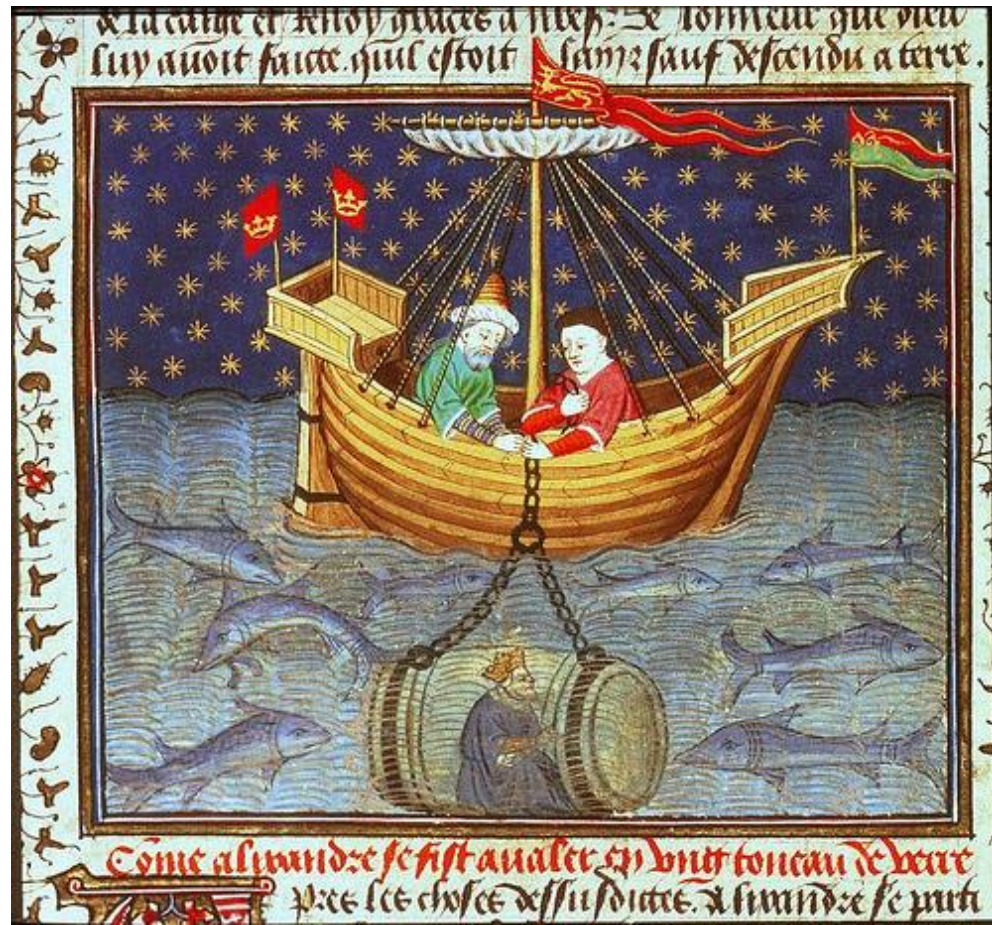
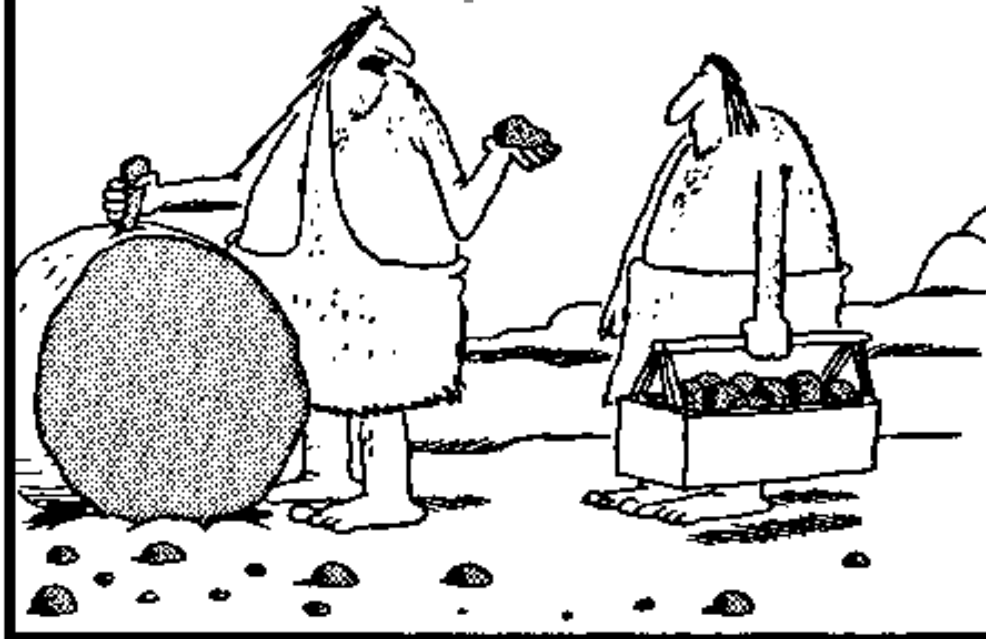


BIOL 101
Lecture 3

History of the Life Sciences



Early Evidence for Human Reliance Upon a Natural Perspective



**“So what’s this? I asked for a *hammer!*
A hammer! *This is a crescent wrench!* ...
Well, maybe it’s a hammer. ... Damn these stone
tools.”**

Prehistoric Period

- Learning by trial and error
- Rich natural history knowledge
- Information not written down
(paper & writing developed ~5K years ago)
- Crops Domesticated

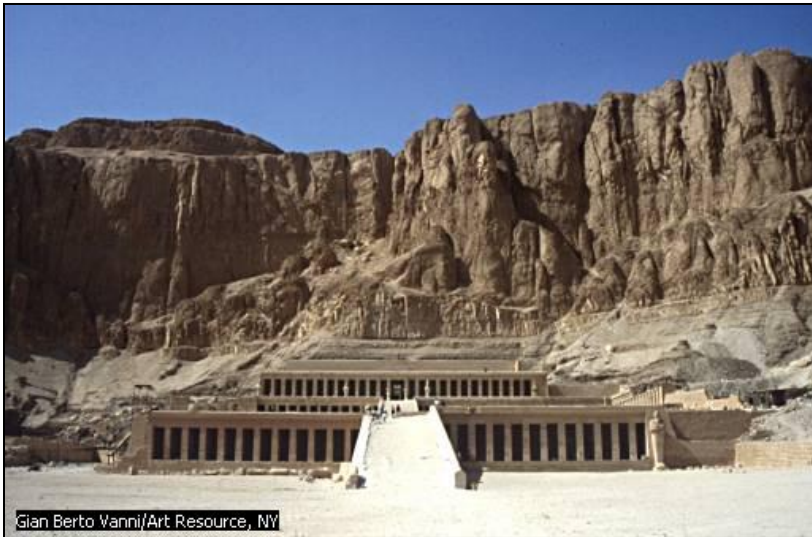
When did the study of science begin?



32,000 years ago

Paleolithic paintings on
cave walls and recordings
on bones- observations

When did the study of science begin?



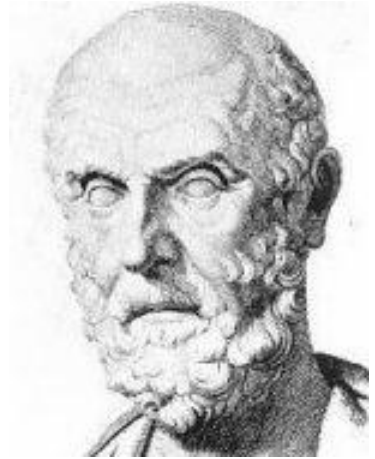
7,000 B.C. to 6th century B.C.

Mesopotamian cultures:

Written record of astronomical observations, chemical substances, disease observations, mathematical tables and calculations

Ancient Greece

Hippocrates (460 – 370? B.C.)



- Greek physician
- Diseases have natural causes
- Rejected view that disease caused by evil spirits
- Believed that the brain was area of higher thought and emotion, not heart
- Program for good health: rest, good nutrition, and exercise.
- Started “Western Medicine”

Hippocrates' Four Humors

- **Blood:** considered to be made by the liver.
- **Phlegm:** associated with the lungs.
- **Yellow bile:** associated with the gall bladder.
- **Black bile:** associated with the spleen.

