

Evolution of Creation:

**Athanasius Kircher's
recognition of a changing
Earth through time**

**Will Parcell
Wichita State University
Wichita, Kansas**

Athanasius Kircher

- **German Jesuit, polymath and semiofficial natural historian at Collegia Romana**
- **Is controversial figure both contemporaneously and currently**
 - **One of the last remaining 'medievalists' who, at worst, inhibited development of science**
 - **Enlightened 'renaissance man' with insights into human reasoning**

Kircher's Approach to Knowledge

- **Recent papers on Kircher reassess his role in development of geosciences**
 - Leinkauf (1993) – concept of Kircher's "Geocosm"
 - Baldwin (1993) – alchemic laboratory analogies
 - Strasser (1996) – volcanology and global water circulation
 - Gould (2004) – fossils and figured stones
 - Yamada (2006) – Kircher's influence on Steno
 - Parcell (2009) – symbolism in Kircher's geologic discussions
 - Godwin (2010) – overview of Kircher's varied topics

Outline

- **Kircher's approach to knowledge**
- **Constraints of Biblical chronology**
- **Conceptions of a fundamental Earth processes**
- **Recognition of a changing Earth**
- **Motivations and underlying principles**



Kircher: Purveyor of Earth's Wonders

- Intrigued by the 'wonders' of the Earth
- Publications discussing Earth processes:
 - *Magnes sive de arte magnetica* (1641)
 - *Iter Estaticum II* (1657)
 - *Mundus Subterraneus* (1664)
 - *China Monumentis* (1667)
 - *Arca Noë* (1675)

Reliable Knowledge

- Kircher's discussion of Earth processes drawn from:
 - **Model**
 - Ambition to discover 'wonders' of the natural world
 - Develop a model of nature that mimics the divine order and provides understanding of God
 - **Empirical**
 - **Received testimony of others**
 - Plato, Aristotle, Bible and contemporary natural philosophers and Jesuits missionaries.

Kircher on Empiricism

- “In studying the physical world, to philosophize without experiment is the same as a blind man presuming to be the judge of colors.” (M.S., B.2, p.168).
- **Experimentation through:**
 - Observation
 - Laboratory experimentation
 - Analogs

Observation and Experimentation

- **Fourteen days of earthquakes and volcanoes in Sicily and Calabria, 1638**
(Vitae and M.S. Praefatio, cap.2)
- **Ascended Vesuvius in 1638 and had himself lowered inside its crater**

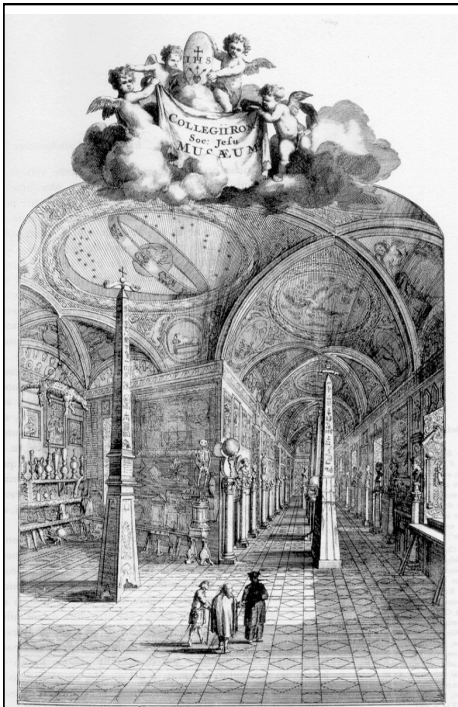
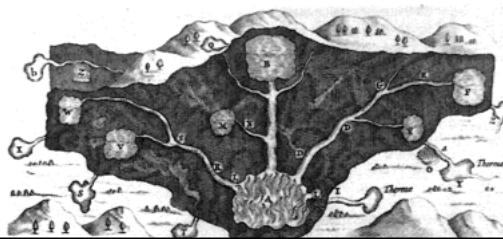


Eruption of Mount Vesuvius in 1638,
from *Mundus Subterraneus* (1678)

