away its apparent size would make it about 8 billion times too small to heat the earth. Plus, its structure would be very easily discernible through telescopes. During a solar eclipse the moon, which is much smaller than the sun, would have to be much closer to the earth than 4000 miles and a solar eclipse would be seen only over a very small area. Using the "fixed" stars as a background, the distance to the sun measured from even a flat earth or a straight base line, is about 150,000,000 kilometers (93,000,000 miles).



2. Using plumb bobs would make buildings bigger on top

"There's all kinds of proofs right around you that show the earth is flat. A very simple one to think of is that to get the walls of buildings going straight down..... You'll take a string with a heavy weight hanging from it, and you'll make the building follow that straight line, that string. Now that plumb bob will point to the centre of a round earth. That means that a plumb bob held here would point in that direction and a plumb bob held here would point in that direction. That means that buildings would be bigger on the top than at the bottom."

Explanation

Many buildings probably are bigger on the top than at the bottom, although most use light (surveyors transits) rather than plumb bobs to determine the vertical. A 30 story (100 metre) building would be 1/60,000th bigger at the top. In a typical building this translates to about 1 millimetre and would be hardly noticeable, if indeed it was measurable at all.



3. Boats sail downhill

"... it would mean that boats would constantly be sailing downhill..... "

Explanation

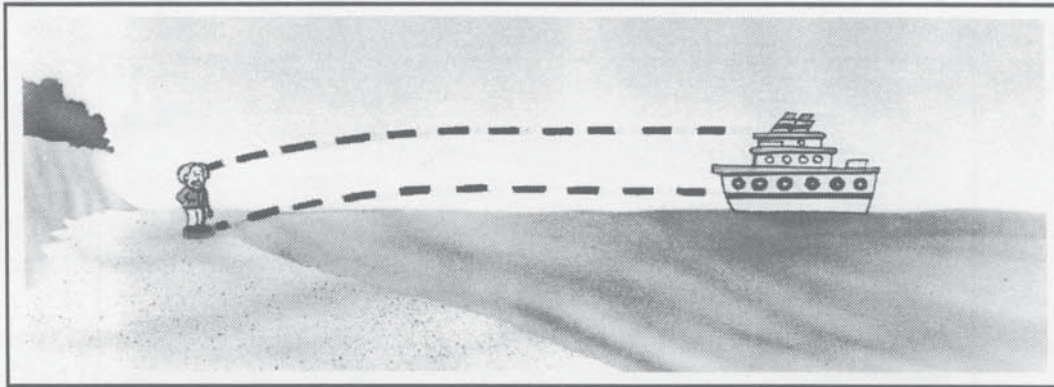
Gravity on a round earth acts exactly straight down, or perpendicular to the surface. The centre of gravity would be the centre of the sphere. In other words you don't get any closer to the centre, or move in the direction of gravity(downhill) by moving along its surface.

4. Light rays bent by gravity make boats disappear

"Invariably in any discussion about the shape of the earth, the first argument used in support of its rotundity, is that as ships sail out to sea, the tops of their masts are visible longer than the hull..... The fact is of course that... the light rays from the lower part of the ship are no longer reaching the shore... Einstein postulated and indeed proved that light rays bend perceptibly in gravitational fields. It should not be surprising that the light rays from the lower parts of the ship do not succeed in reaching the shore.... if the ship is far enough away from the shore and so the particular part of the ship from which those light rays come is not seen..... "

Explanation

The amount of bending postulated by Einstein does not come close (not even to one part in one billion) to explaining the phenomenon. Light must travel millions of kilometres through a very strong gravitational field to display bending which can be measured. And even then it must be done by the most accurate apparatus.



5. Sailors circumnavigate the globe

"The sailor thinks that he's travelling around the earth this way (circumnavigating a globe). When in effect, he's travelling around the earth this way (creating a circle inside a saucer shaped 'earth'). And he's creating a circle. He's moving in a continuous direction around. He goes through the various parts of the circle and he comes back where he started from, he just went around this way."