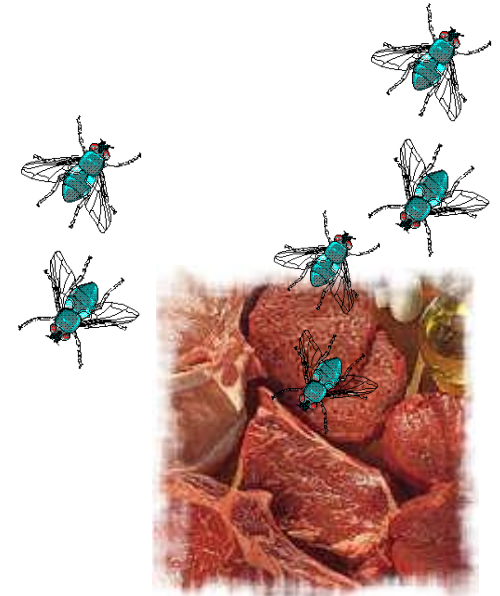
Imbalances of the Humors Cause Disease

- **Sanguine:** Disease, excess blood
- **Phlegmatic:** Disease, excess phlegm
- **Choleric:** Disease, excess yellow bile
- **Melancholic:** Disease, excess black bile

Ancient Greece

Aristotle (384-322 B.C.)

- Scientific method (observation, inductive reasoning)
- Described hundreds of marine species
- Dolphin is a mammal
- The earth is round
- Biology (spontaneous generation)- disproved by Francesco Redi (1668), an Italian doctor who proved maggots came from flies.



Roman Times



Galen (130 - 200 A.D.)

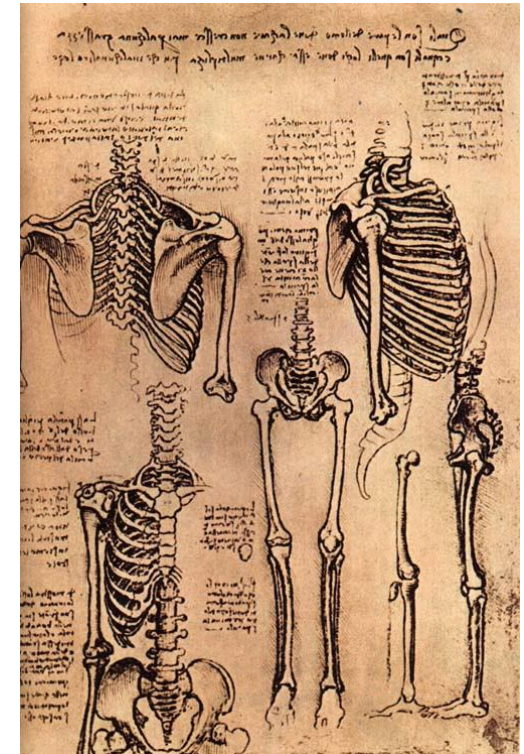
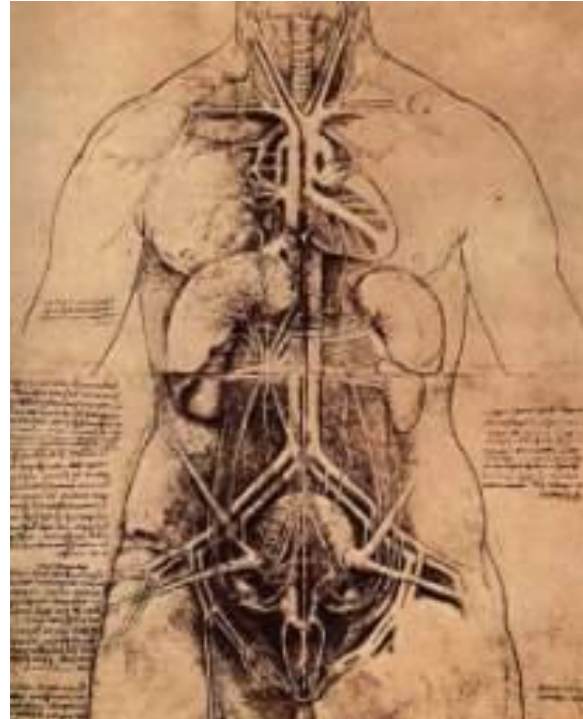
- Anatomy & Physiology
- disease resulted from an internal imbalance of the four humors
- Mistakes in understanding circulation
- Research based on ape dissection
- Textbook used for 1000 years

Dark Ages- 200 to 1200 A.D.

- Sad time
- Little new knowledge
- Taboo against dissecting human cadavers continued
- Avoided actual involvement
- Authority prevails

Renaissance da Vinci(1452-1515)

● Anatomy & Physiology



Renaissance

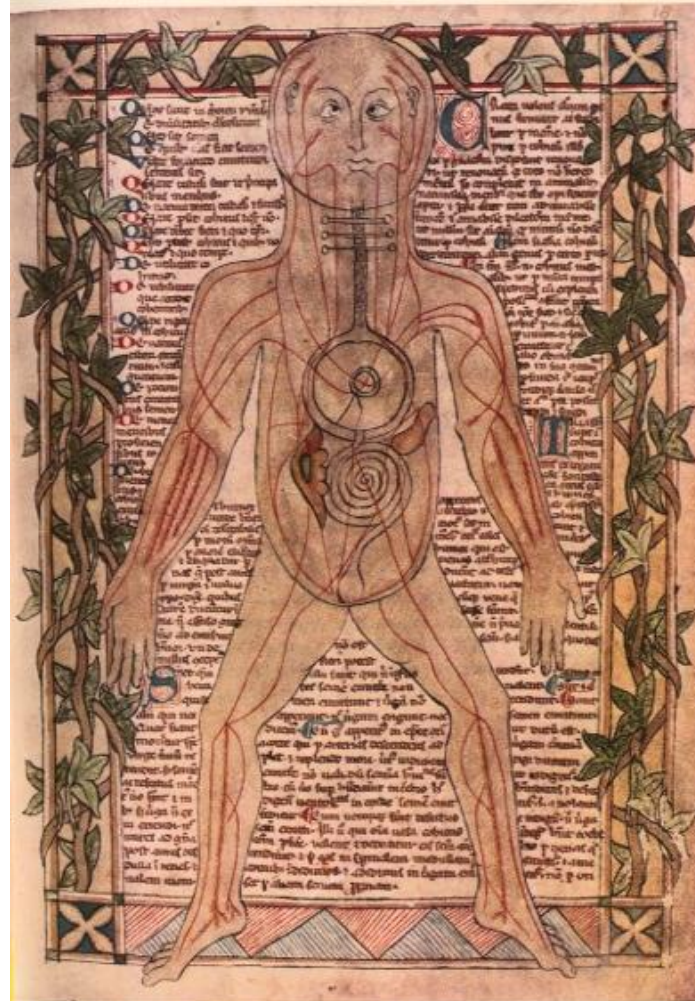
Vesalius (1514-1564)

- Anatomy & Physiology
- Followed Galen's writings, but later found he was wrong



Vesalius dissects a female cadaver in his anatomy lab

Medieval Human Anatomy Before Vesalius



A late thirteenth-century illustration of the venous system within the body.

Medieval Human Anatomy Before Vesalius



This early representation (c. 1300) of a dissection shows a surgeon and a monk.

