# Johns Hopkins Engineering

## Methods in Neurobiology

## New Techniques to Study the Human Brain and Map the Connectome

JOHNS HOPKINS
WHITING SCHOOL
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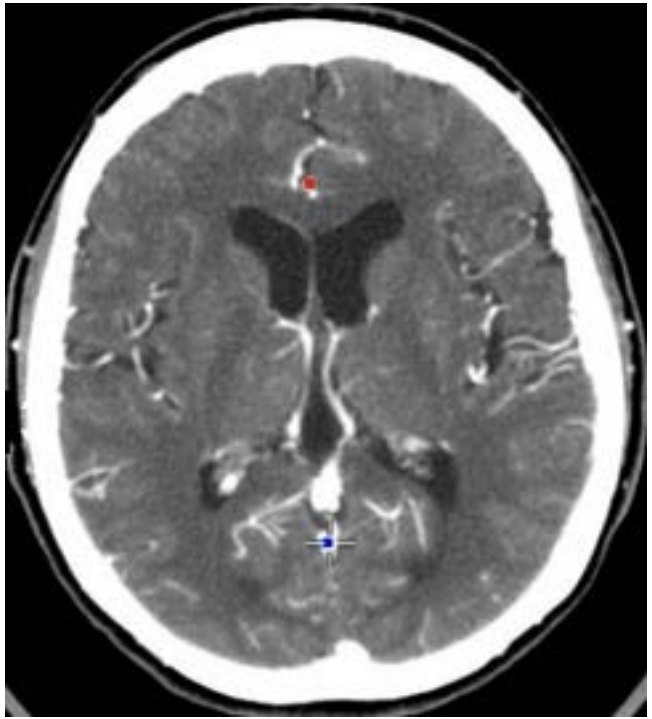
# Neuroimaging: Structural Techniques

