

Medieval Dogma and the Shape of the World

Presented by Wally Hartshorn
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To the Rational Examination
Association of Lincoln Land

What Do You Know?

- For the next few minutes, draw a map of the world from your memory.
- Label major features
- No peeking or cheating!
- Focus on:
 - Coast lines
 - Inland seas
 - Mountain ranges
 - Major rivers
 - Large islands
 - Major countries

Improving Our Maps

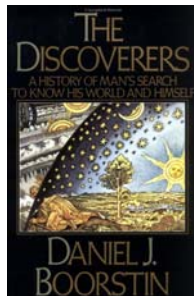
- How could we improve our maps (short of looking at an atlas)?
 - Pool our knowledge
 - Read books to glean information
 - Travel and take notes
 - Ask other travelers for information
 - Consult the Bible

Caveats

- I'm not an expert on ancient maps!
- My main source, **The Discoverers**, by Daniel J. Boorstin, contained no illustrations.

Main Source

- **The Discoverers**, by Daniel J. Boorstin
Copyright 1983,
published by
Random House.



Additional Sources

- **The Mapmakers**, by John Noble Wilford; copyright 1981, 2000; published by Alfred A. Knopf
- **The Story of Maps**, by Lloyd A. Brown; copyright 1949, 1977; published by Dover Publications, Inc.
- **The World through Maps**, by John Rennie Short; copyright 2003; published by Firefly Books Ltd.

- *"The greatest obstacle to discovering the shape of the earth, the continents, and the oceans was not ignorance but the illusion of knowledge."*
– Daniel J. Boorstin,
The Discoverers, p.86
- We sometimes can have the same problem today in other realms.

Homer (ca. 900 BC)

- Greek poet
- Circular disk on a plateau, surrounded by the circular river Oceanus
- Below is Hades (Death's realm)
- Above is dome of the sky
- Popular view long after Pythagoreans' spherical earth proven by Aristotle

Aristotle

- 384-322 BC
- In 5th Century BC, Greek scholars felt earth was a sphere, based only on aesthetic arguments
- Agreed that the earth was a sphere, on mathematical grounds, but also based on some physical evidence
- Round shadow on moon during lunar eclipse shows that the earth is a sphere

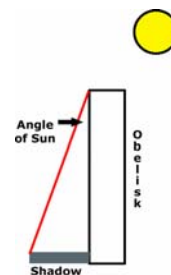
Eratosthenes

- 276?-195? BC, Greek living in Egypt
- Greatest of ancient geographers
- Second librarian of the Great Library of Alexandria
- Developed method for measuring the circumference of the Earth

Circumference of the Earth

- At noon on June 21, a well at Syene casts no shadow – i.e. the sun is directly overhead.
- Syene was roughly due south
- On June 21, measure the length of a shadow at noon in Alexandria.

Circumference of the Earth



- Knowing the height of the obelisk and the length of the shadow, he could compute the angle of the sun – $7^{\circ}14'$
- Therefore, Syene was $7^{\circ}14'$ south of Alexandria

Circumference of the Earth

- $360^\circ \div 7^\circ 14' \approx 50$
- So, distance between Alexandria and Syene is $\frac{1}{50}$ th the circumference of the Earth
- Travelers reported that camels took 50 days to make the trip at 100 stadia per day, so the distance was 5,000 stadia
- $50 \times 5,000 = 250,000$ stadia $\approx 28,700$ miles
- 24,902 at the equator; 24,860 at the poles

Hipparchus of Nicaea

- Abt. 165–127 BC
- Astronomer, discovered precession of the equinoxes
- Replaced unequal *climata* lines with an evenly spaced grid
- Latitude and longitude lines

Ptolemy

- 90-168 AD, father of modern geography
- Best known for Earth-centered model of the solar system, replaced by Sun-centered model of Copernicus
- Established convention of orienting maps with north at the top

Ptolemy

- Devised way to project spherical earth onto a plane
- Said that the best hypothesis was the simplest that would comprehend the facts.
- Was skeptical of some travelers' tales.

Ptolemy and Columbus

- Ptolemy calculated that a degree was 50 miles, not 70, giving the earth a circumference of only 18,000 miles
- Stretched Asia east for 180 degrees, not 130 degrees
- 1,300 years later, Columbus believed Ptolemy and therefore thought Indies was much closer than it really was

The Great Interruption

- Why was Ptolemy still considered accurate 1,300 years later?
- Europe had become Christian
- Expanding knowledge of the world became far less important
- There was no English word for "geography" until the 16th Century

Antipodes

- Place where people hang upside down
- The equator was believed to be a zone of fire – impossible to survive
- How could anything have traveled there after being saved by Noah's Ark?
- Some handled theological questions by rejecting a spherical earth

Cosmas of Alexandria

- 548 AD, *Topographia Christiana*
- Rejected spherical earth
- In the Book of Hebrews, the apostle Paul said that the first Tabernacle of Moses was the pattern of the world