Alchemic Analogs

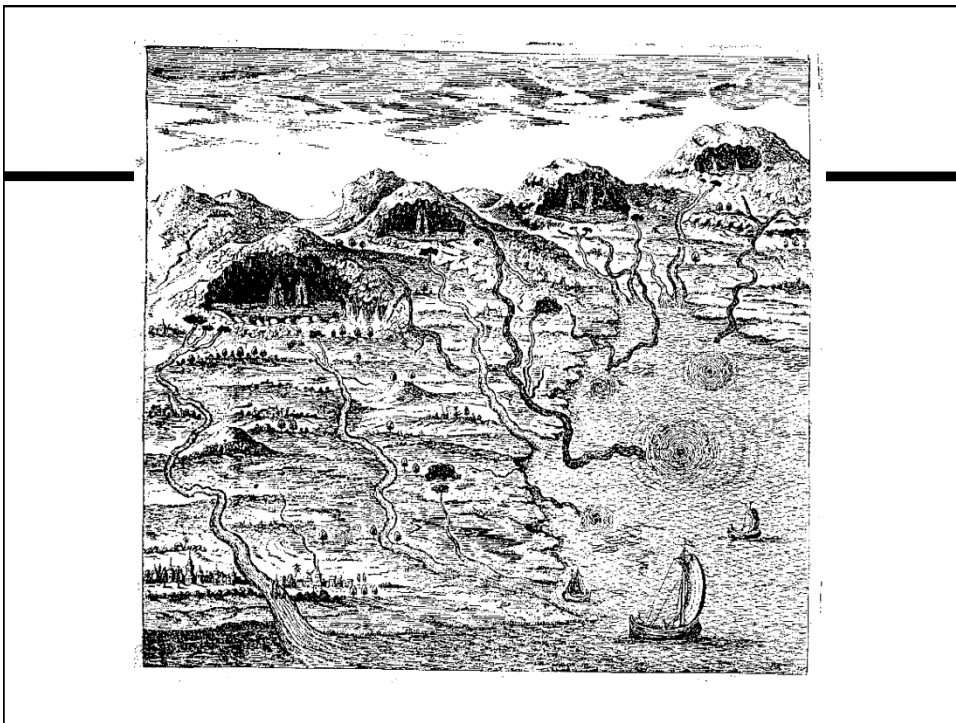
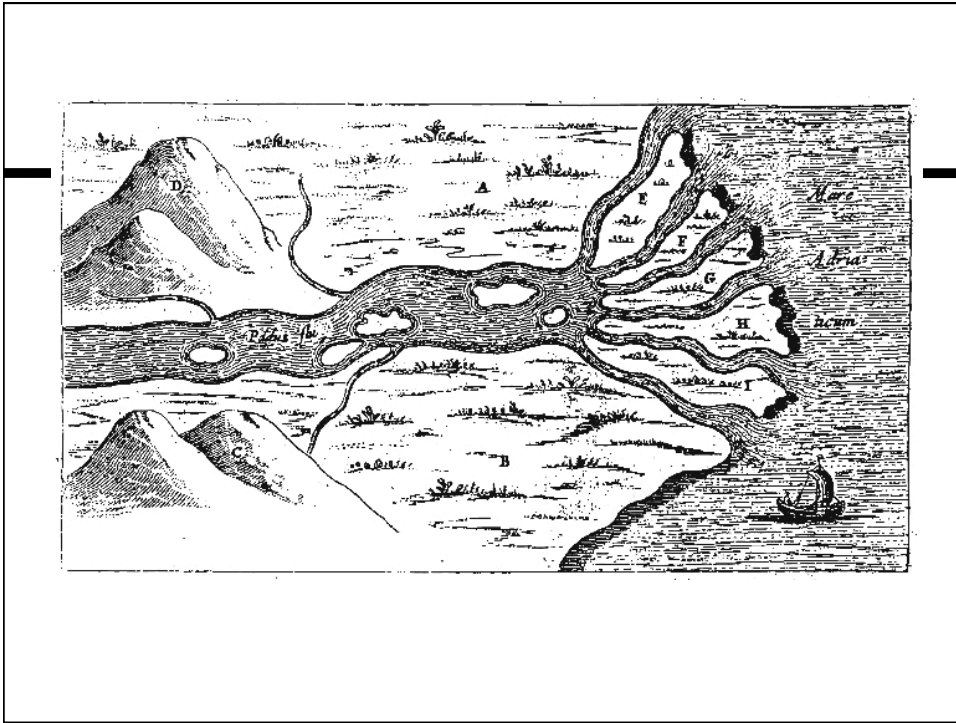


