

History of geology: past faith and science informing the present

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Pop “History”

- Charles Darwin, Charles Lyell, William Smith, or James Hutton rejected the prevailing strict young-earth biblical literalism by introducing the idea of an old earth based on geology
- Anyone in the 1700’s or 1800’s citing a widespread flood or catastrophes held modern young-earth flood geology ideas
- Because of these, they are either heroes or villains



?

None of those are true



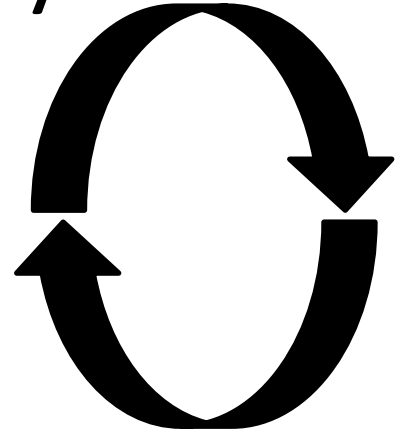
?

Real History of Geologic History

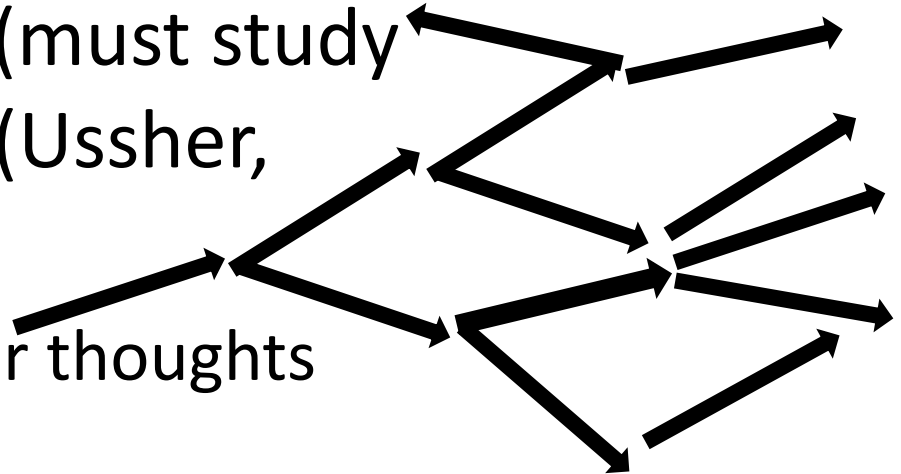
- Gradual development from 1500's-early 1800's
- Major Questions:
 - Pattern of history, Empirical or Philosophical approach
 - How do layers form?
 - How do you match corresponding layers?
 - Can we reconstruct the past?

What are patterns of history?

- Cyclic, infinite, relatively deterministic (discernable by philosophy): Classic Greek, Deist



- Linear, finite, contingent (must study evidence): Chronologers (Ussher, Newton)
 - God's thoughts are not our thoughts




If earth history is evidence-based, what is the evidence?

- Various things are found in rocks and layers – do they tell us about rock history, or might they form within the rocks?
- Can layers and other geologic features be put in order?



Why does that rock look like coral?



Forces that generate life
can also work in the
earth to grow life-like
forms inside the earth

