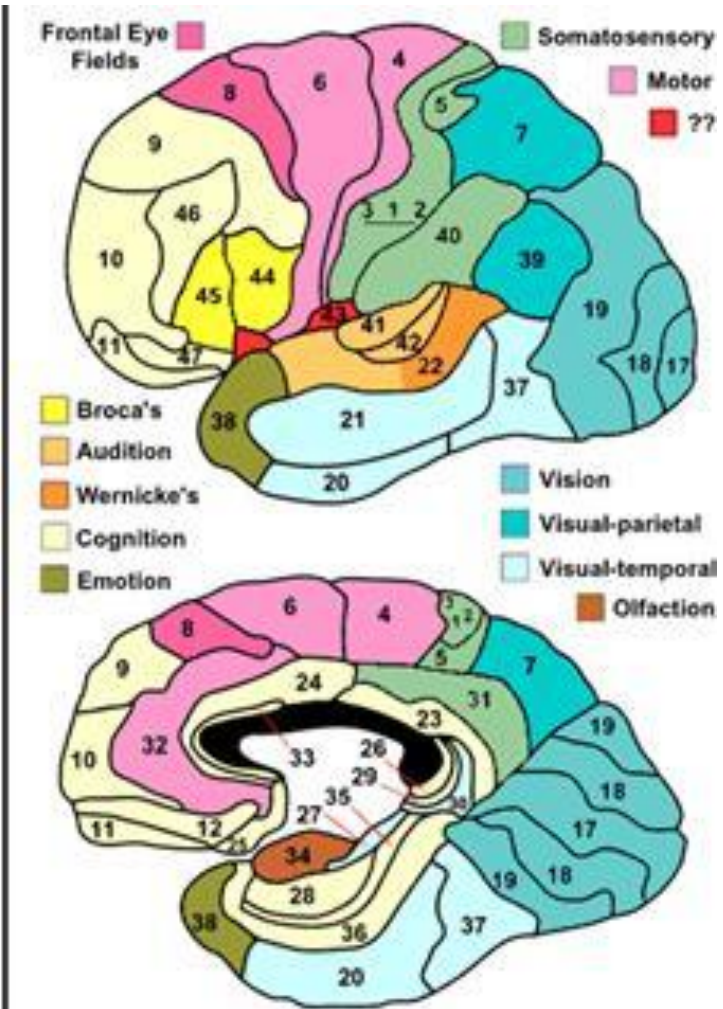


Whole Brain Imaging 2017

Brain Tissue is not Uniform

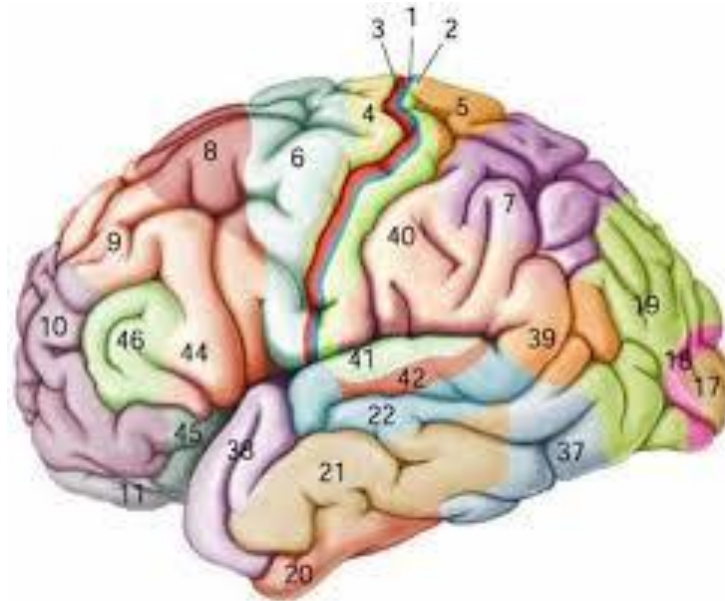


Grey vs White Mater

Broadmanm

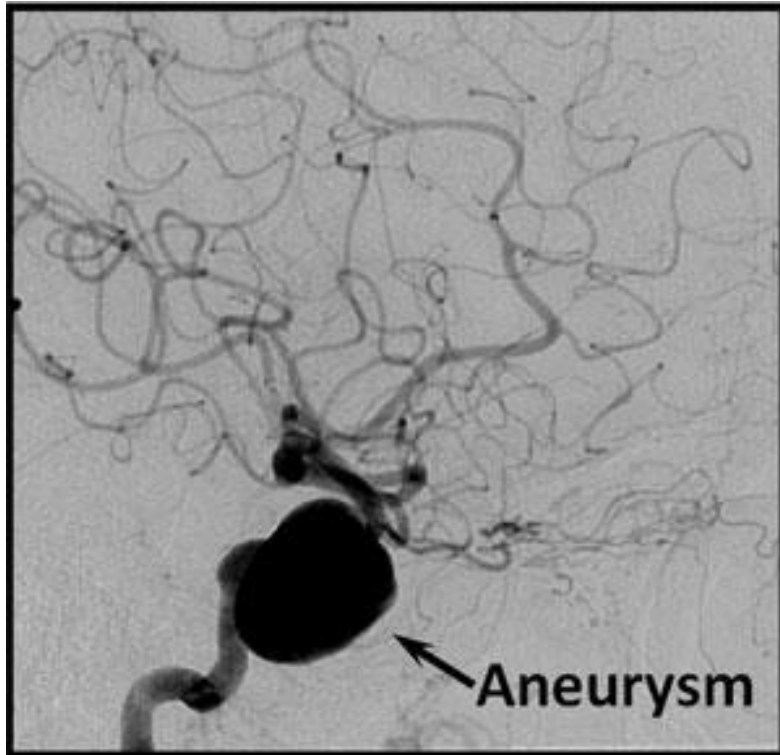
Liquid vs Solid

Protiens, Carbohydrates and Saltwater



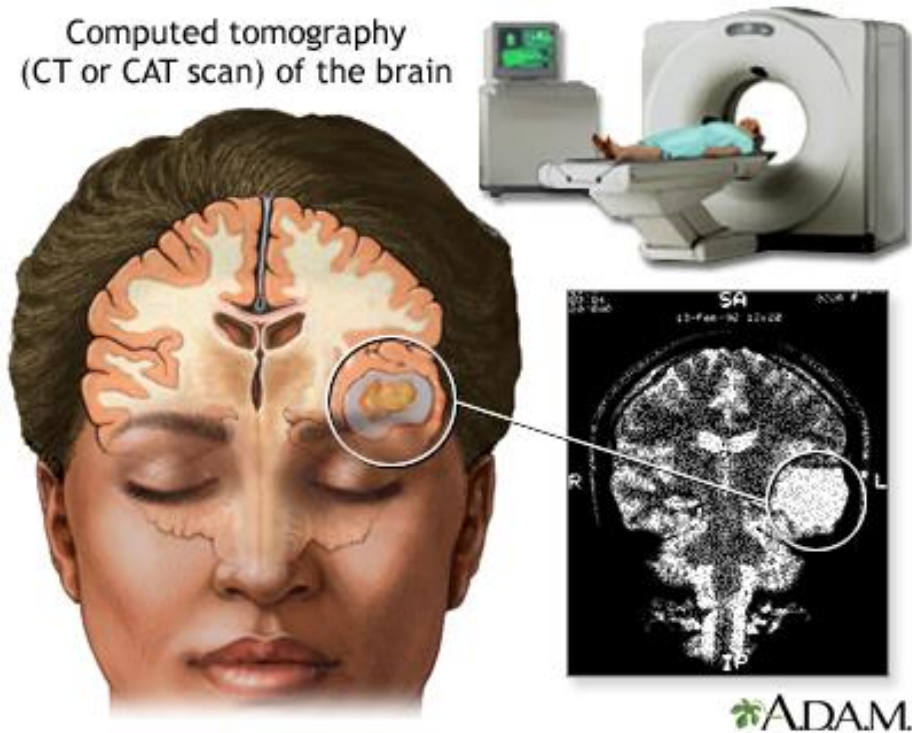
X-Rays and Cerebral Angiogram

- Dye enhanced X-ray
- Show vascular damage ...aneurysm, abnormal ballooning



Computer Tomography

Computed tomography
(CT or CAT scan) of the brain



CT scan of the brain

The imaging technique called CT or CAT scan (computed tomography) is much more sensitive than x-ray. With this technology, a technician can see both bones and soft tissues very well. CT can provide clear images of the brain, veins, arteries, tumors, and hemorrhages with or without the injection of contrasting dye.