Explanation

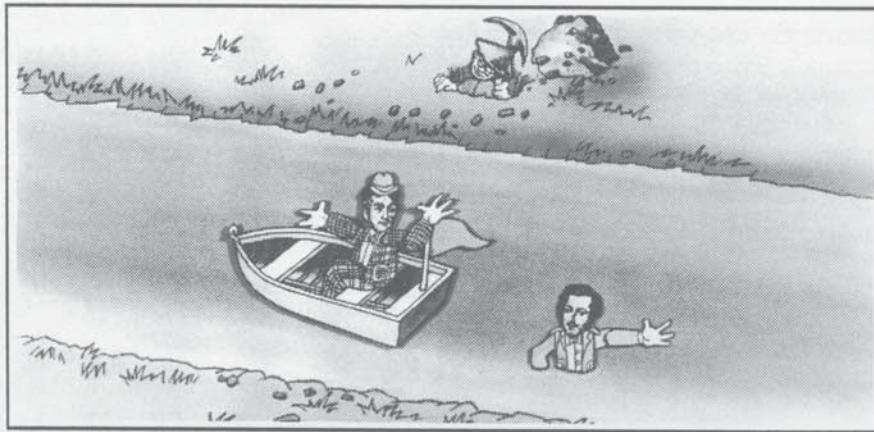
On a globe a sailor can return by travelling in a straight line (in the plane of the surface). On a flat earth you would have to turn continually to the left or right in order to get back to where you started.

6. 'Parallax' with boat and telescope on canal

"Samuel Birley Rowbotham..... carried out experiments on a canal known as the Old Bedford Level.... Located in Cambridgeshire, England, the canal is perfectly straight over an uninterrupted six mile stretch..... In one experiment, a boat carrying a flag rowed from one bridge to the other, 6 miles away.... An observer with a telescope, placed 8" above the surface of the water, found that the flag and the boat were distinctly visible throughout the entire distance..... If the earth is a sphere with a circumference of 25,000 miles, then over a distance of six miles, the second bridge should mathematically be 16 feet below the observer's eyeline...."

Explanation

With a diameter of 7920 miles (12,756km.) the surface of the earth would be approximately 16feet (7m.) below the horizon at a point six miles distant from a telescope placed 8" (20cm) above the water. There is no explanation for the results that Parallax claimed. It is known that many experiments were carried out at the canal throughout the nineteenth century with both sides of the controversy alternately claiming victory.



7. Astronauts misled by appearance of the earth

"Einstein told us light actually is attracted by gravity. In other words, the path of light is not straight in a strong gravitational field. So astronauts looking at the earth, see a curved earth, but what they don't realize is that it's not the earth that's curved..... It's the light taking a curved path from the earth, because of the strong gravitational field of the earth that makes the earth look curved."

Explanation

While there is some sense to this argument - light would curve towards the pull of gravity - the actual effect would be the reverse of that suggested. It would in fact make the surface of the earth appear concave as opposed to convex. But the effect would be so minimal as to be all but imperceptible.

8. Astronauts actually circle above the earth

"In effect, they're going up and the astronaut thinks he's levelling off this way going around (orbiting a globe), when in effect he's levelling off this way and he goes around in a circle, just like so. The farther out he goes, the less he sees of the earth. He makes a bigger circle, he can make as big a circle as he likes. And which is in effect exactly the same as if he was going around the world this way, and going out farther, he makes a bigger, a larger orbit."

Explanation

Orbit is maintained by a spacecraft achieving a balance between the pull of gravity of the planet and centrifugal force pulling it away. There would be no such forces acting on a spaceship merely circling above a flat object. Plus, it does not explain how the earth can change its appearance. A spherical earth has another side, while a flat earth would present a fixed configuration.

9. Clouds racing over the mountains

"Through time lapse photography, the velocity of these clouds has been dramatically increased. While they were actually drifting over the mountains at approximately 27 miles per hour, they now have the appearance of moving at well over a hundred.....four times their normal speed..... If the clouds were stationary, and the earth was revolving underneath them, this is how it would appear if the earth was spinning at 100 miles per hour.... Yet we're told that the earth is spinning at ten times that speed."

Explanation

The atmosphere moves with the earth in the same way as the atmosphere inside a speeding car moves with the car. "Empty" space is not able to exert a force or resistance on the atmosphere preventing it from spinning just as it does not prevent the earth from spinning.