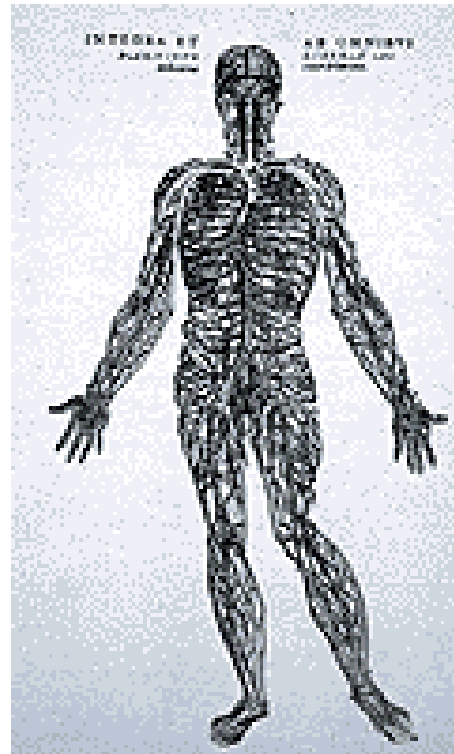
Medieval Human Anatomy Before Vesalius



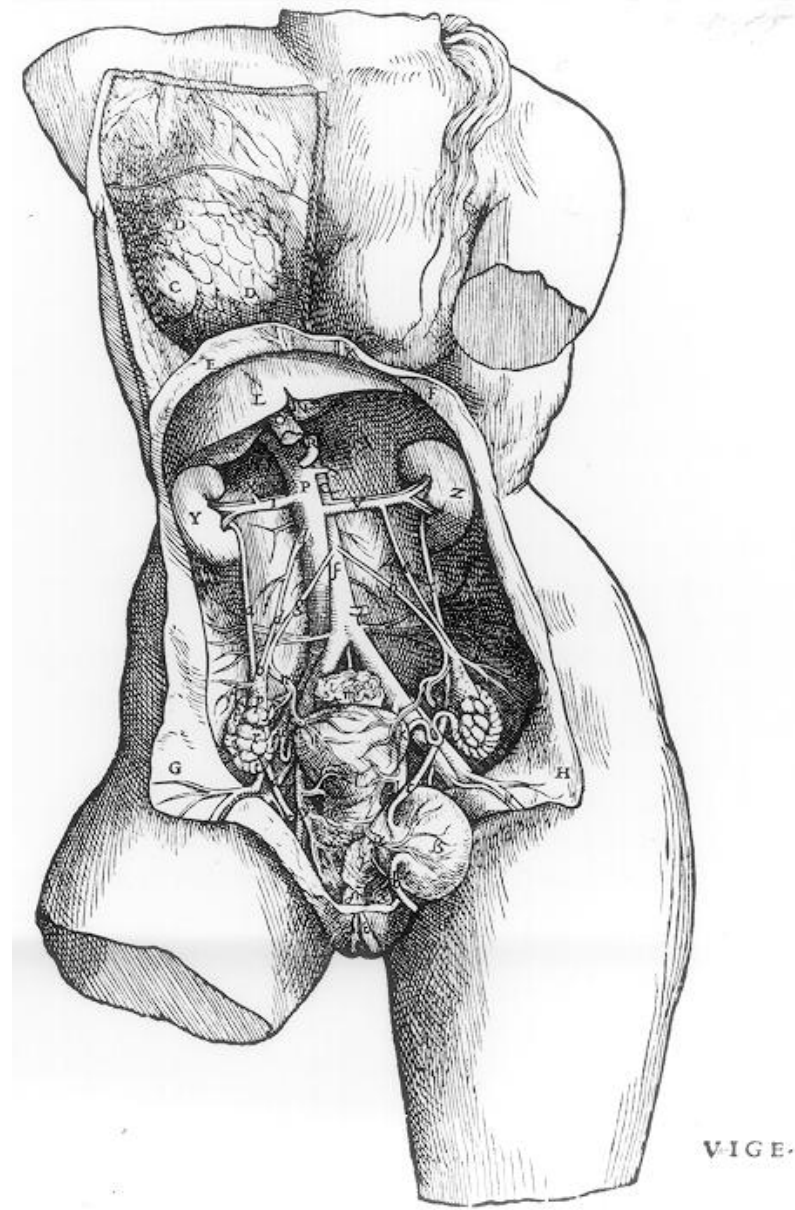
Medieval Human Anatomy Before Vesalius



Vesalius' Images

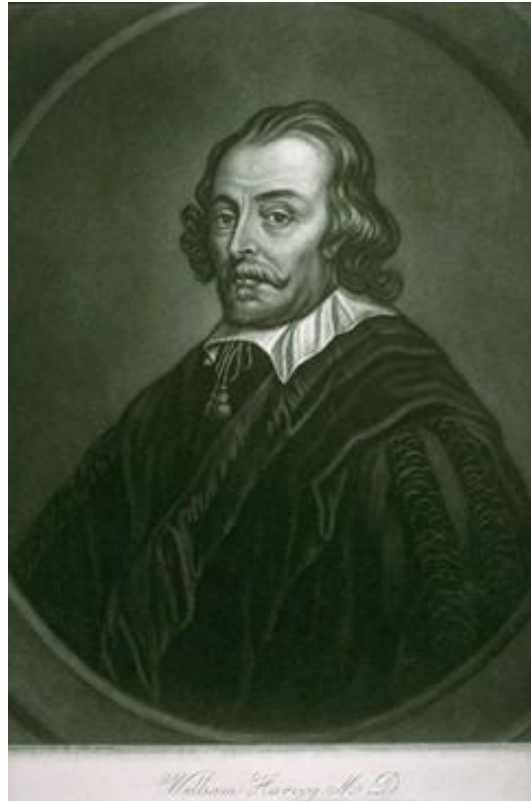


Vesalius' Images



The female pelvic anatomy. From Vesalius's *De Corporis Humani Fabrica*, 1543.

William Harvey



1578 - 1657

- Developed an accurate theory of how the heart and circulatory system operated

Figura 3.

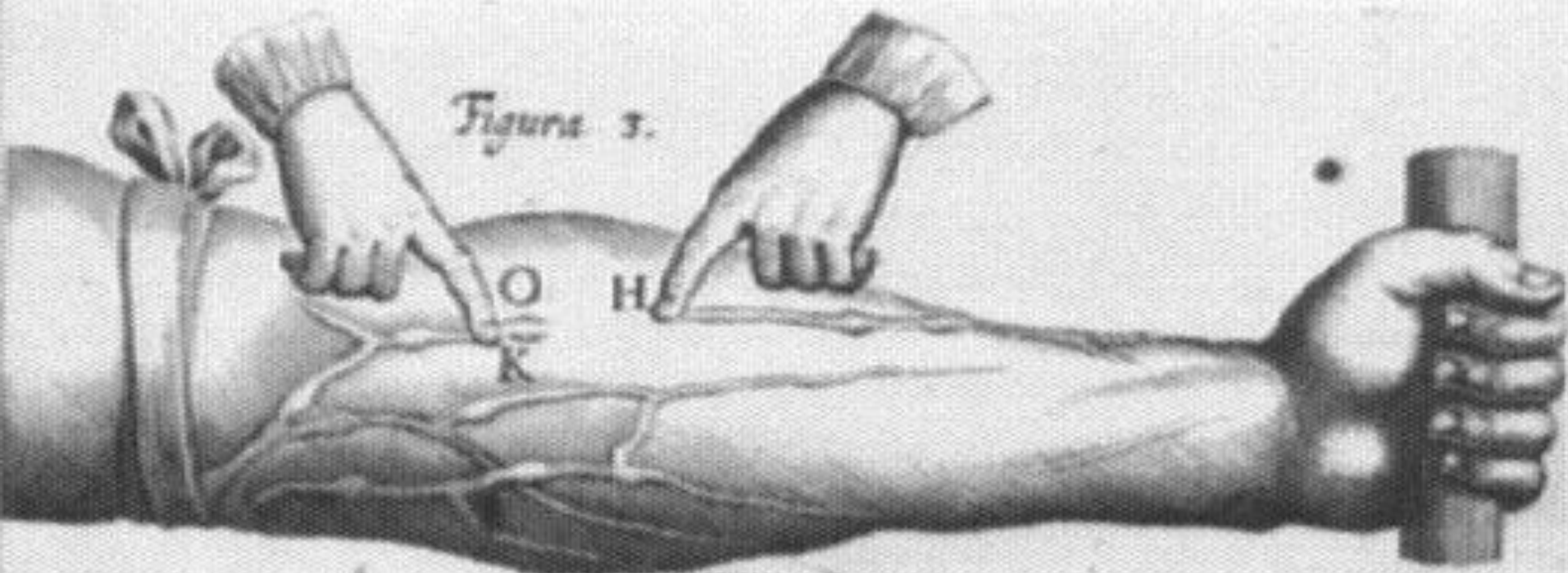
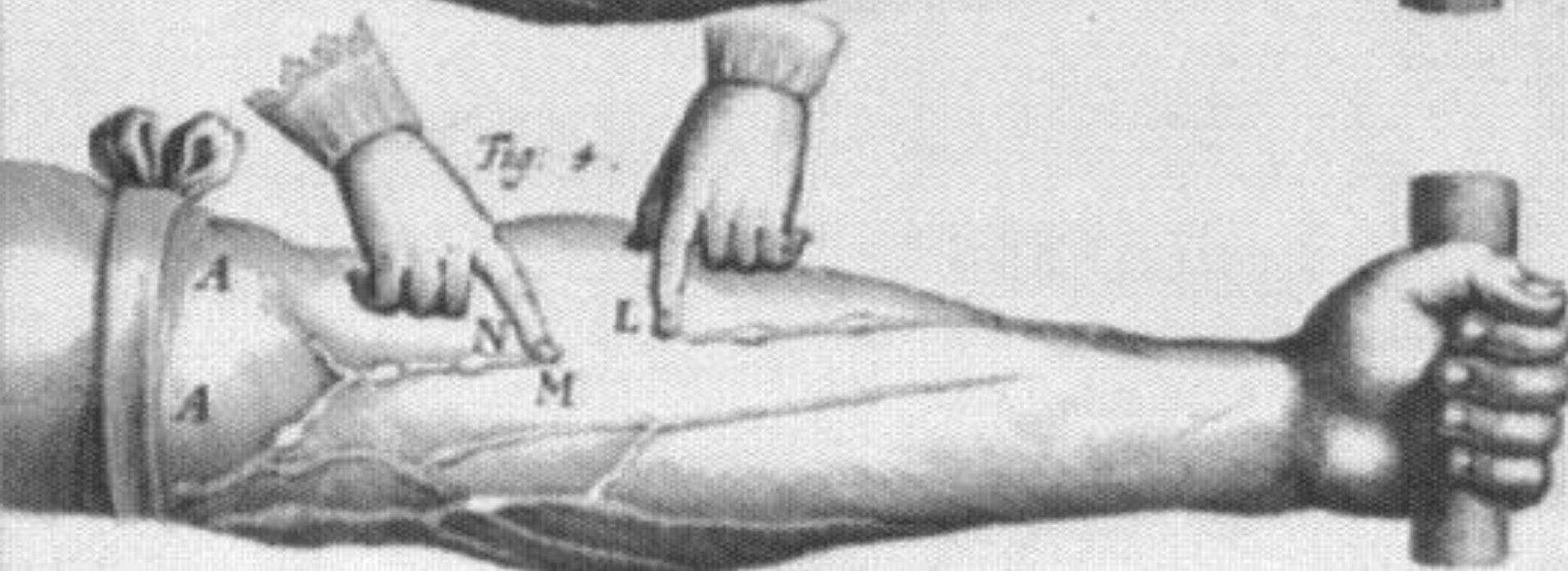
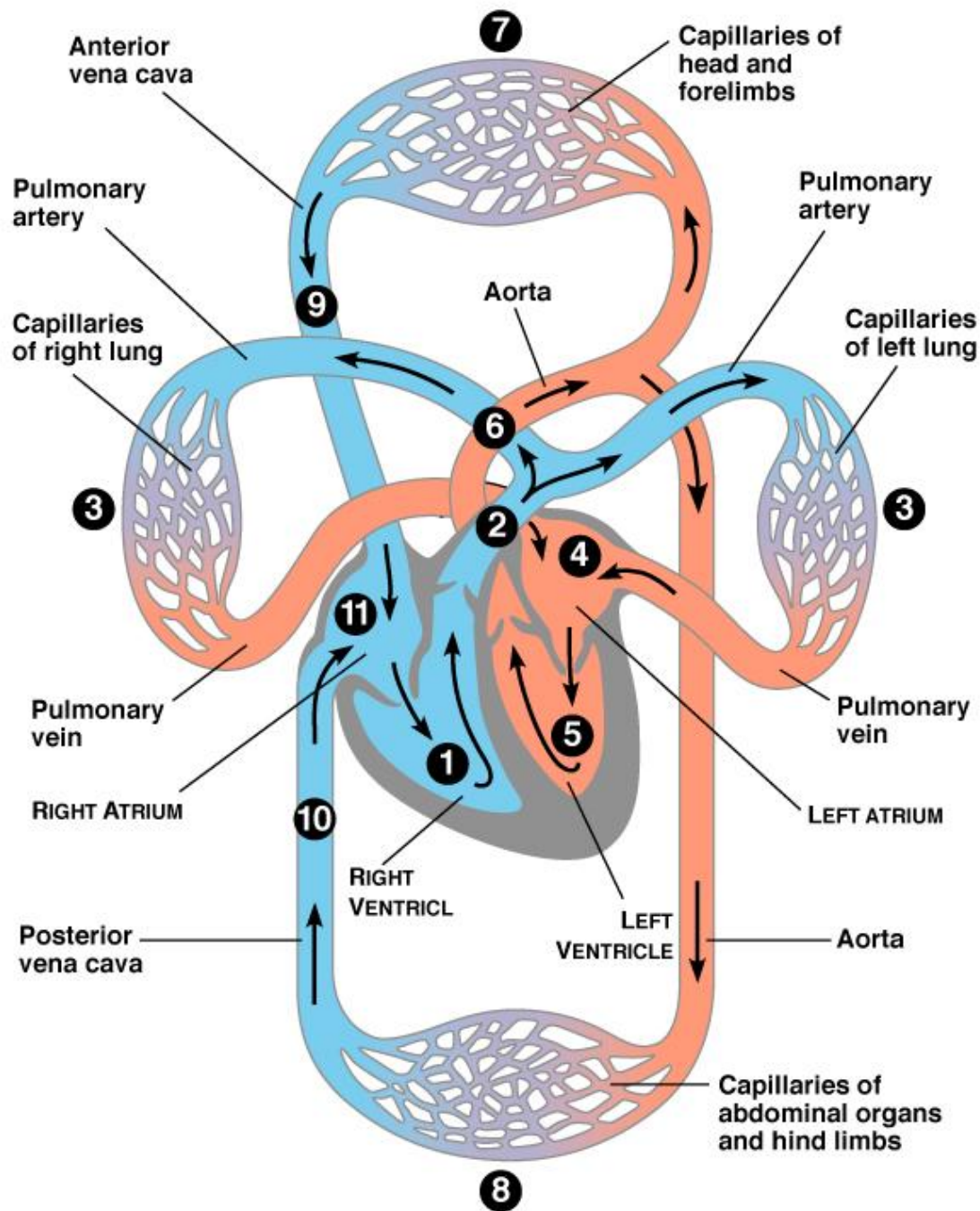