Spatial resolution in mm and particularly good for liquid boundaries

Magnetic Resonance Imaging

<https://www.youtube.com/watch?v=MiL0wCZr0Mw>

-Resolution less than a mm

-Works by exciting hydrogen proton and looking at their relaxation rate

After being placed in the MRI and protons precessing at a constant frequency, some in phase, some in anti-phase a Radio Frequency Pulse is applied....two things happen

(1) some protons in the parallel phase absorb energy, reverse polarity to the antiparallel phase, and therefore decrease the net longitudinal magnetization;

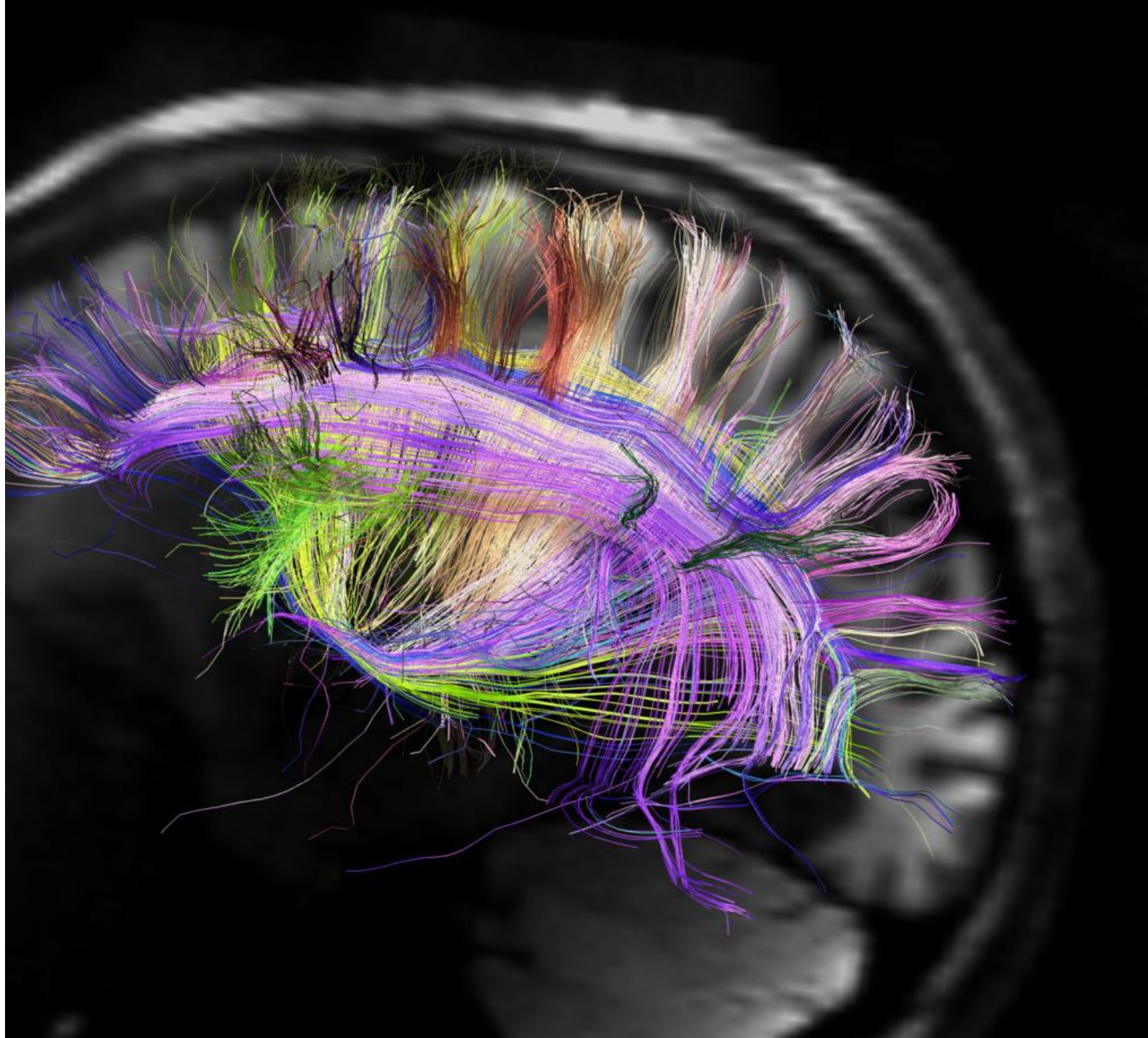
(2) some protons get in sync and start to precess in phase. Their vectors now add up in a direction that is transverse to the external magnetic field (perpendicular to the subject's body). Thus, a new transversal magnetization is established

After the RF pulse is switched off, the high-energy nuclei begin to relax and realign (Figure 1.8D). Eventually, the longitudinal magnetization increases to its original value, while the transversal magnetization decreases to zero. The time(in milliseconds) required for a certain percentage of the protons to realign in the longitudinal direction is termed T1. The transversal relaxation time is termed T2.

