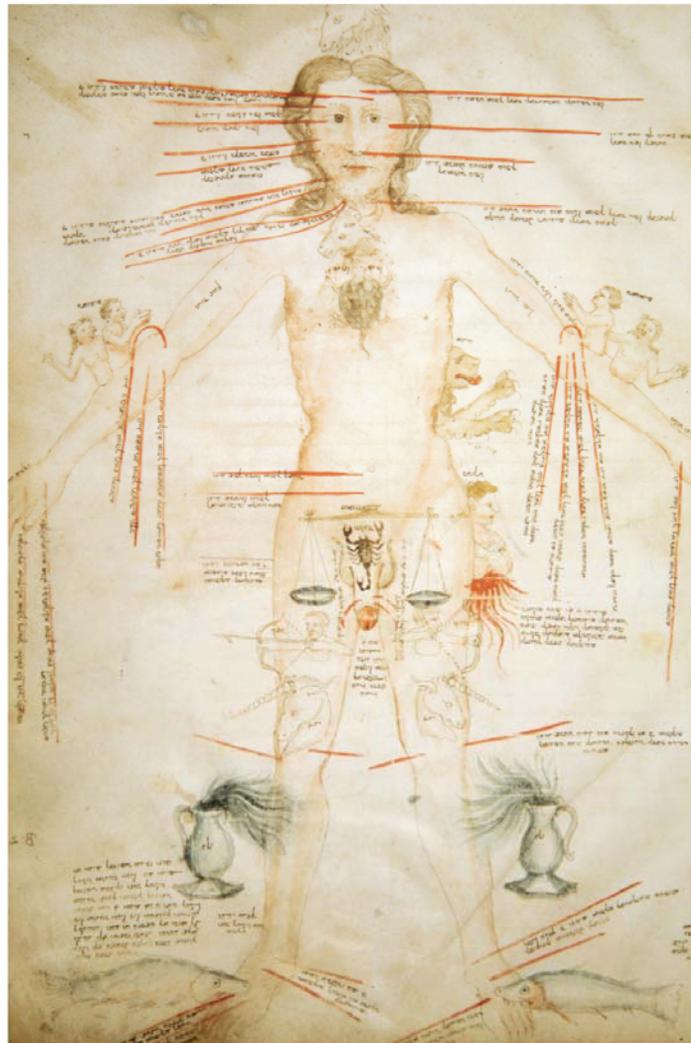


# Origins of Bio-Medical Science

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Art Resource

# Greek and Roman Legacy

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- **Physicians in Mesopotamia and Egypt**
  - 3000 years ago used herbal drugs, salts and physical therapy
- **Hippocrates (460-375 BCE) - Greek physician**
  - “father of medicine”
  - established a code of ethics (Hippocratic Oath)
  - urged physicians to seek natural causes of disease rather than attributing them to acts of the gods and demons

# Greek and Roman Legacy

- Aristotle (384-322 BCE) // one of the first philosophers to write about anatomy and physiology
  - believed that diseases had either supernatural causes or physical causes
    - called supernatural causes of disease theologi
    - called natural causes for disease physiologi
    - this gave rise to the terms: physician and physiology
  - believed that complex structures are built from simpler parts
  - *His most famous student was Alexander the Great!*

# Greek and Roman Legacy

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- **Claudius Galen**
  - physician to the Roman gladiators
  - did animal dissections since use of cadavers banned in his time
  - saw science as a method of discovery not just a body of facts taken on faith
  - wrote book advising followers to trust their own observation more than the teaching of dogma of the “ancient masters”

# Birth of Modern Medicine

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- **Christian culture of Europe in Middle Ages**
  - science severely repressed
  - taught medicine primarily as dogmatic commentary on Galen and Aristotle
  - crude medical illustrations
- **In Jewish and Muslim cultures allowed more free inquiry that was less inhibited**
- **Jewish physician Maimonides** (Moses ben Maimon)
  - wrote 10 influential medical texts
  - was physician to Egyptian sultan, Saladin
- **Avicenna (Ibn Sina) from Muslim world**
  - “the Galen of Islam”
  - combined Galen and Aristotle findings with original discoveries
  - wrote ***The Canon of Medicine***, used in medical schools for 500 years