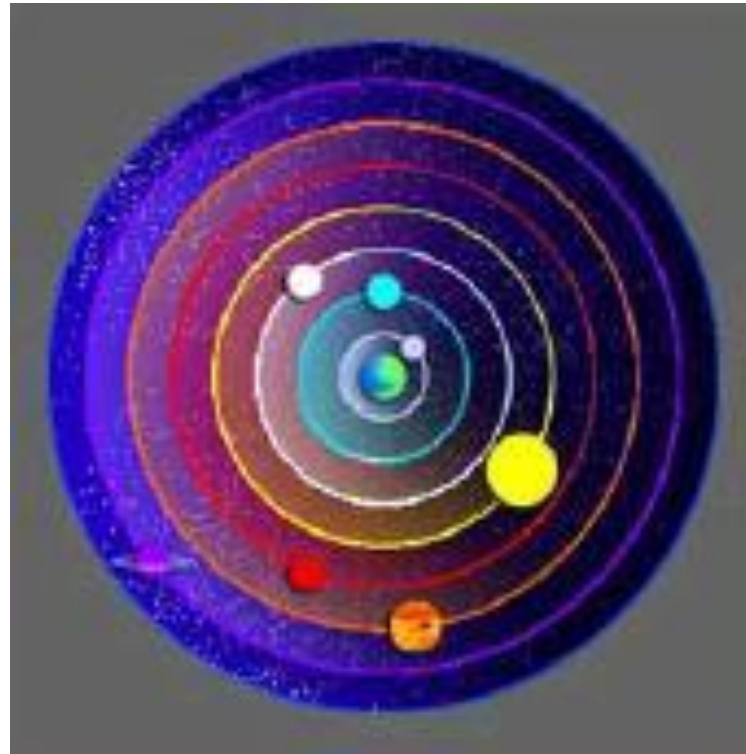
Fig. 4.