- Likened the volcano's heat to that of the alchemist's furnace
- Smoke similar to that of his alchemical concoctions
- Stench likened to the sulphur and bitumen fumes which he inhaled in his laboratory



Museum Kircherianum

- Collection and accumulation of objects was comparable to mathematical proof in descriptive study of the natural world.
- Museum Kircherianum

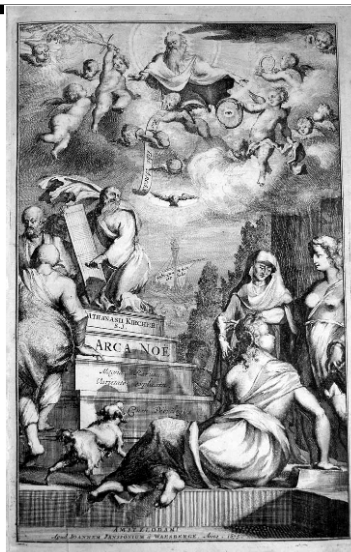


Towards the Recognition of a Changing Earth

- “It is as clear as day that the earth has a far different constitution today from what it had before the global cataclysm, even for forgotten centuries after the Flood.”
- “Earth is heterogeneous, not homogeneous” (MS. B.II, Ch. 18, p. 108)

Constraints of Biblical chronology

- Time restricted to Biblical framework
- Involved in reconciling biblical chronology with ancient and Egyptian, Chinese and Aztec chronologies
 - Arca Noë (1675)



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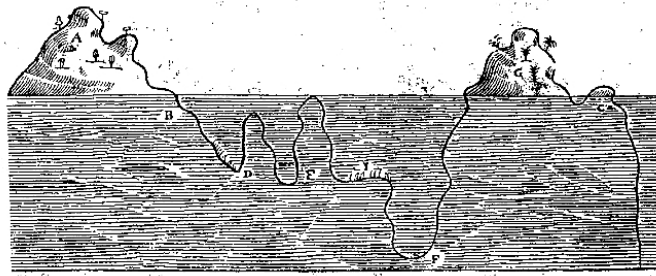
Oedipus
Aegyptiacus
(1652-54)

Recognition of an evolving Earth through time

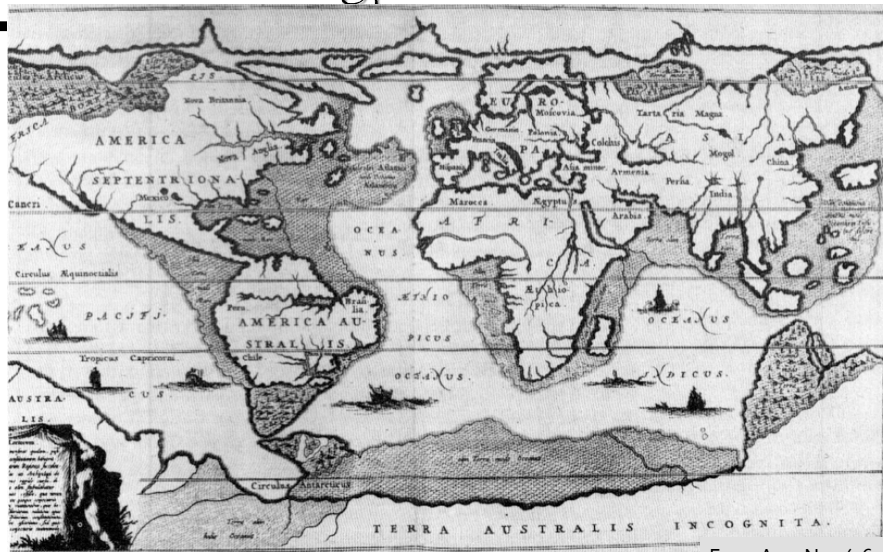
- For Kircher, the processes observed today have shaped the Earth over time
 - Location of land and sea
 - Rising and falling sea levels
 - Rising and falling mountains
 - Distribution of organisms

Rising and Falling Seas

- Parts of the world were dry land after the flood.
- These terrestrial areas would later become ocean due to fluctuations of the ocean and erosion of the land.