Forces and affinities that
govern the universe
produce similar forms
everywhere

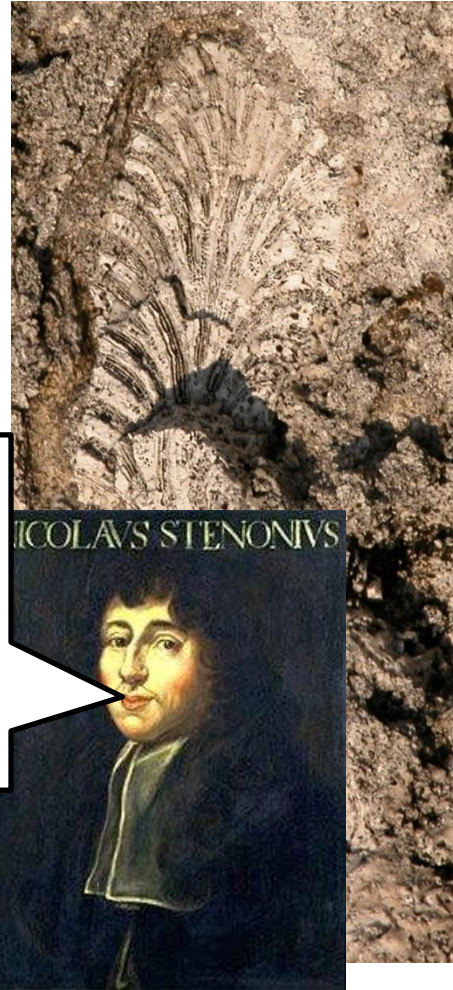
Neoplatonic and
Aristotelian
ideas



Why does that rock look like coral?

- Mid-1600's: More "natural" explanations become popular
- Niels Stensen (Steno) distinguished crystal-style growth and biological growth
- Content of rocks tells us about their formation!
- Common-sense reasoning allowed putting rock layers in sequence

It's old coral,
buried and
turned to rock.



How do fossils get where we find them?

Corals,
central
New York



- Noah's flood? Changes in geography? Best explanations of the 1600's - mid-1700's, but recognized problems with both

How do fossils get where we find them?

Fossil whale
from Alabama
and Egypt



- Noah's flood, biblically, was too brief for them to live inland, too calm to wash them up out of the ocean
- Regional flooding seemed to better fit scientific knowledge and Aristotle, but how much geographic change was possible?

Rock Formation: Neptunism vs. Vulcanism

- Neptunism: Generally form chemically out of water; changing chemistry and slow recession of a primordial ocean produce different layers (not Noah!)
- Vulcanism: Rock layers generally form by cooling of molten rock



You're full
of hot air!

Both partially right: some layers
form each way (many neither)

You're all
wet!



Many Layers

- Increased study and comparison across Europe led to recognition of myriad layers
- Each required time to form
- Most looked like layers forming today under ordinary conditions
- Implies a long time, apparently all pre-human
- Old earth widely recognized by the later 1700's
- Not generally seen as unbiblical

James Hutton (1726-97)

- Typical deist: Earth **and** humans essentially eternal; predictable cyclic patterns, constant slow change
- Not strongly based on actual observation of the earth, not modern geology (6000 yrs is closer to 4.5 billion than ∞ is!)
- Vulcanist; correctly demonstrated basalt is igneous
- Not really “father of geology”

sedimentary layers shoved up by basalt in Edinburgh

basalt

Georges Cuvier (1769-1832)

- Investigated (with others) the layers around Paris
- Irregular – sometimes marine, sometimes freshwater
- **Not** regular cycles
- **Not** a steady retreat
- **Must rely on the evidence**
- **Not on speculation**