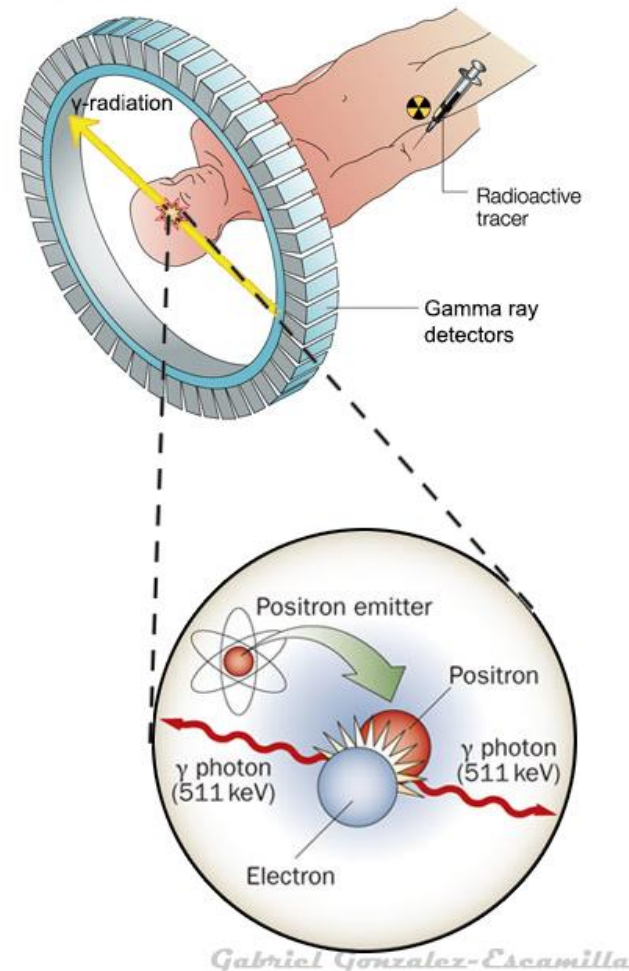
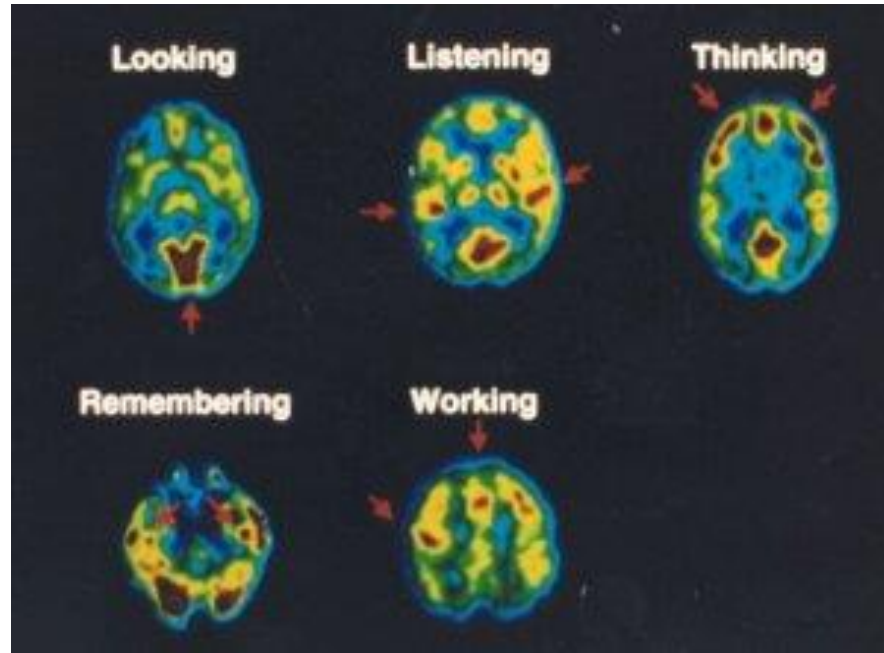
<https://www.youtube.com/watch?v=Ok9ILlYzmaY>