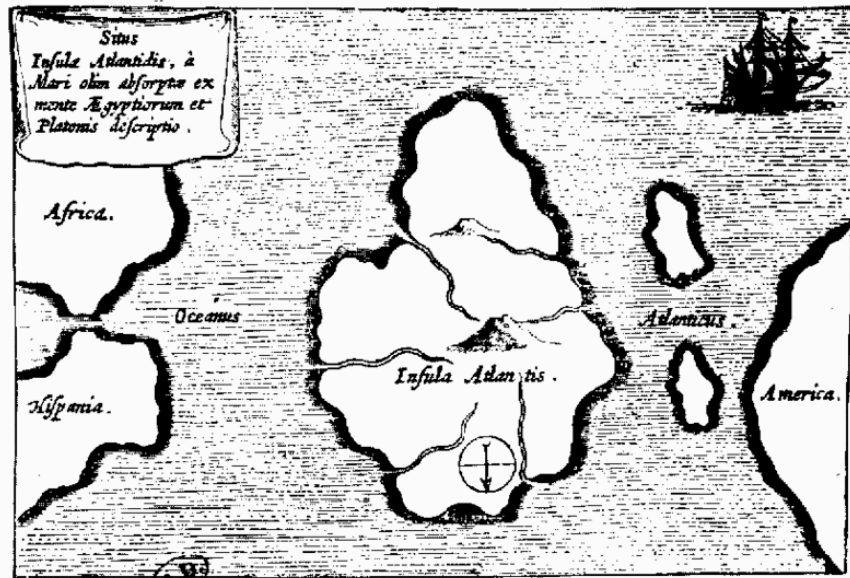


“We know tracts of land that were once rich and fertile, but are now under the sea’s dominion and a lurking place for fishes.”



From Arca Noe (1675)

Areas of Sea Level Rise



M.S. Book 2

“Islands exist today that did not exist before.”

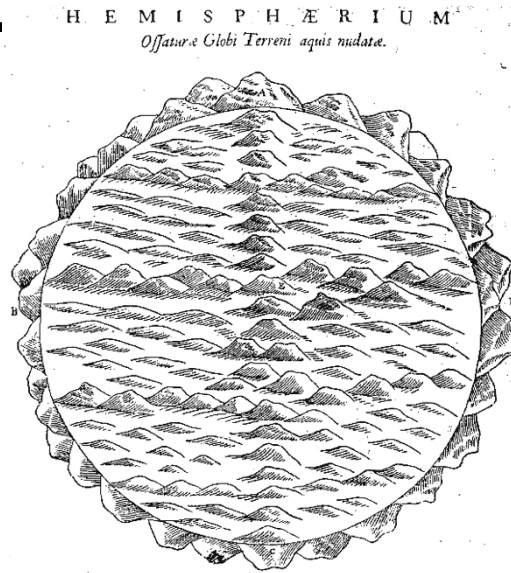


Areas of Sea Level Fall



“Mountain ranges disappear in one place,
while others grow elsewhere.”

- **Book 2. Mundus Subterraneus:** discusses the Earth's chains of mountains, terrestrial changes, the heights of mountains and depth of the sea.
- **Chapters 8-12:** explains the condition of mountains before the Deluge and changes of mountains since the Flood.



