

# Brain Scan Imaging

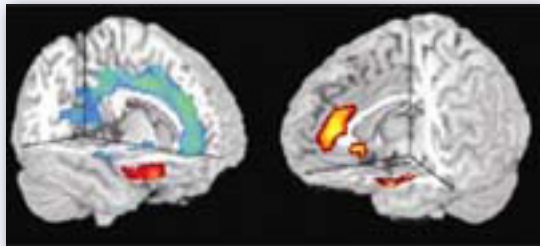
## New Tools for Research on Hate and Prejudice

Functional scan imaging and other technologies are providing us with direct access to brain processes. Mapping the activity and structure of the brain has given us unprecedented insight into human nature: we can watch the brain develop and respond to stimuli, and see how a mind can flourish, learn, and imagine. We can also observe how our minds can be damaged by the trauma and neglect that lead to impaired thinking and behavior.

Cognitive neuroscientists are using these tools to pinpoint areas of the brain that are activated during moral dilemmas and decision-making; to study how the mind creates categories and how the brain can distort perceptions and memory leading to false assumptions about other people; as well as undergirding social psychology findings on group think, peer pressure, denial, projection, conformity and obedience, the effects of group membership, stigma and status, and how dehumanization can lead to cruelty and injustice toward disempowered groups.

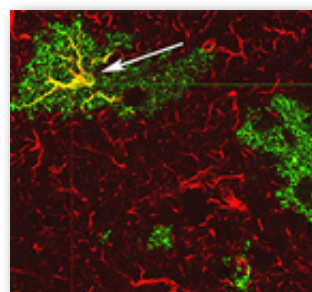
Measures blood oxygenation. fMRI shows both structure and activity of the brain and is safer, because it does not require radioactive tracers.

### Functional Magnetic Resonance Imaging (fMRI)



### Cortical pattern matching

Uses an algorithm to compare maps of gyri and sulci of many brains to create template for individual variations.



## Types of MRI

Types of fMRI and MRI have varying degrees of resolution and uses:

### Voxel-based morphometry (VBM)

Measures volume of gray- and white matter by comparing statistical differences of small brain segments across many subjects

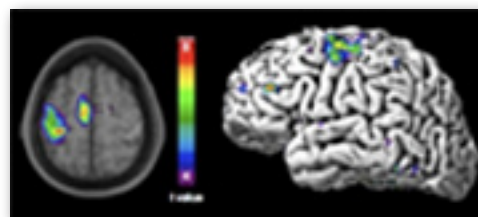


### Echo-planar

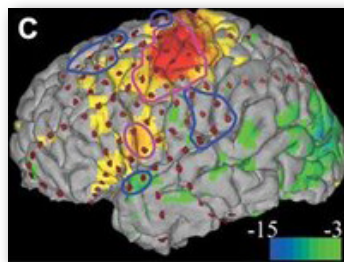
Ultra-fast and efficient method to see changes in real time related to BOLD (Blood-oxygen-level dependent)

### Magnetization transfer imaging (MTI)

Enhances MR image contrast, based on observing off-resonance radio-frequency pulses effects, as well as measuring signal intensity.



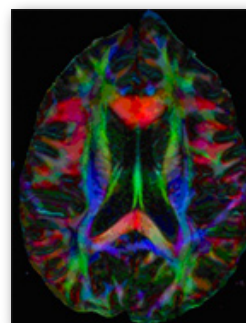
### Diffusion tensor imaging (DTI)



Measures diffusion of water in living tissue. DTI coupled with fiber tractography (DFT) is non-invasive method for measuring white matter pathways.

### Fractional Anisotropy (FA)

Used with DTI to measure white matter tracts



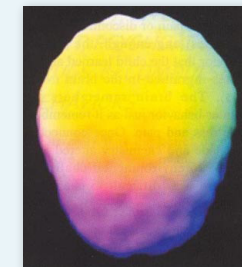
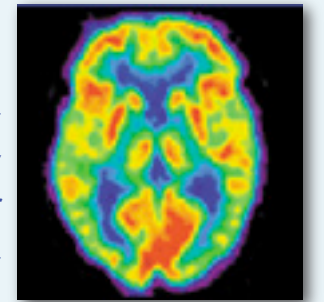
Functional scans map brain activity:

- metabolism
- cerebral blood flow
- oxygenation
- brain wave states
- neurotransmitter pathways

## Other Imaging Tools

### Positron Emission Tomography (PET)

Measures glucose metabolism. FDG-PET uses Fluorodeoxyglucose to reveal biomarkers for cancer.

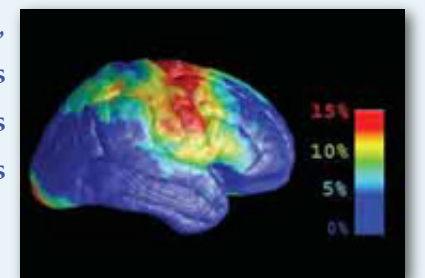


### Single Photon Emission Computer Tomography (SPECT)

Measures cerebral blood flow.

### Magnetoencephalogram (MEG)

Measures brain wave states, similar to an EEG, but uses magnetic fields to access deeper subcortical layers



### Transcranial Magnetic Stimulation (TMS)

Uses electromagnetic induction to excite neurons to study the brain and can also be used to treat certain brain imbalances.