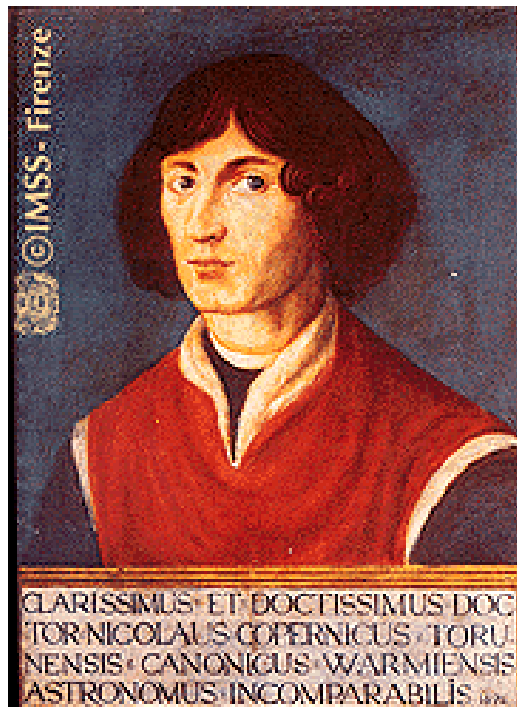
Ptolemy

- Ptolemy (170 A.D.)- geocentric universe



Nicholaus Copernicus

- Heliocentric universe; not accepted until 100 years after his death



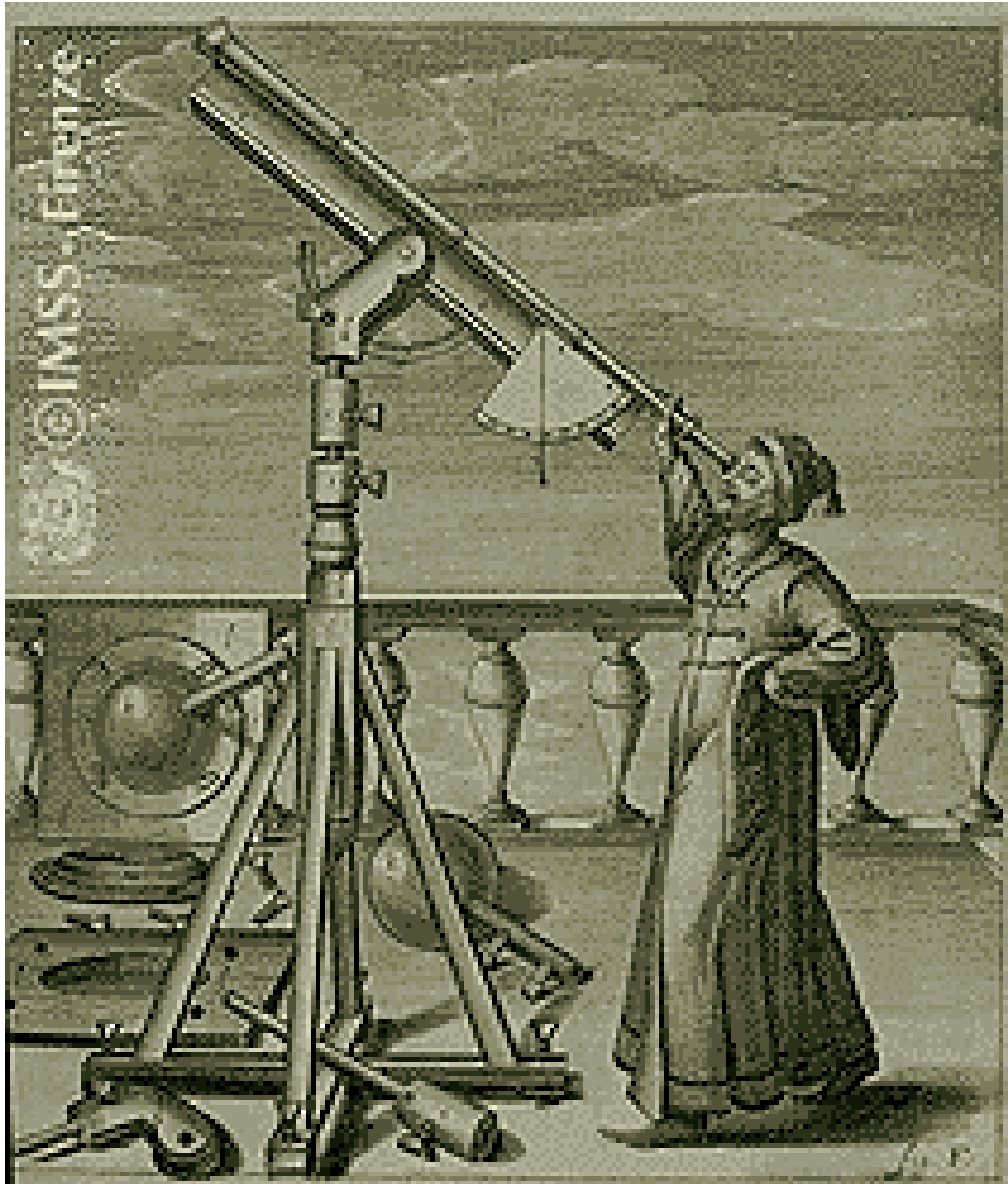
1473 - 1543 C.E.

Galileo Galilei



1564 - 1642

- physicist, astronomer, scientific method



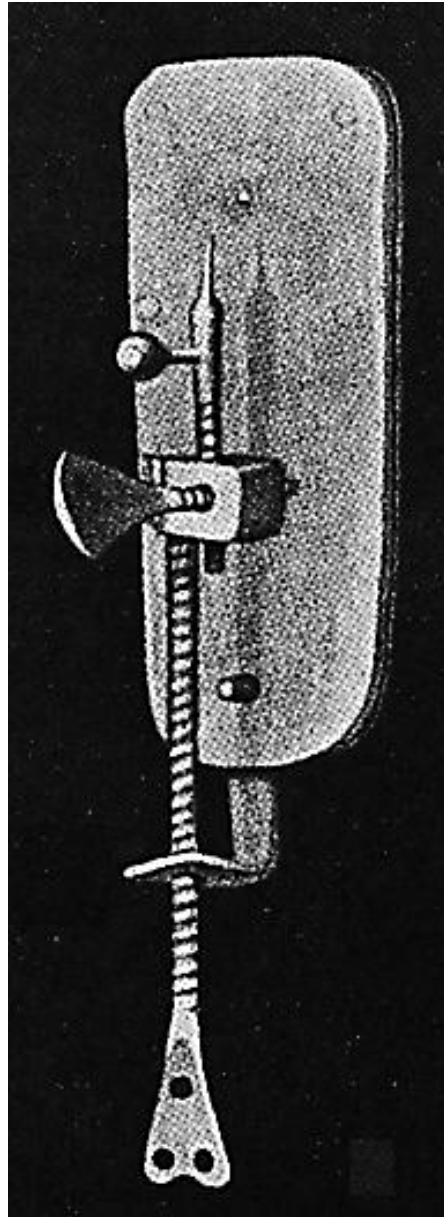
Anton van Leeuwenhoek



1632 - 1723

- Invented a simple microscope
- Discovered bacteria, protists, sperm cells, blood cells...

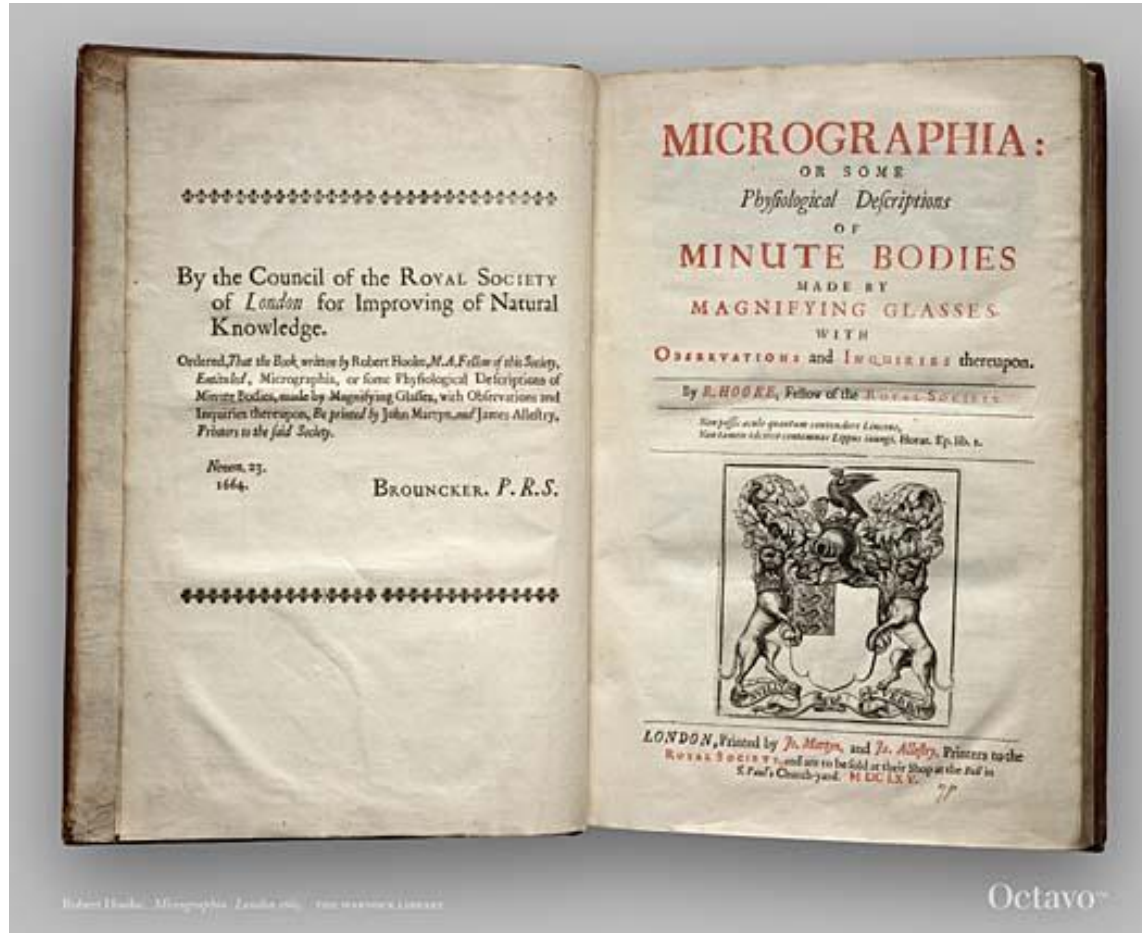
Leeuwenhoek's Microscope



Leeuwenhoek's "Animalcules"