10. Earth spinning through space

"Consider this....Those who maintain that the earth is a globe that spins, suggest that people standing at the equator are being whirled around at approximately 1000 miles an hour....They further maintain that the earth is spinning around the sun at a speed of 67,000 miles per hour and that our sun is supposedly racing around the centre of our galaxy at some 600,000 miles per hour, and yet you and I both know that on many days it's possible to stand outside without a single hair being messed up by the breeze."

Explanation

The only motion that means anything is relative motion. When we feel wind it's caused by the air moving in relation to the earth. Since the atmosphere is rotating with the earth, it is not moving relative to us and so it does not create a wind relative to us.

11. Hand sticking out car window

"You put your hand outside the window of a car which is going at only eighty kilometres per hour, a terrific wind goes blasting by and pushes your hand back.... Imagine putting your hand outside the window of a car which is going at one thousand six hundred kilometres per hour, it'd just take your hand right off."

Explanation

This explanation is the same as number ten on page 28 - the air is moving with us.

12. Room spun round like merry-go-round

"....with a sphere of 4000 miles radius, being spun around once every twenty four hours, a little bit of calculation will show that that person there, is being spun round at about a thousand miles an hour, and doesn't know it, I mean this is obvious nonsense....
.... You go on a merry-go-round and it goes I doubt more than ten miles an hour, and you get off all dizzy, you mean to tell me that people can be spun around at approximately a thousand miles an hour and not know it?..... Why if this is so, this whole room that we're in, is supposedly being spun round at something of approximately that order of speed, and we don't know it!!"

Explanation

Although it is true that at the equator we are moving "around" at almost 1000 miles per hour (1600 kph), you will not become dizzy because you are only making one rotation every 24 hours. This is slow enough as to be totally imperceptible to us and undetectable to our inner ear and thus will not make us dizzy.

13. Continental drift

"There's all kinds of evidence for the phenomenon called continental drift. This means that the continents are able to move as if they're floating on a fluid.... Now if the earth is spherical and if it's spinning, anybody knows that if this is spinning very, very fast like that, that the continents should all be located at the equator, because....it's like, it's like, what would be a good example of that? It's like spinning a stone around your head on the end of a string or something like that. The centrifugal force would move the continents from the poles to the middle...."

Explanation

There is some validity to this argument and the spinning motion of the earth does affect the motion of the continents. However, it is a relatively small and insignificant force compared to the more powerful forces of convection and friction.

14. Shouting, while travelling at the speed of sound

"Another thing that's maybe a little easier to understand..... sound doesn't travel nearly that fast (referring to the speed of the rotation of the earth at the equator).... So for example, if you're at the equator and you wanted to shout to warn somebody, it's quite possible that they could never hear you because, if you were shouting, say the earth was spinning in this direction, the sound could never catch up to the person, who is of course, being carried away by the earth."

Explanation

*Sound travels in air. Since the air is moving with us and the rotation of the earth, the air is not moving **relative** to us. Sound travels through the air at the speed of sound **relative to us and the earth**, not some other reference point.*



15. Earth goes up and down to make sunrise and sunset

"The earth, instead of going, spinning around this way, and going around, goes up and down. Now when the earth is up here and this is the sun, no rays....dark. When the earth is down here, daylight. When the earth is here relative to the sun and it's going up....Sunset..... Into night. Reaches the top of its pattern, path....comes back down again and.....sunrise."

Explanation

This motion has not been detected scientifically. It would be easy to measure, particularly when the direction changed at the top and bottom of the earth's path which would be similar to the starting and stopping of an elevator. Also, if this were the true motion of the earth, it would mean that stars would "set" at their nearest horizon. They would appear to spread and contract rather than orbit.