“Mountains diminish over time while
plains and valleys are elevated”

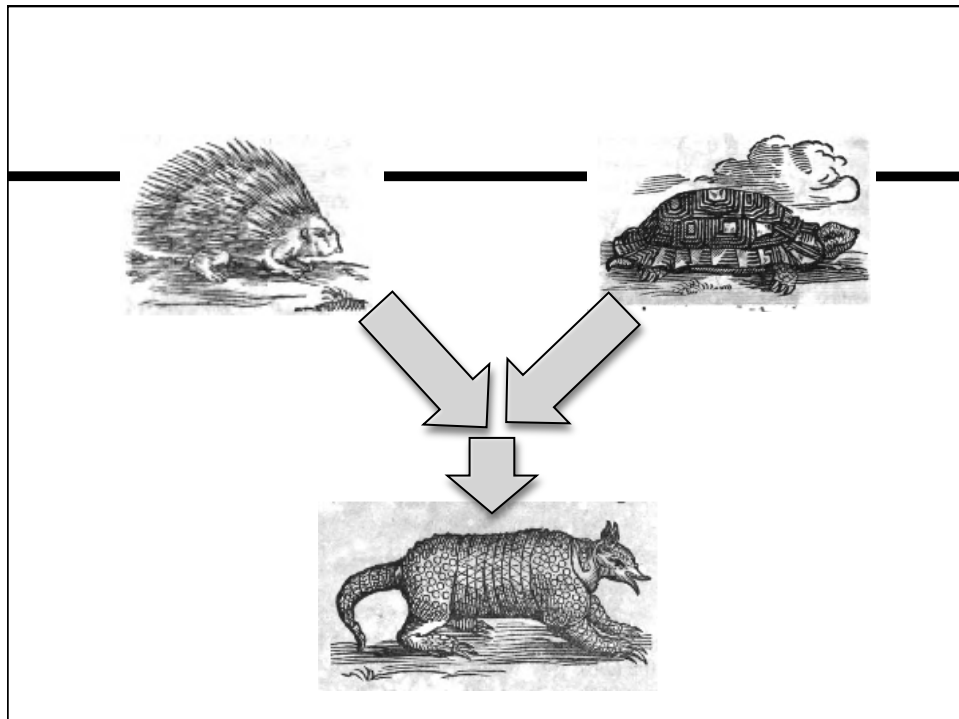
- “Experience has shown us that the tops of the mountains are reduced by rain, snow, hail, frost, and abrasion by air over a long time, and ... by volcanoes.”



MS, B2, Ch12, Sec2

Occurrence and Distribution of Fauna

- Environmental pressures on macrofauna produce new organisms
- As animals moving into colder or warmer climates are physically transformed.
 - Deer → Reindeer
 - Turtle + Hedgehog → Armadillo



Mechanisms to distribute animals

- Distribution of fauna after the Flood was explained by

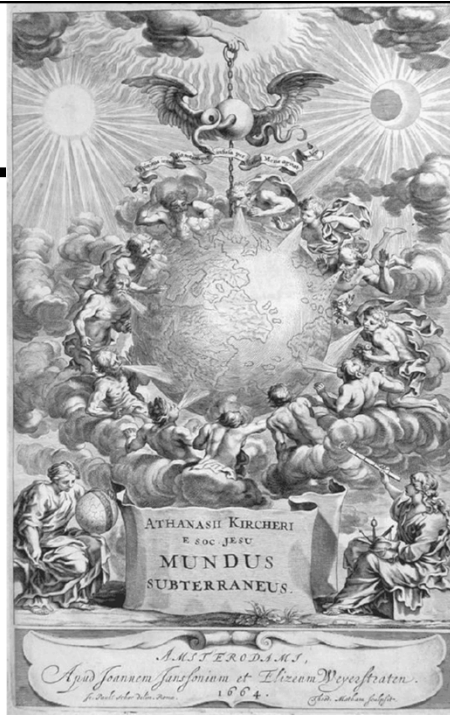
- land bridges
- island hopping
- swimming



From (Arca Noe p. 195-196)

Motivations and Conclusions

- The order of nature mimics the divine order and an understanding of nature provides understanding of God
- Hermetic tradition permits study of natural world to fold into Catholic system.