Diffusion MRI

- Follow the water molecules...
- https://www.youtube.com/watch?v=J_aamn_pRJE8
- isotropic versus anisotropic

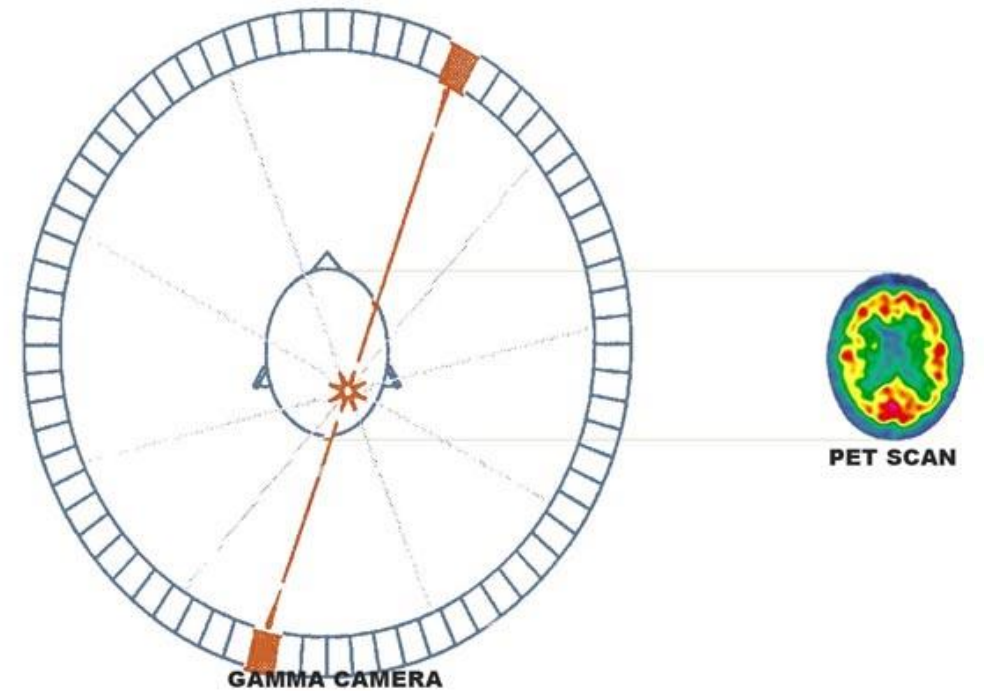
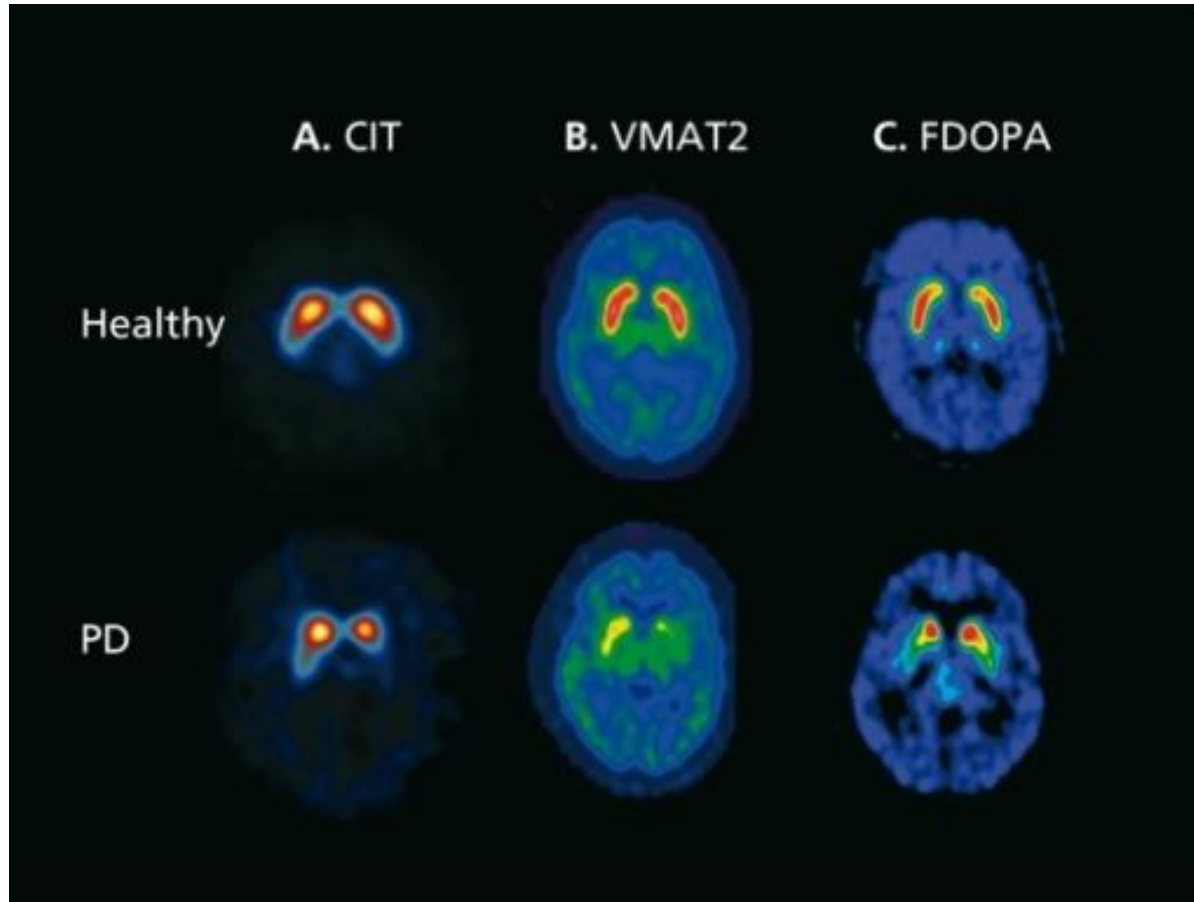


