

Introduction to Medical Imaging

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- **Humours:** Until 19th century western medicine was based on Galen's theory of humours, or principal fluids: black bile, yellow bile, phlegm (strange liquid related to tumors), and blood
 - Healing included physical and spiritual therapeutics like herbs, healthy diet, cleaning, meditation, prayers, music
 - It was understood that environment influenced the humours
 - However they also used leeches (*sangsue*)...
- **De Humani Corporis Fabrica - 1543:** series of books of Andreas Vesalius on human anatomy (University of Padova). Great and clear illustrations of the human anatomy.
- **19th century:** advances in technology and science make more systematic the analysis of symptoms for diagnosis (e.g. stethoscope invented in 1816 by René Laennec at the Necker-Enfants Malades Hospital in Paris.)

- **Before 19th century:** anatomical and functional study of human body is based on the strategy *open, examine, report*.

During 19th-20th century: external tools are used to probe the human body (non invasive). For instance, neurosurgeon Penfield stimulated the brain of conscious patients with electrical probes and observed their responses → **cortical homunculus**

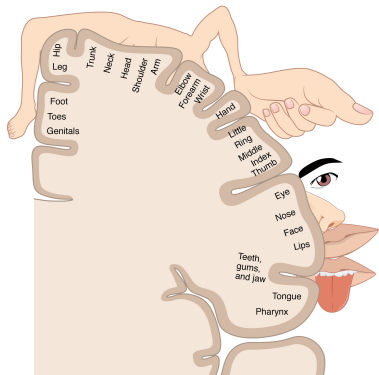


Figure 1: Image taken from Wikipedia.

- **During 20th century:** Medical imaging transforms clinical practice and research ! We can now see inside the human body in a non-invasive way !
- **1895:** first X-ray image (Rontgen)
- **1940-1950:** medical ultrasonography
- **1973:** first Magnetic Resonance imaging on a animal
- **1990:** development of nuclear medicine



Figure 2: Image taken from Wikipedia.

- There are different medical imaging techniques
- Each technique is based on different physical principles and can be used to analyze only specific tissues/organs/functions of the human body
- Different techniques give different results → choice depends on what you want to do/analyze
- **You need to understand the physical principles behind the imaging modalities to correctly analyze/interpret the resulting images !**

Medical Imaging

In this course, you will learn about:

- X-ray imaging



- Ultrasound imaging



- Magnetic Resonance imaging



and much more...

Complex and multi-disciplinary topic

- Physics
- Mathematics
- Computer Science
- Biology
- Medicine, Anatomy
- Neuroscience, Psychology
- Engineer - Doctor communication
- and the patient....

- Reconstruction, Denoising
- Improve quality
- Segmentation, Detection, Classification
- Modeling
- Visualization
- Fusion of Information among modalities
- Computer-aided tools for clinicians
- ...

Research in medical imaging