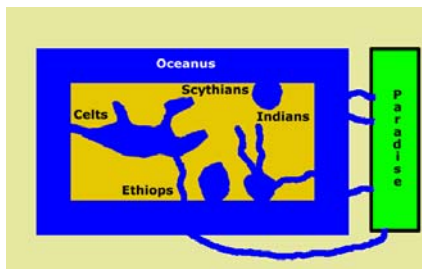
Cosmas of Alexandria

- Cosmas modeled the world as a rectangular box
- The lid was the arch of heaven
- To the north was a mountain; the sun orbited around it, thus the seasons
- There were four peoples: Indians, Ethiops, Celts, and Scythians

Cosmas of Alexandria

- From Paradise in the east flowed:
 - The Indus (Ganges) into India
 - The Nile into Ethiopia and Egypt
 - The Tigris and Euphrates into Mesopotamia

Cosmas of Alexandria



T-O Maps

- Focus was on mapping what was believed, not on expanding knowledge
- General form of maps was very similar
- Habitable earth was within a circle (the "O") divided by a "T" of water.
- "Orienting" a map meant placing east (the Orient) at the top

T-O Maps



- "T" was formed by Mediterranean Sea, Danube, and Nile
- Asia was above the "T"; Europe was to the lower-left; Africa was to the lower-right.

T-O Maps

- St. Isidore of Seville, 600-636 AD
- These were maps of Christian belief
- The Bible said that earth had been divided among Noah's 3 sons
 - Shem was given Asia
 - Ham was given Africa
 - Japheth was given Europe

T-O Maps

- *Thus saith the Lord God; This is Jerusalem: I have set it in the midst of the nations and countries that are round about her. – Ezekiel 5:5*
- Therefore, Jerusalem was placed at the center of the map
- This caused problems as more lands were discovered

T-O Maps

- All events in the Bible required a location on the map
- This provided plenty opportunities for speculation and the imagination to do a bit of creative cartography

Garden of Eden

- At the top of the map (the east) geographers placed the Garden of Eden
- Typically surrounded by a mountain range or a high wall, outside of which was a wasteland filled with wild beasts
- Popular tales told of monks who traveled to locate it

Garden of Eden

- Saint Brendan (484-578), Irish monk
- Believed Eden was in the Atlantic
- Reportedly sailed west and found a beautiful island paradise
- "St. Brendan's Island" remained on maps until at least 1759, even though it was never found by anyone else



Gog and Magog

- *And when the thousand years are ended, Satan shall be loosed out of his prison and shall go out to deceive the nations which are in the four corners of the earth, that is, Gog and Magog, to gather them for battle; their number like the sand of the sea.*
– Revelation 20:7



Gog and Magog

- Ezekial and the Book of Revelation both warned of Gog and Magog
- Usually located in the extreme north
- Alexander the Great was said to have driven them onto a peninsula and had closed them in with an iron gate
- Roger Bacon urged the study of geography to prepare for the invasion



Gog and Magog

- The Koran also mentioned Gog and Magog, so Muslims also sought the answer
- Despite the uncertainty, a location was picked and marked on medieval maps



Prester John

- During the Crusades of the 12th century, Europe sought allies in the Holy Land
- Prester John was said to be a priest-king who had defeated the Muslims in his kingdom
- Descended from race of the Three Wise Men
- Ruled their land with solid emerald scepter
- Military genius, pious Christian, and enormously wealthy!



Prester John

- About 1165, a letter appeared from Prester John to the Byzantine emperor of Rome and the King of France
- Promised to help conquer Jerusalem
- "Prester John's Letter" was extremely popular and widely published
- It was also a fake



Prester John

- "birds called griffins who can easily carry an ox or a horse into their nest to feed their young"
- "horned men who have but one eye in front and three or four in the back"
- Bowmen "who from the waist up are men, but whose lower part is that of a horse"



Prester John

- For years, mapmakers continued to attempt to locate Prester John's kingdom



Trade with the East

- Europe enjoyed trade with the east, including spices, silk, rugs, etc.
- Silk Road, the overland route from eastern China through Baghdad to the Mediterranean or the Black Sea
- Muslim Turks would not allow European merchants to travel to China directly



Help from the Mongols

- 1250-1350, Europeans were allowed to travel through these lands
- Mongol Tartars had conquered Persia and opened the roads to all
- Not Christian, but tolerant
- Could the Khan be converted? Was the Khan Prester John? Gog and Magog?