16. Space and Non-space

"Now interesting things happen at the ends of the earth..... When you go in a car on a car trip from point A to point B, you are moving through what's called space..... And it takes time to get through space. But if there's space there must also be non-space. It's kind of like saying if there's wet there must be dry.... You can't have one without the other. It's obvious. So if there's space, there must be non-space. So when you get to the end of the pizza model of the earth, you're actually moving..... from space into non-space. Now you can move through non-space in no time. See it takes time to move through space but it takes no time to move through non-space. So a lot of things are affected by this. For example satellites as they cross the earth they will then go into this non-space region. They will instantly be able to reappear back where they started, by taking a non-space route. The moon does this, the sun does this, and stars even do this at a very, very slow rate, moving from space into non-space, then reappearing back where they started from. This is due to a property of reflectivity and complimentarity that is a well-known phenomenon."

Explanation

Non-space is at the present time a science fiction notion. At any rate it is not relevant to the argument since a considerable time elapses between the sun setting and rising again.



ADDITIONAL QUOTES FOR DISCUSSION:

- “And when Magellan’s crew claimed to have circumnavigated the globe in 1522, it was seen as a new piece in the scientific puzzle..... But more importantly it was seen as a strong psychological boost for free enterprise..... It’s also been seen as a huge publicity stunt.”
... Host
- “Does running around your neighborhood prove that the neighborhood is round?” ... Dr. Leo Ferrari
- “The path of light is not straight in a strong gravitational field. So astronauts looking at the earth, see a curved earth, but what they don’t realize is that it’s not the earth that’s curved, it’s the light taking a curved path from the earth, because of the strong gravitational field of the earth that makes the earth look curved.” ... George Vanderkuur (see explanation page 27)
- “Those who maintain that the earth is a globe that spins, suggest that people standing at the equator are being whirled around at approximately 1000 miles an hour....They further maintain that the earth is spinning around the sun at a speed of 67,000 miles per hour and that our sun is supposedly racing around the centre of our galaxy at some 600,000 miles per hour, and yet you and I both know that on many days it’s possible to stand outside without a single hair being messed up by the breeze.” ... Host (see page 28)
- “You go on a merry-go-round and it goes I doubt more than ten miles an hour, and you get off all dizzy, you mean to tell me that people can be spun around at approximately a thousand miles an hour and not know it?” ... Dr. Leo Ferrari (see page 29)
- “There’s all kinds of evidence for the phenomena called continental drift. This means that the continents are able to move as if they’re floating on a fluid. Now if the earth is spherical and if it’s spinning, anybody knows that if this is spinning very, very fast like that, that the continents should all be located at the equator.”... George Vanderkuur (see page 29)
- “It was reasoned that if a dirigible was to go aloft in England and hold itself perfectly static, then by the accepted theory, the earth should rotate underneath it and New York should come into view some 4 or 5 hours later.” ... Host
- “If there’s space, there must be non-space. So when you get to the end of the pizza model of the earth, you’re actually moving from space into non-space. Now you can move through non-space in no time.” ... George Vanderkuur (see page 31)
- “We shall not cease from exploration. And the end of all our exploring will be to arrive where we started, and know the place for the first time.” ... T.S. Eliot

GLOSSARY:

Challenging words from the film.

Achievement

An accomplishment. Something done successfully. *Reaching the summit of the Matterhorn was quite an **achievement** for the climber.*

Amassing

Accumulating. Gathering something together in large numbers. *The students were **amassing** as many baseball cards as possible.*

Anti-Globularists

Those who believe that the earth is not shaped like a globe or sphere. *The **anti-globularists** drew a flat-earth map to illustrate their argument.*

Axis

An imaginary line around which a body rotates. *The wheel rotated around the **axis** formed by the car's axle.*

Barrier

An object, a fence, wall etc., that bars passage or access. *The hikers realized that the river would be a **barrier** preventing them from getting to the forest.*

Calculation

The process or result of computing. *By his **calculation**, Jeremy would have fifty dollars left after buying the car.*

Centrifugal Force

The force by which a body moves away from a centre about which it rotates.