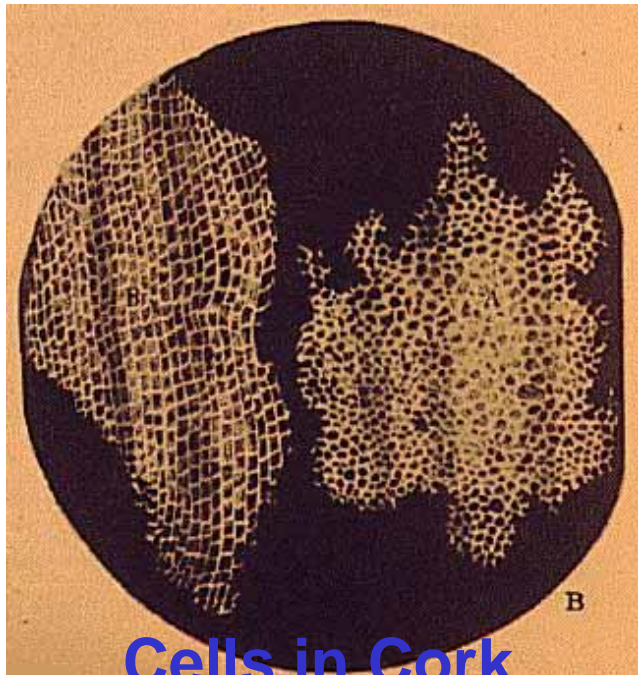
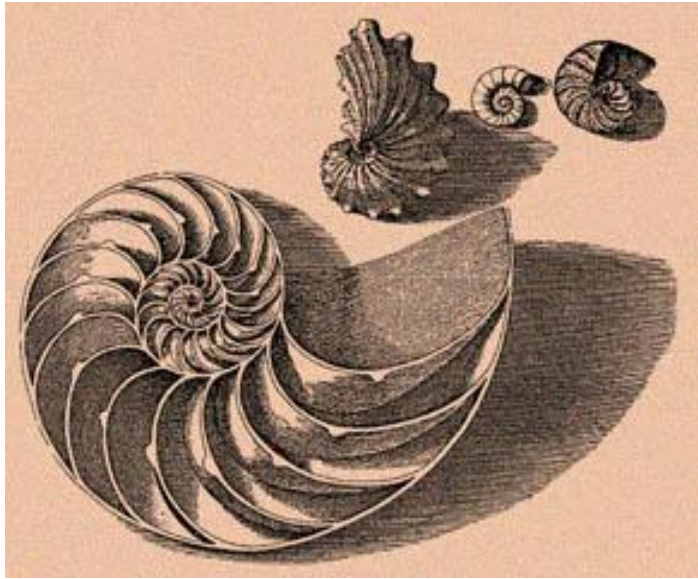
Robert Hooke



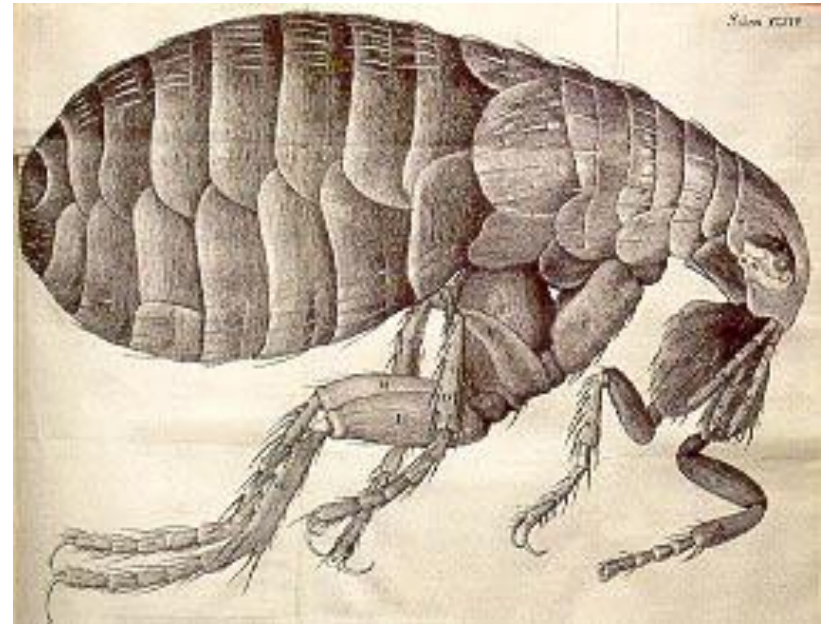
Robert Hooke, *Micrographia*, London 1665. <http://www.britainonline.com>

Octavo™

1635 - 1703







Cells in Cork



Impact of Leeuwenhoek and Hooke on the Development of Biological Science

- **Developed the microscope.**
- **Their observations led to the development of the Cell Theory.**
- **However, their observations were of little practical significance to their peers.**
- **Nothing immediately developed from their work.**

Botany

-  Medicinal plants
-  1600: 6,000 species known
-  Classification added
-  Travel to find new plants

Age of Systematics






 1700s

 **Carl Linnaeus**

 Incurable classifier

 Flair for creative simplicity

Linnaeus

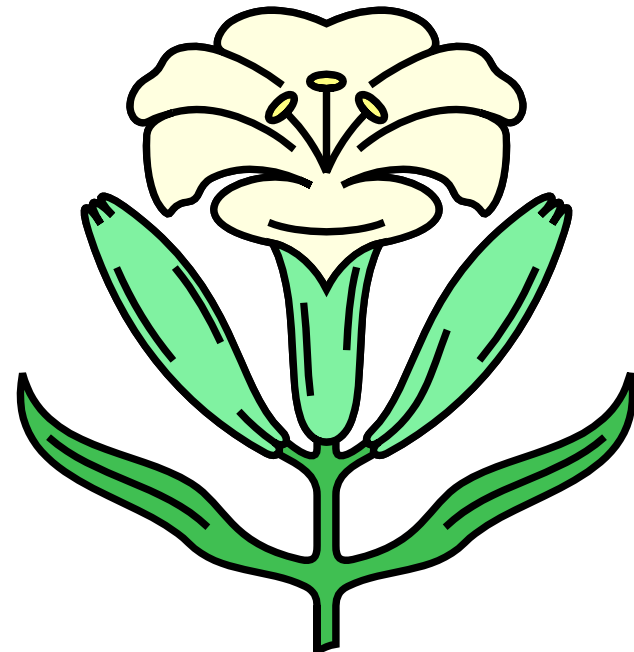
-  Born in Sweden
-  Medical school in Holland
-  14 books in 3 years
-  Fish book: 3,000 pages
-  Back to Sweden as a doctor

Linnaeus

- Cure for _____
- Goal: academic position
- Professor of Medicine & Natural History
- Held the position for 30 years

Linnaeus

- 1753: published book describing World's plants
- Start of naming process
- ID: flowers - number & structure of the parts



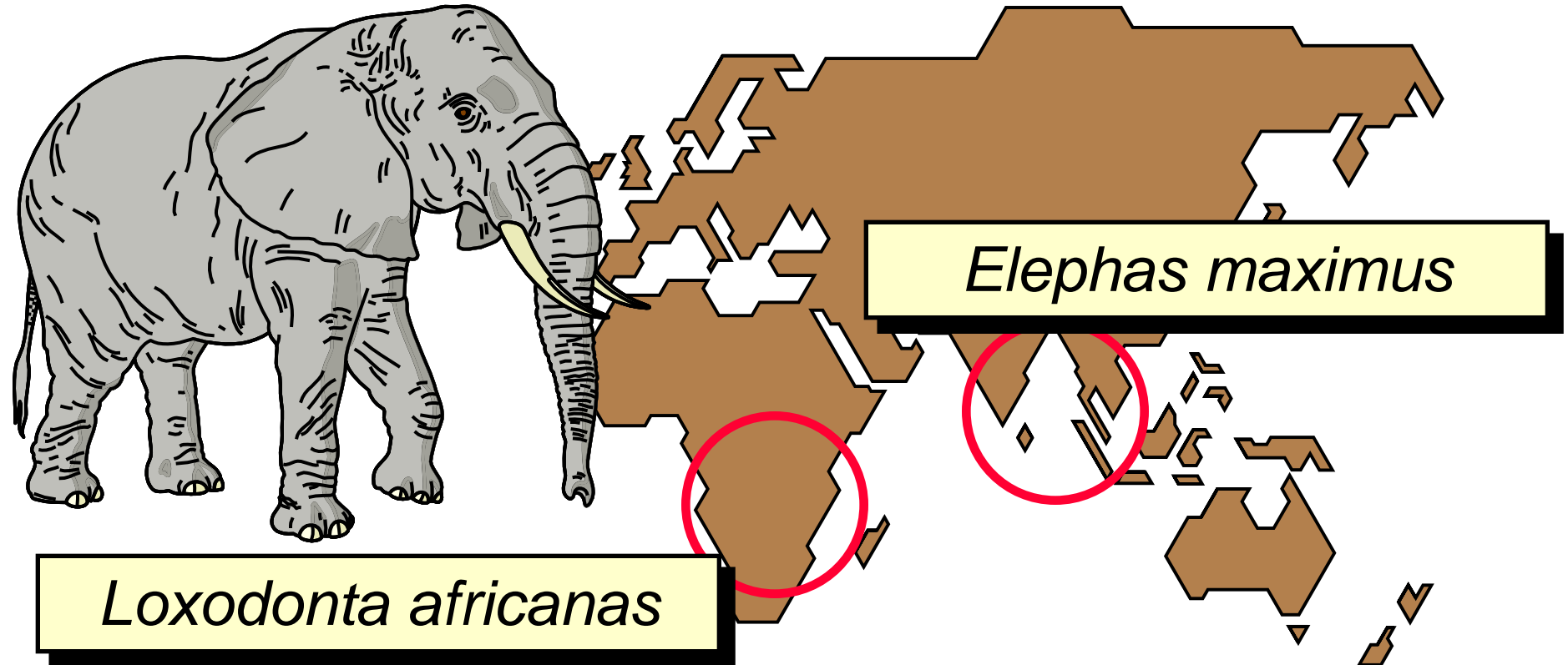
Linnaeus

- Descriptions: “poetic precision”
- Result: easily applied system
- 2 word names:
“binomial nomenclature”