CAT or CT

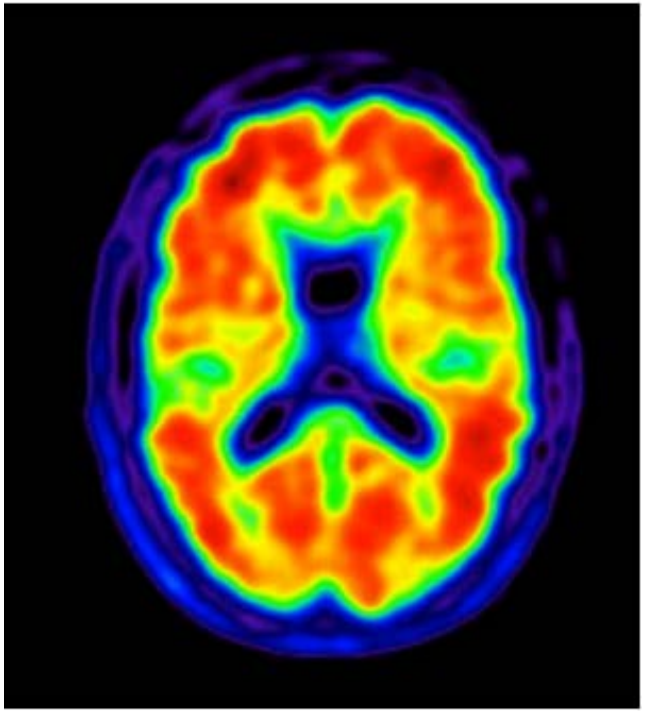


MRI

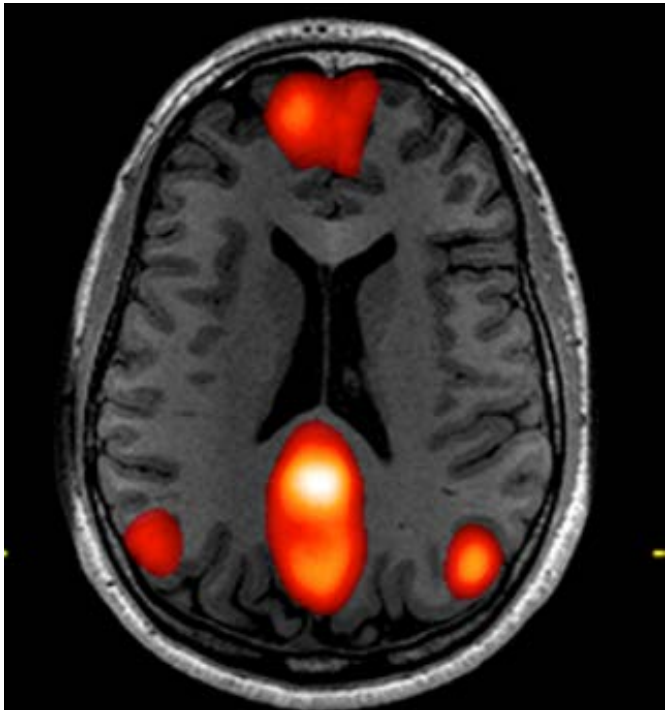
CAT or CT scan; PET; MRI

# Neuroimaging: Functional Techniques

PET

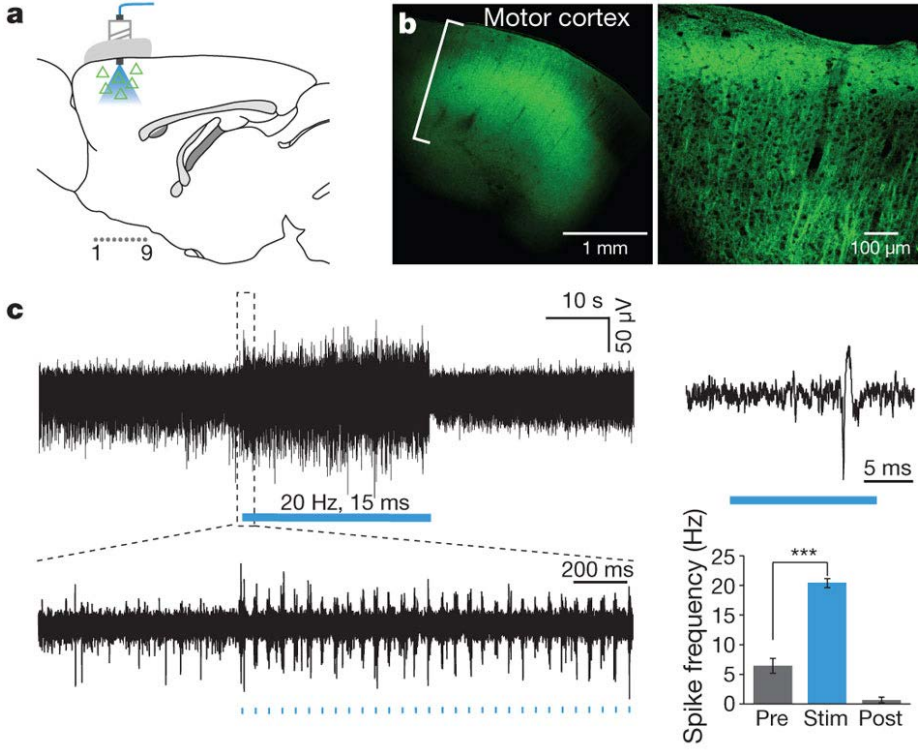


fMRI

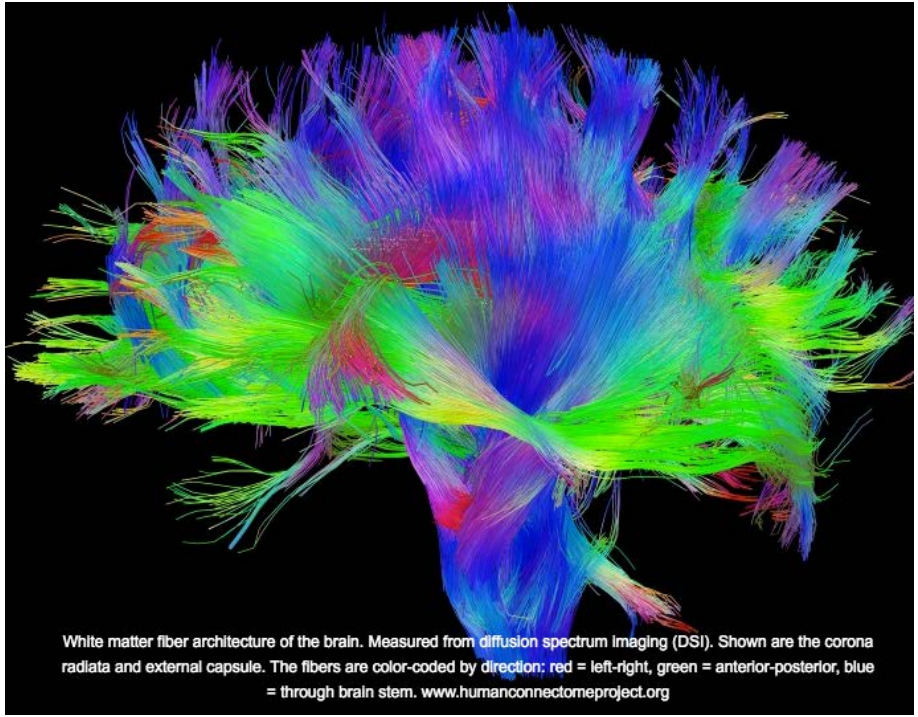


# Optogenetic Functional MRI (of MRI)

AAV5-CaMKIIα::ChR2(H134R)-EYFP



# The Human Connectome Project



White matter fiber architecture of the brain. Measured from diffusion spectrum imaging (DSI). Shown are the corona radiata and external capsule. The fibers are color-coded by direction: red = left-right, green = anterior-posterior, blue = through brain stem. www.humanconnectomeproject.org

- Structural/anatomical v. functional connections
- Techniques
  - dMRI;
  - MEG;
  - fMRI and ofMRI;
  - …
- Validation with brain histology, animal tracing experiments, optogenetic models

# References

| Slide | Reference |
|---|---|
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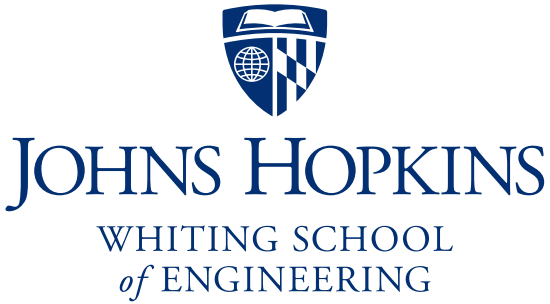
| 4 | Lee, J., Durand, R., Gradinaru, V. *et al.* 2010 Global and local fMRI signals driven by neurons defined optogenetically by type and wiring. *Nature* **465,** 788–792. |
| 5 | The human Connectome Project (n.d.). The human Connectome Project http://www.humanconnectomeproject.org/ |

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