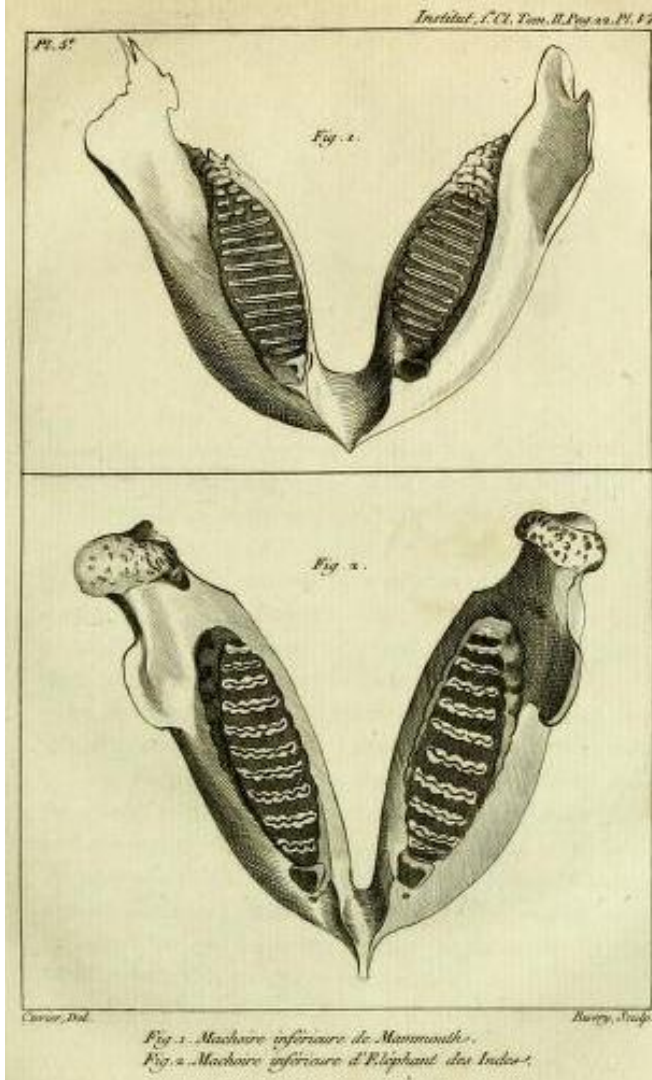
Marine snail from the
Paris Basin, from
Cossmann and Pissaro



Cuvier: Part 2

- Expert anatomist
- Demonstrated extinction: Mammoths are not modern elephants
- This confirmed the impression that different fossils indicated different layers
- Supported the idea of occasional dramatic events in the past, to cause extinction

One of Cuvier's figures, from Biodiversity Heritage Library



The Map that Improved Geology

- William “Strata” Smith (1769-1839): Seeing layers during canal and railroad building led to independent realization that different fossils characterized layers
- Made an excellent geologic map of England – better detail and larger area than anything before
- Not much interest in how the layers formed or age
- Not as influential as the more well-to-do, better educated geologists

Detail of the map, from NHM

Not a radical change

- Winchester's The Map that Changed the World claims that Smith was boldly challenging the church and risking jail by claiming that the earth was old (a review by Steve Gould described these claims as "silly").
- First significant publication of his data by a friend, Rev. Joseph Townsend, in The Character of Moses Established for Veracity as an Historian, Recording Events from the Creation to the Deluge.
- Smith was slower than most to recognize an old earth

By early 1800's all geologists recognized:

- Earth has a long pre-human history
- Ordinary geologic processes seen in the present can account for most geologic layers
- Changes in the dominant types of species occur over time

Mosasaur tooth from North Carolina –
no giant predatory swimming lizards live
there now!

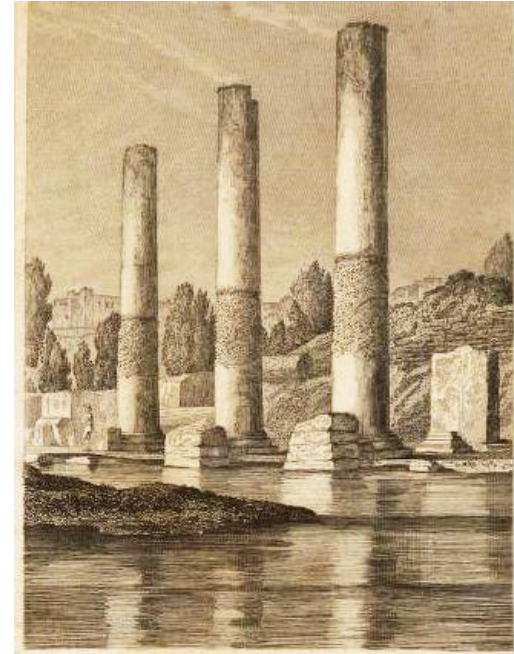


Catastrophism and Uniformitarianism

- Almost all in the first half of 1800's recognized:
 - Geologic record suggests occasional catastrophes outside the events seen in the present
 - Changes in the types of species over time are directional, humans only at the very end
- This is “**catastrophism**” (Cuvier, Buckland, *etc.*)
- Noah's flood often considered an account of the most recent catastrophe
- Not necessarily global; natural but uncertain cause