Binomial Nomenclature

● 2 word name (genus + species)

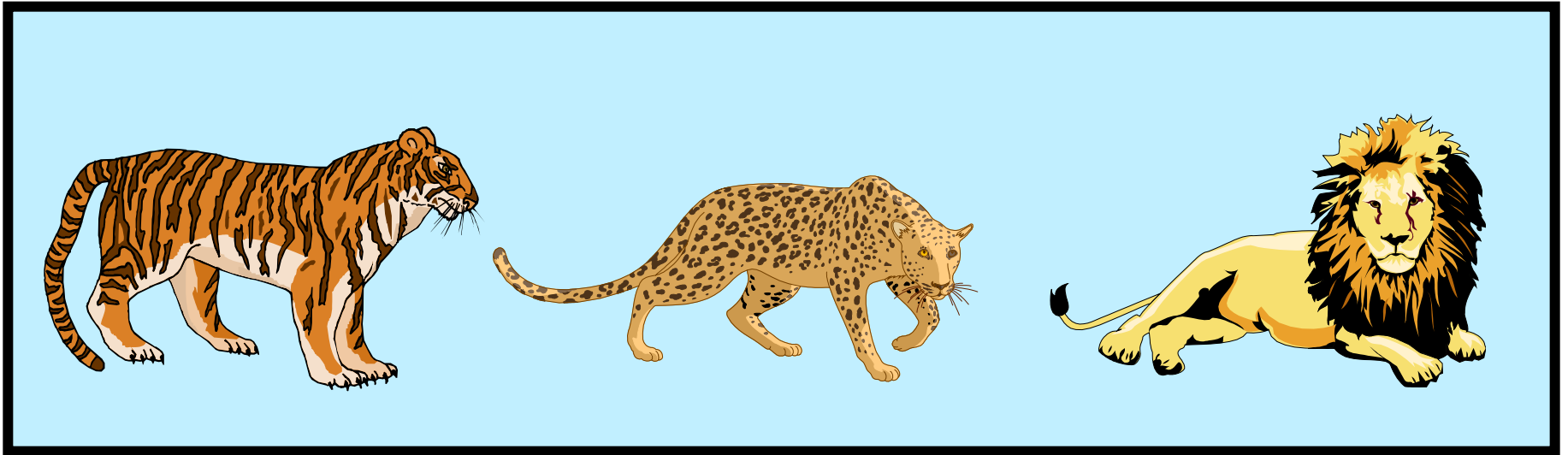
● 1st level classification



Tiger = *Panthera tigris*

Leopard = *Panthera pardus*

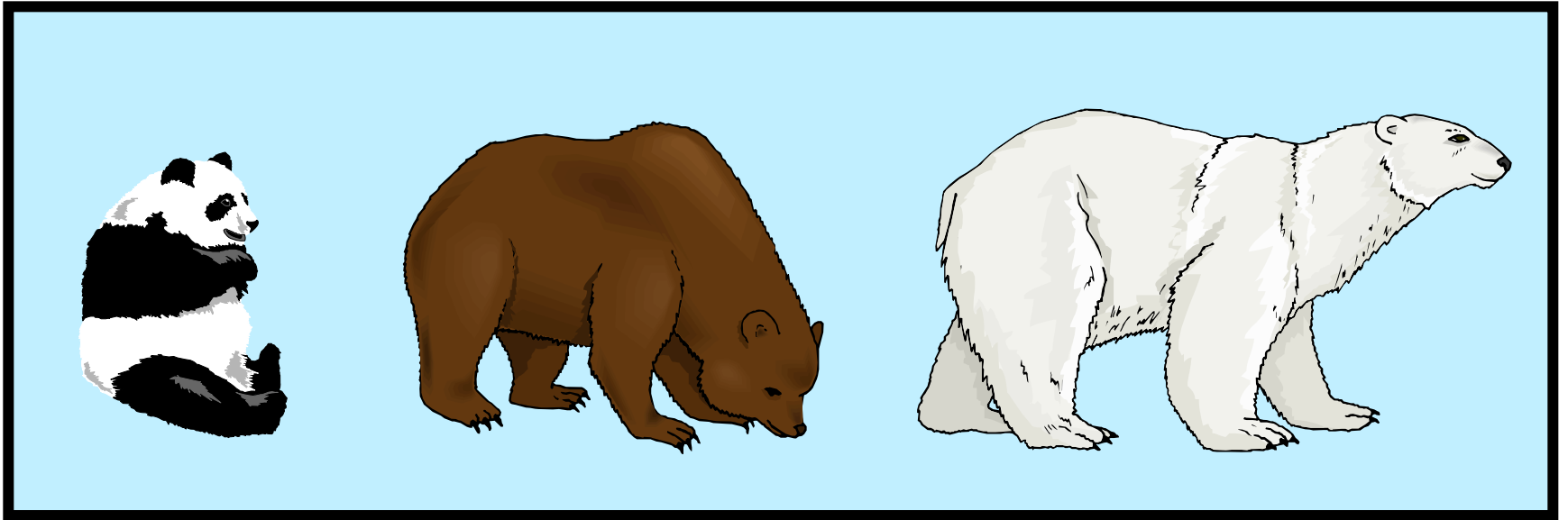
Lion = *Panthera leo*



Panda Bear = *Ailuropoda melanoleuca*

Black Bear = *Ursus americanus*

Polar Bear = *Ursus maritimus*






Linnaeus

- Classification system
- Implies relationships between species
- Linnaeus' ideas were not useful
- “National hero”

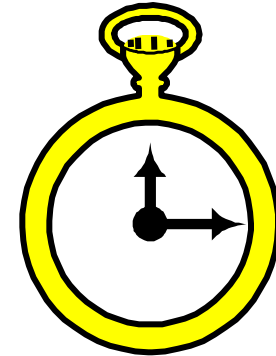
But... retarded botany for a century

Epic Voyages

-  18th & 19th centuries
-  Discover new species
-  Sponsored by governments and wealthy individuals

Epic Voyages

Navigation (longitude):



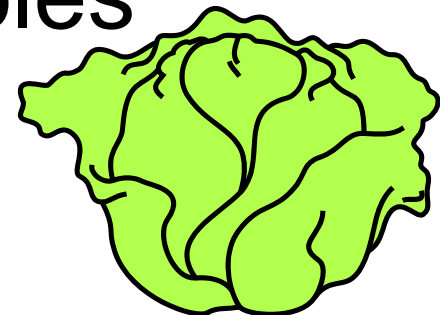
- Chronometer with temperature compensation

Prevent scurvy:



- Fresh fruits & vegetables

- Sauerkraut



Epic Voyages

Lt. James Cook

● Southern Hemisphere

● 1769: transit of Venus

● King funds the Royal Society



HMS Endeavor

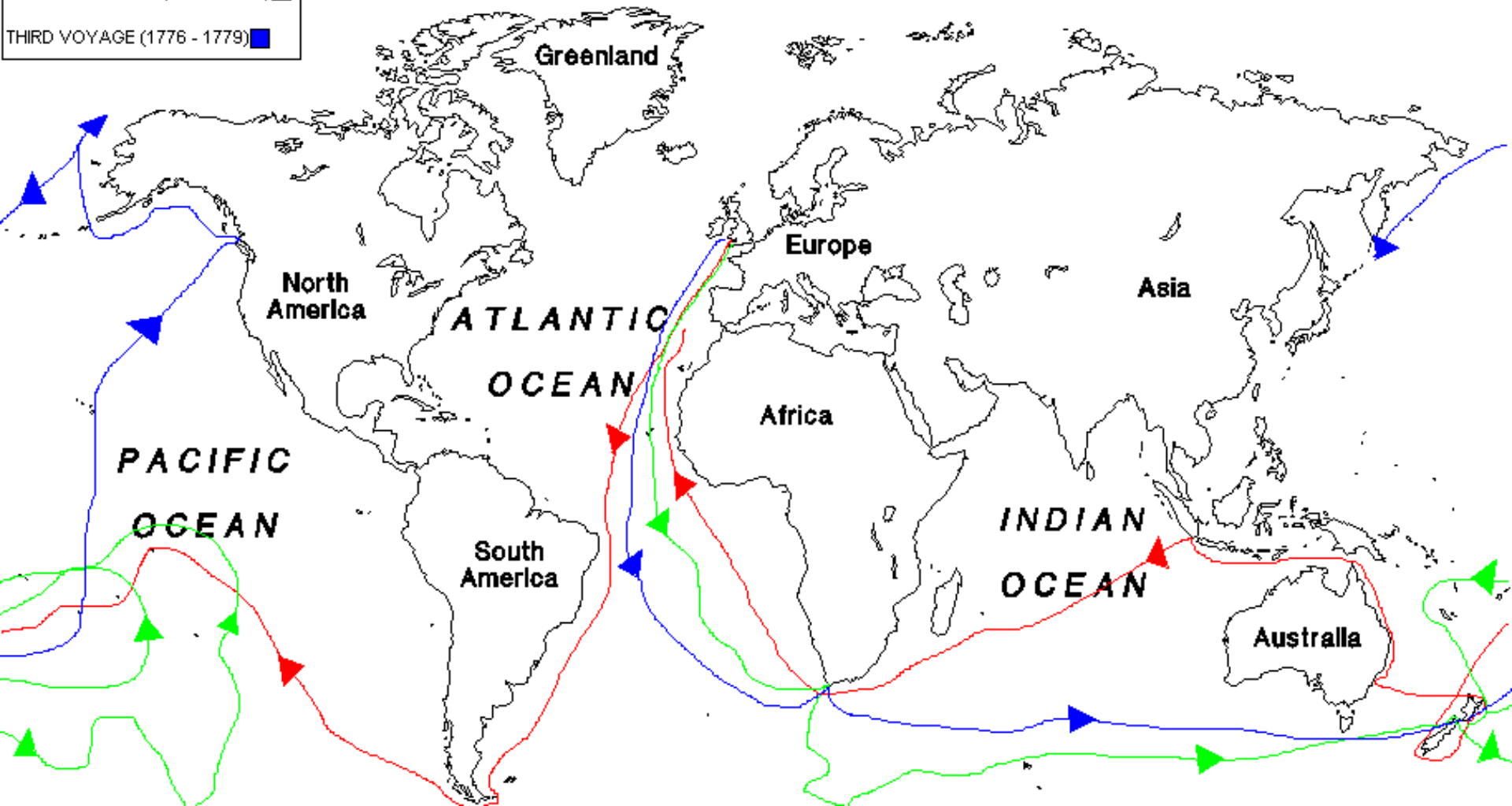
Cook (1700's)- sailed twice around the world