Circumnavigated

To have sailed around something, particularly the globe. *In the round-the-world race, all of the entrants **circumnavigated** the globe.*

Circumference

Enclosing boundary, particularly that enclosing a circle. *The ball had a thin green stripe around its **circumference**.*

Comet

A celestial body, with a nucleus and a tail moving in an orbit around the sun. *Halley's Comet, which is probably the best known comet, follows a path that brings it close to the earth every 76 years.*

Concentric

Shapes, usually circles, having a common centre. *The grooves on a record are concentric.*

Consortium

A co-operation or coalition of groups or individuals, pooling their resources to accomplish a goal - usually one requiring vast resources. *The consortium of businessmen combined their financial resources to buy the football team.*

Controversy

A dispute over a matter on which opinions differ. *There was quite a controversy over the mayor hiring his brother's company to build the new city hall.*

Dirigible

A lighter-than-air craft, with a gas-tight envelope stretched over a rigid frame, that is able to move and manoeuvre under its own power. *The dirigible flew over the city on its maiden flight.*

Eminent

Distinguished; high in station or merit. *Mickey Mantle was one of the most eminent baseball players of his era.*

Endorsement

Support; approval. *When the company president gave her endorsement to the plan, the project was able to proceed.*

Equator

The great circle of the earth. The imaginary line that runs around the centre of the earth equidistant from and perpendicular to, the poles. *The aircraft, flying from the North Pole to the South Pole passed over the equator at the half-way point.*

Expedition

A journey or voyage with a definite purpose. *The expedition set off to find the source of the Amazon River.*

Fervently

Enthusiastically; intensely; showing great warmth or enthusiasm. *The fans fervently supported their team as they competed for the championship.*

Free Enterprise

An Economic system based on private ownership with little governmental control. *The merchants were able to thrive within the free enterprise system.*

Galaxy

A large system of stars, usually containing millions of stars. *The sun is just one of many, many stars in our galaxy.*

Globular

In the shape of a sphere; globe-shaped. *The planets in our solar system are globular in shape.*

Globularists

Those who believe that the earth is in the shape of a sphere.

Gravity

The tendency of material bodies to be pulled towards the centre of the earth. *The space shuttle uses a great deal of fuel overcoming the earth's gravity.*

Impoverished

Reduced to poverty; made poor. *The businessman was impoverished by the failure of his company.*

Mass

Coherent body of matter of indefinite shape. The volume of a solid body. *The mass of the earth is very much greater than the mass of the moon.*

Misconception

A mistaken notion or concept. *The students who thought they would be getting out of school early were living under a misconception.*

Monopolized

To have exercised complete possession or control over. *The all-star right-winger monopolized the puck during the final period.*

Non-space

There is no such phenomenon as non-space. Non-space is pure science fiction.

Nonsensical

Without sense. Words or actions that are absurd or meaningless. *The students had the nonsensical notion that summer vacation would start two weeks early.*

Orbit

The curved path along which a heavy body moves about its centre of attraction. *The earth orbits the sun once every year.*

Patronage

Support or encouragement, often financial, given by a patron. *The patronage of the wealthy dowager made it possible for the artist to finish his series of paintings.*

Phenomenon

Something that appears or is perceived; something taken note of. *The scientists observed the **phenomenon**.*

Plumb bob

The weight used at the end of a plumb line to determine vertical. *The builder used a **plumb bob** to ensure that the walls of the house were straight up and down.*

Postulated

A fact claimed or assumed to be true as a basis of reasoning. *The silly professor postulated that the planets were all connected to each other by binder twine.*

Procedures

Ways of acting in a course of action; ways of conducting business. *The businesswoman followed the correct **procedures** when setting up her franchise.*

Radius

A straight line from the centre of a circle to its circumference.

Refuted

Proved, or argued, the incorrectness or falsity. *The consumers **refuted** the storeowner's claim that his prices were the lowest in town.*

Rotundity

The condition of being round. *The scientists were impressed by the **rotundity** of the meteorite found in the crater.*

Satellites

A body orbiting or revolving around a larger one. *Weather **satellites** revolve around the earth.*

Spherical

Globular; shaped like a sphere. *The basketball was **spherical** in shape.*

Stability

Steadiness; the condition of being stable. *The **stability** of the ship helped it weather the storm.*

Technology

The application of technical, scientific and industrial advances. *Modern **technology** made it possible to put men on the moon.*

Velocity

Rate of motion; quickness. *The high **velocity** of the jet enabled it to overtake the slower propeller plane.*



IN SEARCH OF THE EDGE

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