Positron Emission Tomography



https://www.youtube.com/watch?time_continue=90&v=GHLBcCv4rqk

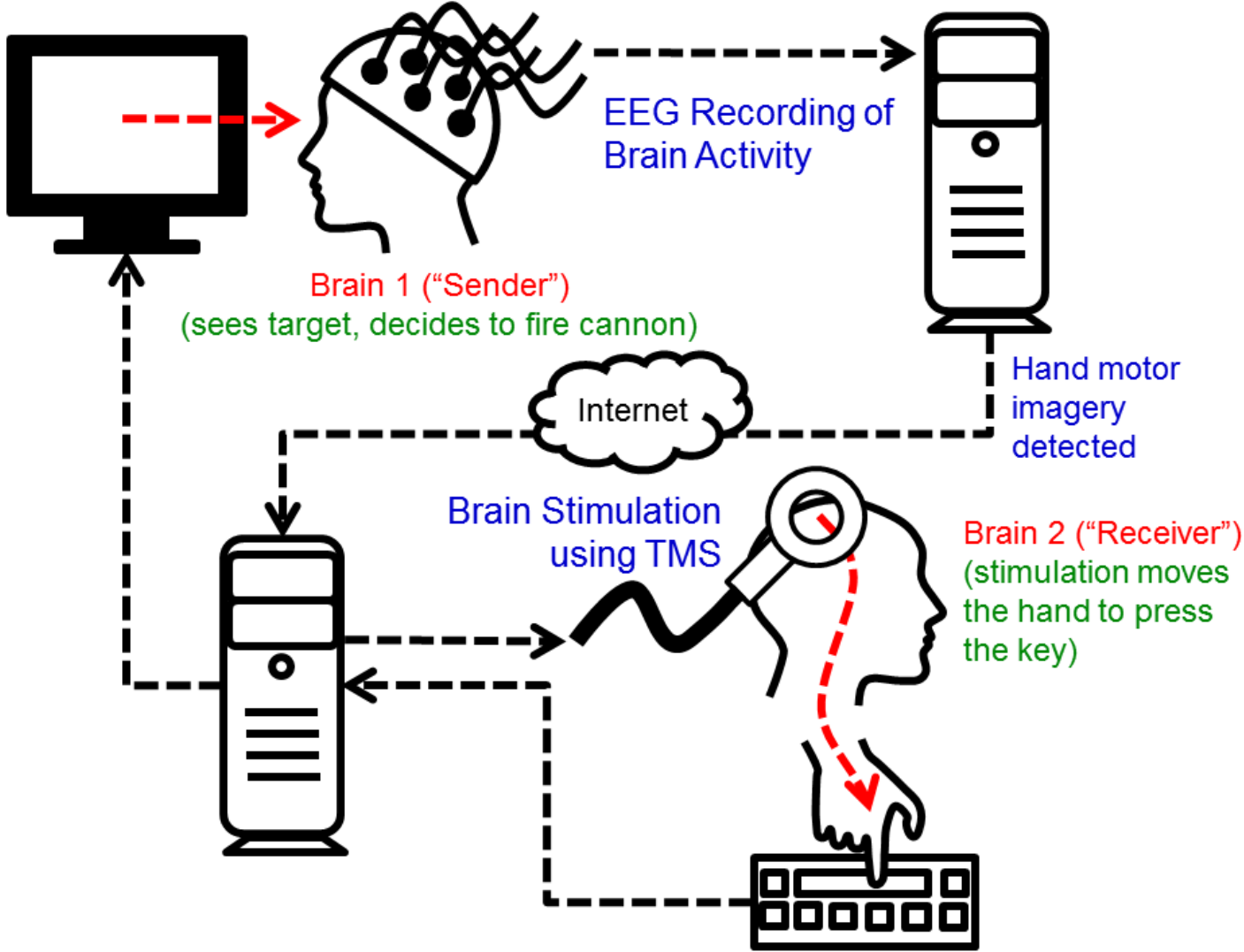
Single Photon Emission Computerize Tomography