Charles Lyell, Uniformitarian

- Thoroughly documented modern geologic processes and patterns of change in fossils
- Wrote major textbook: Principles of Geology (illustration from it, BHL)
- Strongly committed to a strict, gradual, cyclic pattern, more or less eternal – like the “Enlightenment” deists
- Resisted the idea of any past geologic events significantly outside the range observed in the present



Present state of the Temple of Isis at Abydos

Engraved by John Brown, Abbotsford Street, April 1833

Charles Lyell, Uniformitarian

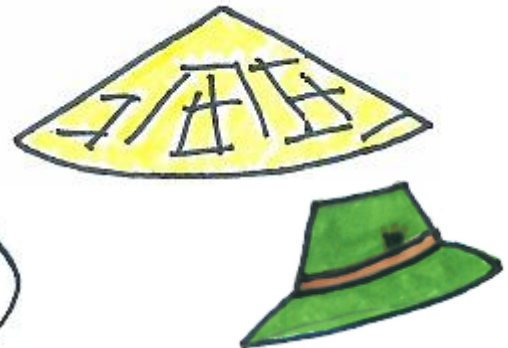
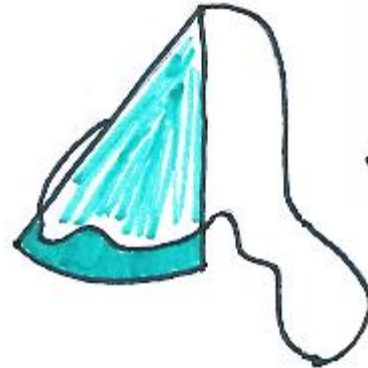
- Resisted the directionality of life
- Major influence on Charles Darwin's views – excessively gradualistic
- But catastrophists often underestimated the cumulative effect of slow processes over time

A contemporary cartoon by De La Beche spoofing Lyell's cyclic history of life , depicting a future Age of Reptiles
<http://historyofgeology.fieldofscience.com/2010/08/geology-history-in-caricatures-lyells.html>



Many Views

- Biology and geology textbooks, popular science “history” writing, young-earth advocates, and science TV shows routinely give a false modern geology/ young earth dichotomy, often with the science-faith warfare errors





Many Views



- Modern geology and modern young-earth creationism both originate in the 1800's and are not identical to any one previous position: varied points of similarity or differences
- Multiple old-earth and/or flood-including views existed, not matching any currently popular idea



Many Views

- Christians were prominent in the development of modern geology – old earth and regional flood were orthodox options
- Linear, contingent, evidence-based history of Ussher *et al.* led into geology and a gradually expanding timescale



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- Illustrations: Susan Campbell, Raphael, Velázquez, and an ancient Greek artist



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References

- Most important: Martin J. S. Rudwick's books:
- The Meaning of Fossils: Episodes in the History of Paleontology: from the 1500's through Darwin
- Bursting the Limits of Time: development of the idea of an ancient Earth
- Worlds Before Adam: development of reconstructing the geologic past
- Scenes from Deep Time: history of paleontological illustration of the earth in the past

Further Reading

- [The Earth's Deep History](#): Martin Rudwick
 - Overview of history of geology
 - Good gateway into his other books
- [Galileo Goes to Jail](#): Ron Numbers (ed.)
 - Short essays on numerous false science-faith claims
- [The Bible, Rocks, and Time](#): Davis Young and Ralph Stearley
 - Survey of geology and Christianity issues