1st European to visit Hawaii



- FIRST VOYAGE (1768 - 1771) ■
- SECOND VOYAGE (1772 - 1775) ■
- THIRD VOYAGE (1776 - 1779) ■

CAPTAIN JAMES COOK



Cook's First Voyage

● Passengers: **Joseph Banks + 9**

● Stopped in Tahiti

● Named the "Society Islands"

● NZ & Australia

● Botany Bay





Banksia

Other Epic Voyages

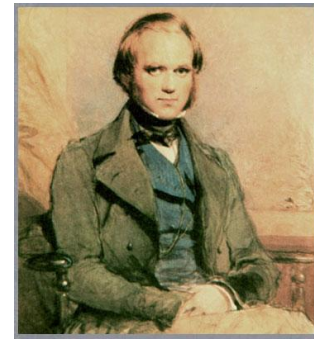
🟢 **Capt. Fitzroy**

🟢 **1831: HMS Beagle**

🟢 **Chas. Darwin**

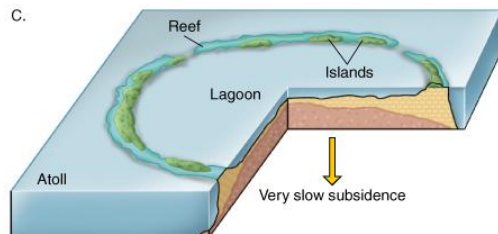
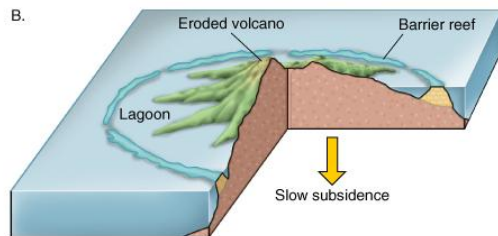
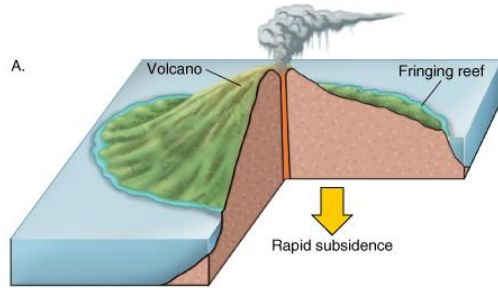


Darwin- HMS Beagle (1831);

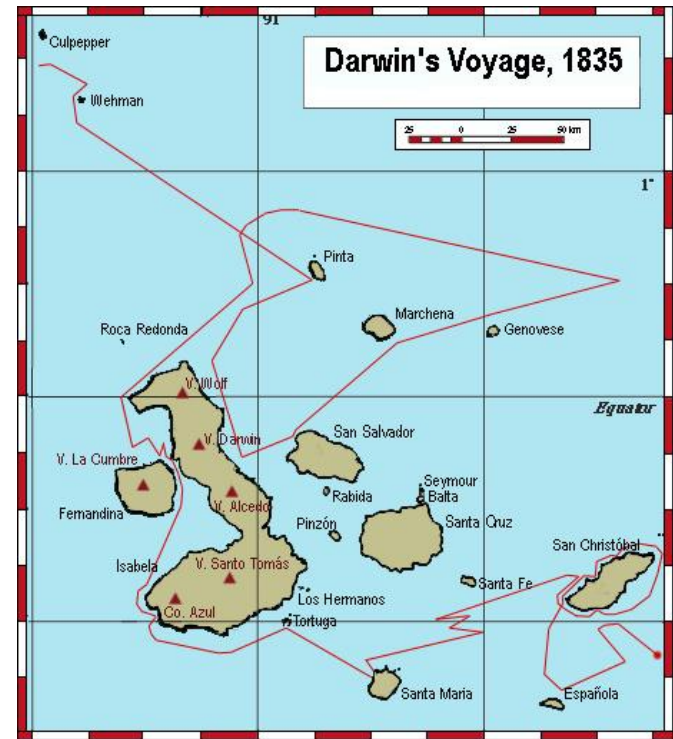


- Subsidence theory

- Origin of Species (1859)



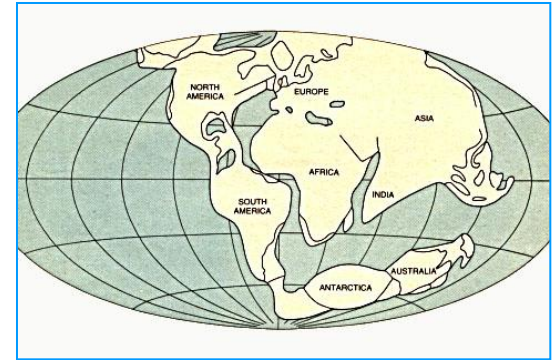
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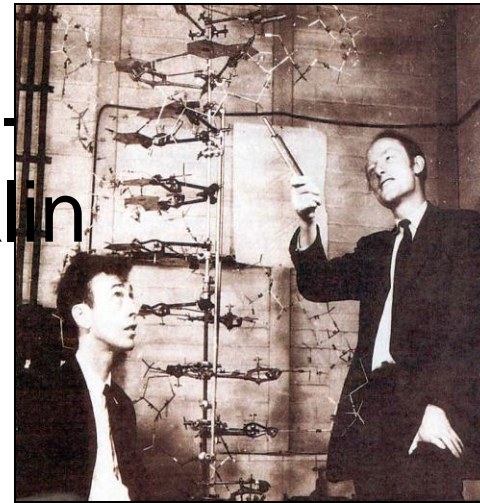
Galapagos Islands, Ecuador

Modern Science

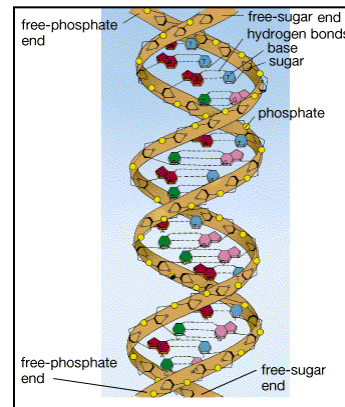
- Wegener (1880-1930)- plate tectonics



- Crick & Watson 1953-
Rosalind Elsie Franklin
(1900's)- DNA



- Human Genome Project



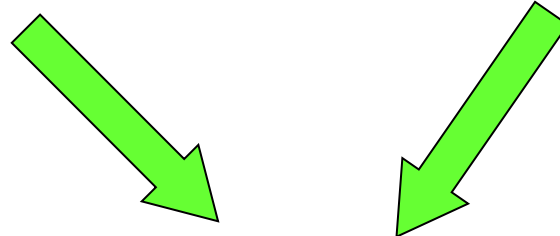
Science Disciplines

Physical Sciences

Physics
Astronomy
Chemistry
Geology
Aerospace
Engineering
Agronomy

Biological or Life Sciences

Botany
Zoology
Oceanography
Marine biology
Embryology
Anatomy
Ecology
Genetics
Microbiology



Biochemistry
Biophysics
Biomath
Bioengineering

TECHNOLOGY

Questions:

- Linnaeus developed a classification scheme that uses _____ nomenclature.
- The invention of the microscope contributed to the _____ theory.
- Cook's primary mission in 1769 was to _____.
- Vitamin C prevented _____.
- Two theories proposed by Darwin are:
- Galen's anatomy text book was based on the anatomy of _____.