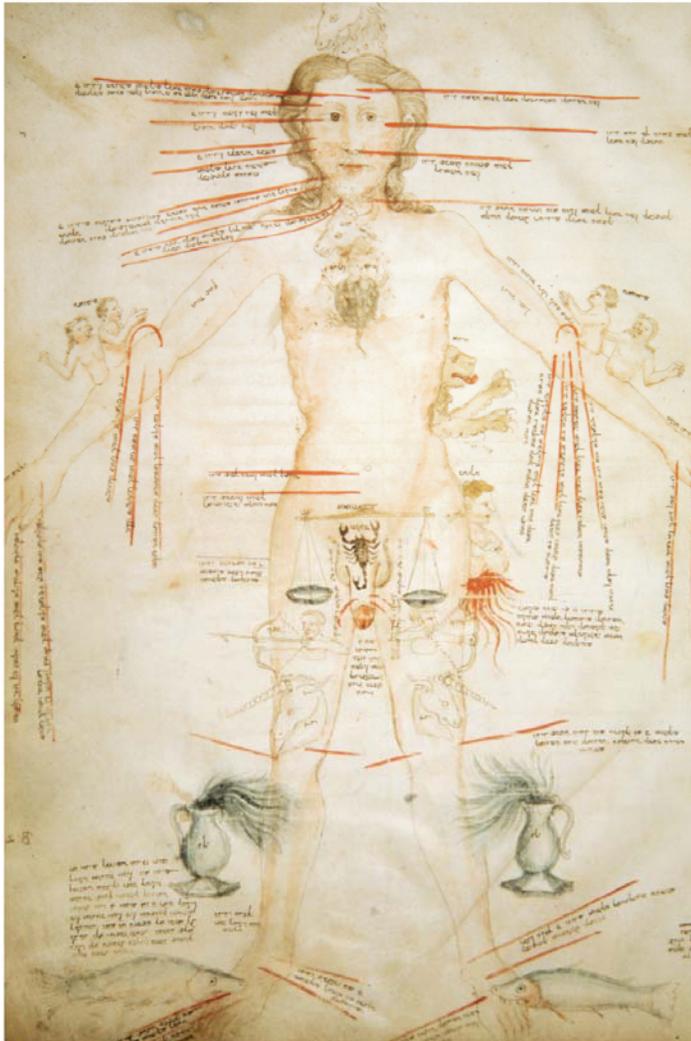
# Birth of Modern Medicine around the 16<sup>th</sup> century

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- **Leonardo da Vinci (1452 - 1519)**
  - Renaissance Artist & Scientist
  - Catholic Church was his patron
  - **Forced him to abandon his anatomical studies**
  - His work was not “rediscovered” until 200 years after his death. By then most of his work was duplicated by other people, but 200 years of “learning” was lost.
  
- **Andreas Vesalius (1514 – 1564)**
  - taught anatomy in Italy
  - Catholic Church relaxed restrictions on dissection of cadavers and permitting autopsies
  - barbering and surgery were considered ‘kindred arts of the knife’
  - performed his own dissections rather than the barber-surgeons
  - published first atlas of anatomy, *Di Humani Corporis Fabrica (On the Structure of the Human Body)* in 1543