Motivations and Conclusions

- **Macrocosm – microcosm: Kircher viewed Earth as an organic body, analogous to the human body.**
- **His discussion of time appears when he is forced to reconcile Biblical timeline with personal observations or testimony by others.**
 - **Time and the age of the Earth in relation to its workings not of primary importance to Kircher**

These changes in the terrestrial globe, however horrible exist that they might show forth the infinite power of God and the incertitude of human fate, and warn the mortal inhabitants of this Geocosm that nothing is perpetual or stable,

...

Transl. By Godwin 2009

... but all things are fleeting and subject to the variable fates of fortune and destruction so that they might raise their minds, their studies, their soul and intellect, which no created things can satisfy, to sublime and eternal possessions, and gaze at God alone, in whose hand are all the powers of the realms and the destinies of universal nature.

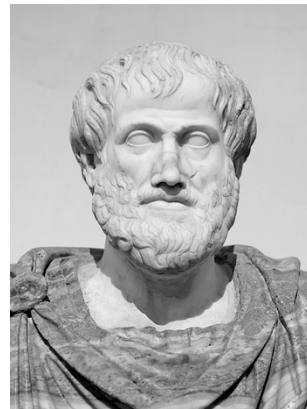
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Conclusions

- **Recognition of an evolving Earth**
 - Geography changed over time
 - Rising and falling sea levels
 - Rising and falling mountains
 - Descriptions of Atlantis
 - Fossils, corals

Nature of Knowledge in 17 Century

- **Epistemology under a paradigm shift in latter 17th century.**
- **Supremacy of 'received truth' being replaced with deduction and experimentation**
- **Aristotle approach to wisdom consisted of universal truths**
 - Universal truths are made apparent in different forms of experience
 - How knowledge and understanding was determined was undergoing a paradigm shift.



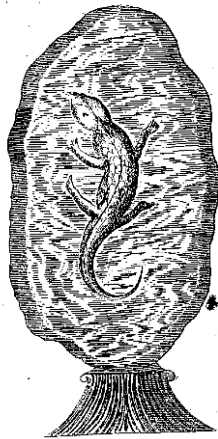
?Experimentation and Observation

- **Experimentation increasingly viewed as important for understanding the natural/physical world**
- **Various approaches to experimentation**
 - **Alchemic**
 - ******
 - ******

- **In its viscera are generated diverse juices which, mingled with waters that they encounter, produce marvelous effects and marvelous genesis of things since Creation... (Mundus Sub. I P. 329) – transl. from Thorndike, 1958**

- From this perhaps overlong discourse, it is as clear as day that the earth has a far different constitution today from what it had before the global cataclysm, even for forgotten centuries after the Flood.
- Islands exist that did not exist before.
- Where once were fierce whirlpools, it has turned to land.
- On the other hand, we know tracts of land that were once rich and fertile, but are now under the sea's dominion and a lurking place for fishes.
- Mountain ranges disappear in one place, while others grow elsewhere.
- Great lakes have exchanged the rule of Neptune for that of Rhea or Vesta and vice versa
- These changes in the terrestrial globe, however horrible, exist that they might show forth the infinite power of God and the incertitude of human fate, and warn the mortal inhabitants of this Geocosm that nothing is perpetual or stable, but all things are fleeting and subject to the variable fates of fortune and destruction; so that they might raise their minds, their studies, their soul and intellect, which no created things can satisfy, to sublime and sempiternal possessions, and gaze at God alone, in whose hand are all the powers of the realms and the destinies of universal nature.

Geological Curiosities



- **Geologic items in museum (from Sepibus)**

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- ***
- ***

??Regarding a static Earth

- *Mundus Subterraneus* often described as a rigid, unchanging, static model of the Earth
- The same set of processes active through time
 - Fire and water as forces of change
 - Rivers, deltas and sedimentation

Empiricism: Observation, Experience, Experiment



- Jacques Rohault (*Traite de Physique*, 1671) outlines three varieties of 'facts', derived from:
 - 1. use of senses without predetermined design
 - 2. initial deliberate design of an experiment, without knowing the end result
 - 3. experimentation designed after reasoning in order to discover whether hypothesis can be confirmed

Interpretation and Meaning of Fossils

- **Recognizes salamander in amber as fossil? Certainly accepts that it is an actual organism not just a figment/folly of nature**
- **See Gould...**