Marco Polo

- Left Venice in 1271 at age 17 with his father and uncle, merchants, for the court of Kublai Khan
- Returned to Venice in 1295
- Imprisoned in 1298 by Genoa with a writer, Rustichello, following a sea battle; the rest is literally history



The Insignificant Ocean

- *Six parts hast thou dried up.*
– II Esdras 6:42 (of the Apocrypha)
- Six sevenths of the world must be land, so the ocean was unimportant
- "Ocean" mean the circle of water that surrounded the world
- Beyond the ocean lay Paradise



The Significant Ocean

- After land routes were closed, Europe turned to the ocean to reach the East
- Travel on the ocean required accurate charts of coastlines and harbors
- *Portolanos* (harbor guides) were constantly corrected by real-world experience



Portolanos

- *The pioneer-masters of modern cartography [...] found little that was useful in all the speculations of Christian theologian-cosmographers. But they gratefully incorporated the piecemeal everyday findings of working mariners.*
– **The Discoverers**, p 147



Catalan Atlas

- 1375, Made for King of Aragon by Abraham Cresques, a Jew on Majorca
- Created by combining knowledge from numerous *portolanos*
- Jerusalem still near center, Gog and Magog still present
- Marco Polo's "Description of the World"



Catalan Atlas

- Finally showed India as a large peninsula
- *The cartographer's greatest act of self-control was to leave parts of the earth blank [...].*
– **The Discoverers**, p. 151



Ptolemy Returns

- Ptolemy's *Geography* was translated from Greek to Latin ca. 1400
- *Portolano* charts were unprojected
- Ptolemy's maps were projected
- Following his instructions, you could reproduce his maps at any size with the same level of accuracy
- Ptolemy's method was *quantitative*



"Ptolemy" Returns

- Actually, it seems likely that only the first part (the theory) of Ptolemy's *Geography* survived intact
- The maps and locations of cities seem likely to have been created by others
- "Ptolemy" was taken as gospel – including the errors



Ptolemy's Errors

- Circumference of the earth; size of Asia
- Southern continent joining Africa and Asia – making it impossible to reach China by sea
- *The sea route to India would have to be opened in men's minds, and on their maps, before it could be traversed by ships.*
– **The Discoverers**, p. 154



Nicolo de' Conti

- Merchant who left Venice in 1419
- Returned to Venice in 1444
- Told of travels down west coast of India, to Ceylon, Sumatra, Burma, Java – and the court of Prester John
- Speculated reaching India by sailing south of Africa



Ptolemy Lives!

- Based on Nicolo de' Conti's speculations, some mapmakers began showing Africa as a peninsula and Indian Ocean as an open sea
- Ptolemy's name was the standard, much as Webster was the standard for English dictionaries



Ptolemy Lives!

- Development of printing meant that maps could be reproduced quickly
- Engravers had investment in old maps
- Were reluctant to create new plates
- Therefore, outdated maps continued to be printed for many years – until 1570



Prince Henry the Navigator

- Portuguese prince, 1394-1460
- Explored mentally – but stayed at home
- *In the crusader's world the known was dogma and the unknown was unknowable. But in the explorer's world the unknown was simply the not-yet-discovered.*
 - **The Discoverers**, p. 161



Prince Henry the Navigator

- Required his mariners to record what they saw on their voyages and to return that information to him at Sagres
- Systematic accumulation of knowledge
- Sagres attracted Jews, Muslims, Arabs, Italians, Germans, Scandinavians – even Africans



Prince Henry the Navigator

- Navigation tools were popularized, improved, and invented at Sagres
- New type of ship – the caravel – was also developed at Sagres and at Lagos
- Caravels could sail into the wind, were small and maneuverable
- Was designed to get there **and back**



Prince Henry the Navigator

- Goal was sailing around Africa
- Cape Bojador was a mental barrier
- 1424-1434, sent 15 expeditions to pass
- In 1435, finally passed
- In 1436, slave trade began
- When Henry died in 1460, profit motive kept the Portuguese exploring



Bartholomeu Dias

- In 1487, the search was still on to locate Prester John's kingdom, now believed to be in Africa
- In 1488, Bartholomeu Dias finally made it past the southern tip of Africa
- When Dias arrived back in Portugal, one of those on the docks was Columbus



Columbus

- 1451?-1506
- Heard of idea of westward passage to Indies in 1482
- Worked from 1484-1492 to convince a patron to sponsor such a voyage
- Flat vs. spherical earth was not an issue; distance was the question



Columbus

- Spain finally agreed in April 1492
- Departed on August 2
- Sighted land on October 12 (33 days)
- Repeated the voyage 3 more times
- Was forever convinced that what he found was Asia or islands off the coast of Asia



Columbus

- *They were called voyages of discovery, but more precisely they should have been called voyages of confirmation. For someone less committed they might have produced tantalizing puzzles, planting seeds of doubt.*
– **The Discoverers**, p. 239



Columbus

- Fresh waters from the Orinoco implied a great river and a vast continent
- Christian doctrine said that such could not exist south of the equator
- So, he decided that he had found the location of Paradise

Modern Flat-Earthers

- The Flat Earth Society still existed until recently; Charles Johnson
- Their home burned, along with all records of the society, in 1995
- Johnson died in 2001
- Skeptics of a spherical earth called themselves "zetetics"

Modern Flat-Earthers?!



- Original publication of CSICOP was called *The Zetetic*
- After 3 issues, changed to *The Skeptical Inquirer*

And Finally...

- Conclusions
- Questions?
- PowerPoint slides will be on the web site: www.reall.org
- editor@reall.org