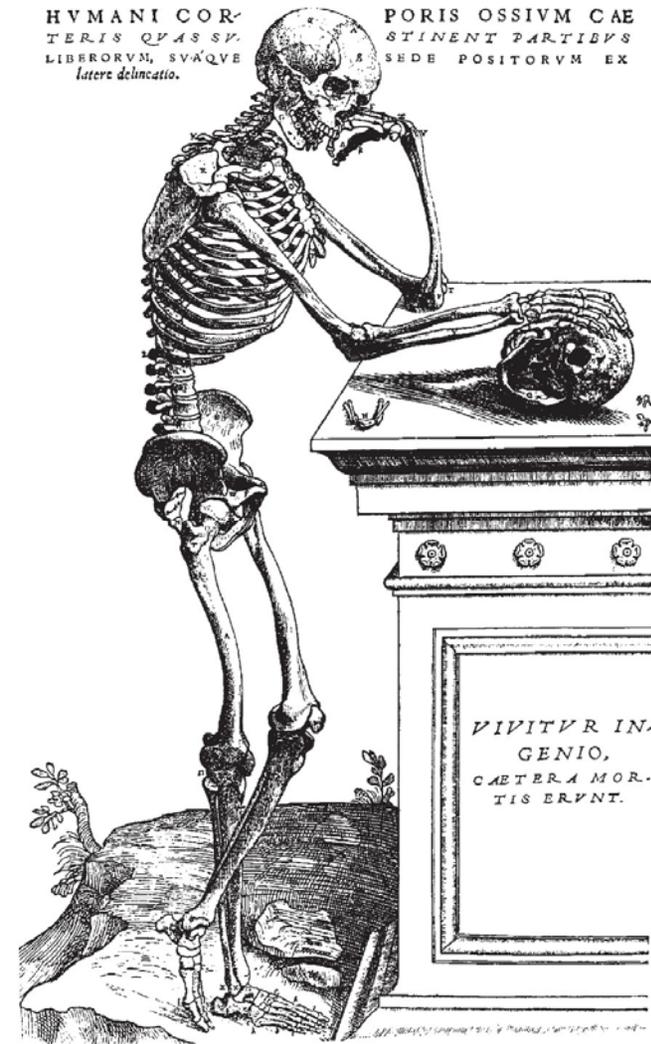
# Early Medical Illustrations

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# Birth of Modern Medicine around the 16<sup>th</sup> century

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- **William Harvey (1578 – 1657)**

- early physiologist...contributions represent the birth of experimental physiology
- remembered for early studies on blood circulation
- realized blood flows out from heart and back to it again
- published book *De Motu Cordis (On the Motion of the Heart)* in 1628

- **Michael Servetus**

- along with Harvey, were the first Western scientists to realize that blood must circulate continuously around the body, from the heart to other organs, and back to the heart again

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**Note:** What are the historical parallels in science today?

(Hint: Stem Cell Research. How may this affect your health?)

# Birth of Modern Medicine

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- **Robert Hooke**
  - made many improvements to the compound microscope -2 lenses-ocular lens (eyepiece) and objective lens (near specimen)
    - invented specimen stage, illuminator, coarse and fine focus controls
    - his microscopes magnified only 30X
    - first to see and named 'cells'
  - published first comprehensive book of microscopy (*Micrographia*) in 1665
- **Antony van Leeuwenhoek**
  - invented a simple (single-lens) microscope with great magnification to look at fabrics (200X)
  - published his observations of blood, lake water, sperm, bacteria from tooth scrapings and many other things

# Birth of Modern Medicine

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- **Carl Zeiss & Ernst Abbe** // greatly improved the compound microscopes
  - added condenser and superior optics // eliminated blurry edges (spherical aberration) and rainbow-like distortions (chromatic aberration)
- **Matthias Schleiden and Theodor Schwann** // with improved microscopes, examination of a wide variety of specimens followed
  - Studies resulted in the **Cell Theory** // considered as the most important breakthrough in biomedical history
    - *All organisms are composed of cells*
    - *Cells are the smallest unit of life*
    - *All functions of the body are interpreted as effects of cellular activity*
    - *Cells only originate from living cells.*

# Early Compound Microscopes

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(a)

(b)

a: Courtesy of the Armed Forces Institute of Pathology, b: © Corbis-Bettmann

**The first cells seen were plant cell walls in a section of dried cork.**

# Living in a Revolution

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- **Modern biomedical science**
  - technological enhancements // advances in Medical Imaging have enhanced our diagnostic ability and life-support strategies
- **Genetic Revolution**
  - human genome is finished
  - gene therapy is being used to treat disease
- **Early pioneers were important**
  - established scientific way of thinking
  - replaced superstition with natural laws