<https://www.youtube.com/watch?v=wx2zyfgYZrE>

E

Electroencephalography & ERP

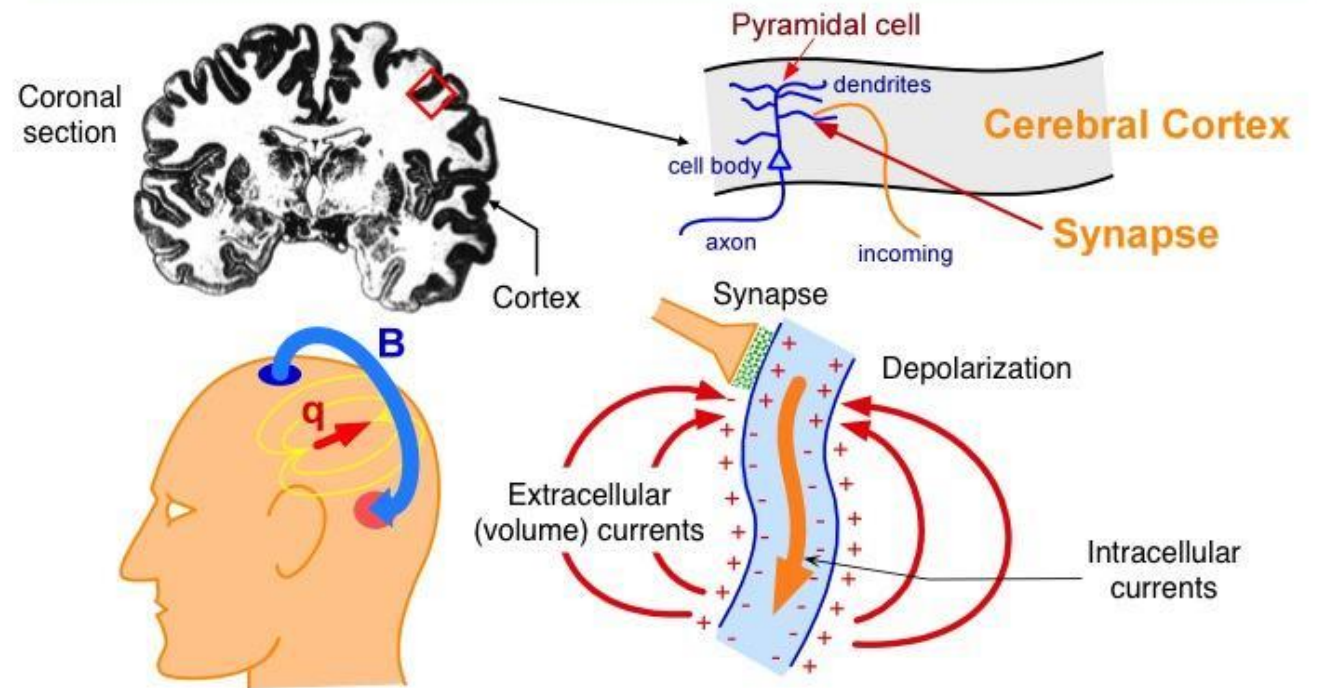


Magnetoencephalography

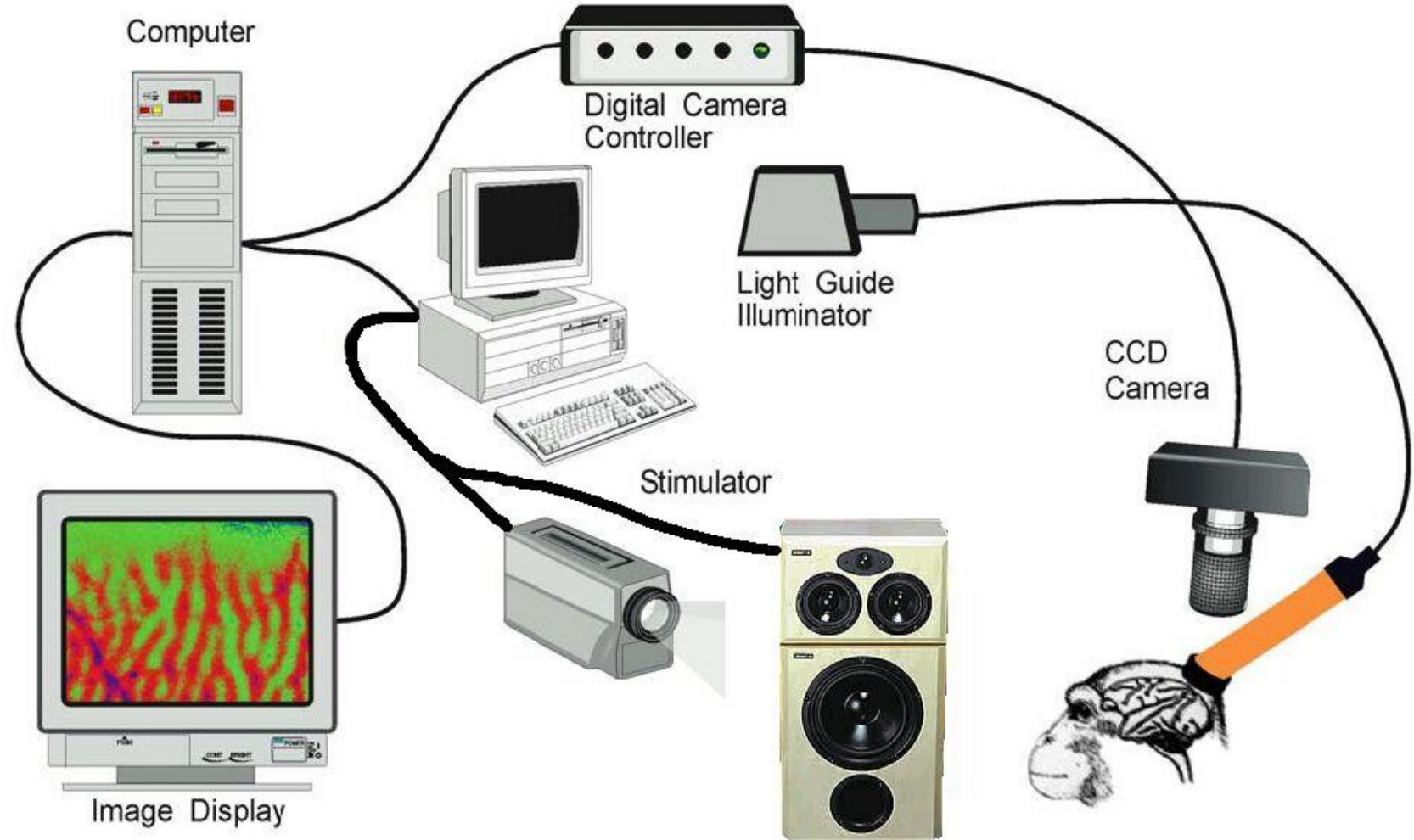
- <https://www.youtube.com/watch?v=CPj4jJACeIs>
- <https://www.youtube.com/watch?v=BLfwZ1NPNKY>



Origins of MEG Signals



Optical Imaging



Connectomics

[https://www.youtube.com/watch?v=nvXuq9jRW
KE](https://www.youtube.com/watch?v=nvXuq9jRWKE)

Power

Do neuroimaging studies suffer from a lack of power?

Planning an Experiment

- Read 100 abstract
- Read 10 review articles
- Find a mento paper to leap from....