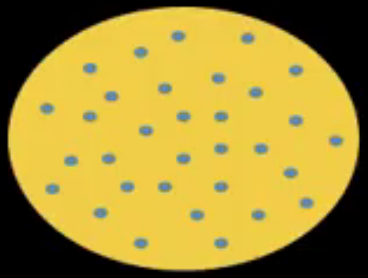
Diffusion-Weighted MRI

Provides architecture of biological tissues

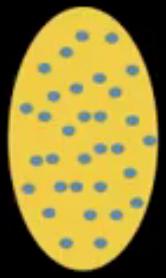
Used to study:

- **Neurological disorders**
- **Brain development**
- **Structure of brain fiber bundles**

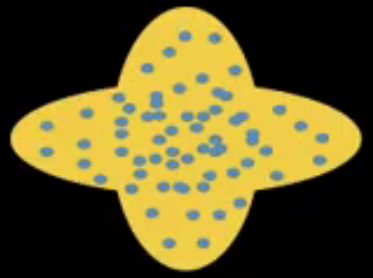
Diffusion of Water Molecules



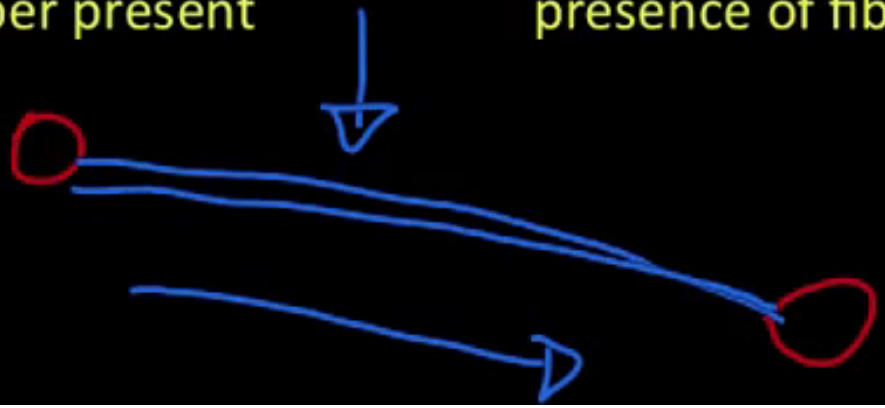
Isotropic Diffusion
no fiber present



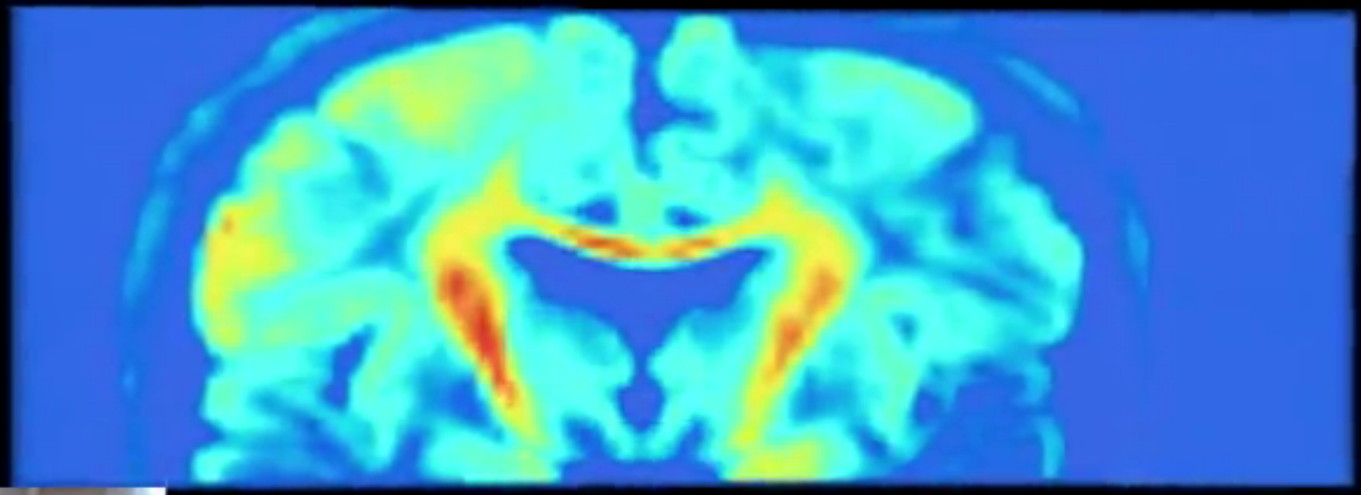
Anisotropic Diffusion
presence of fiber



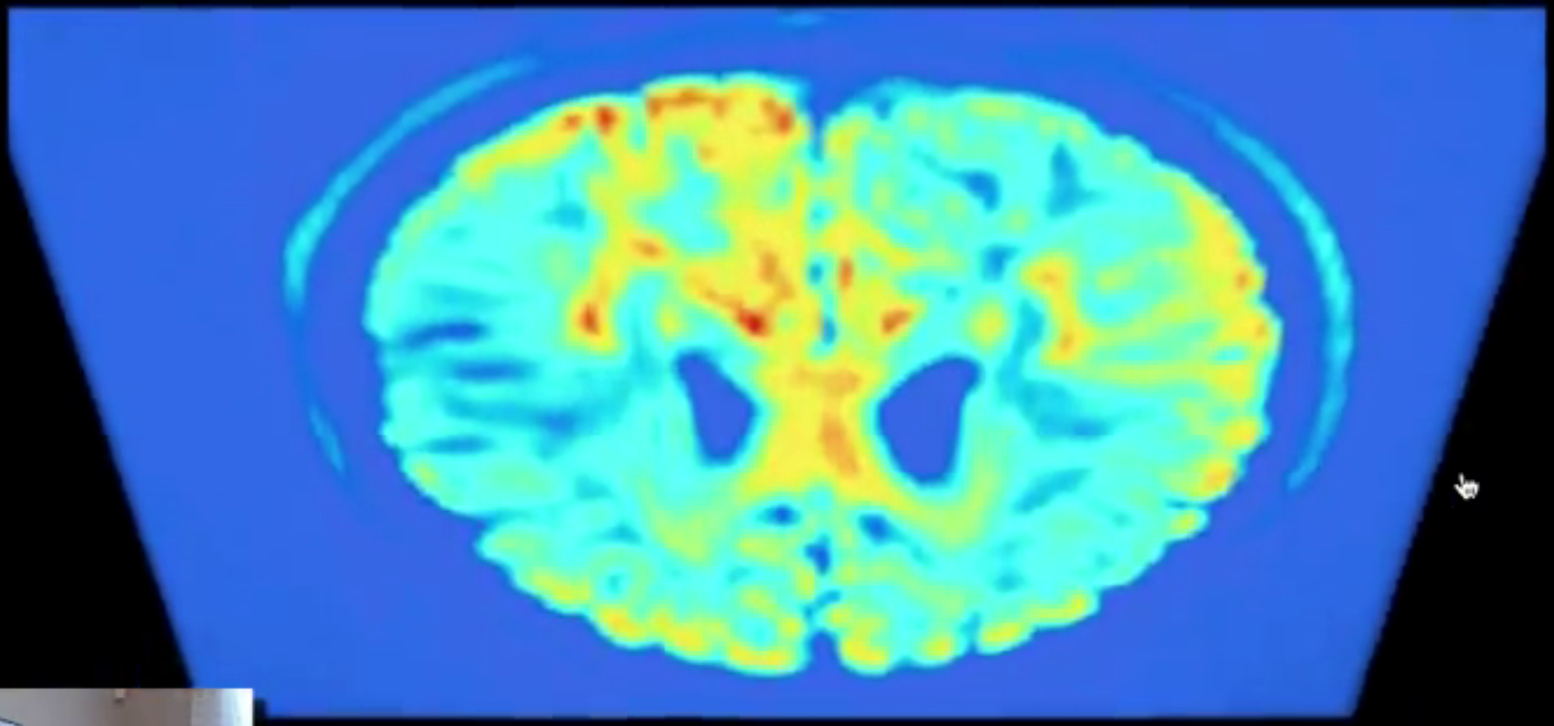
Orthogonal Diffusion
fiber crossing

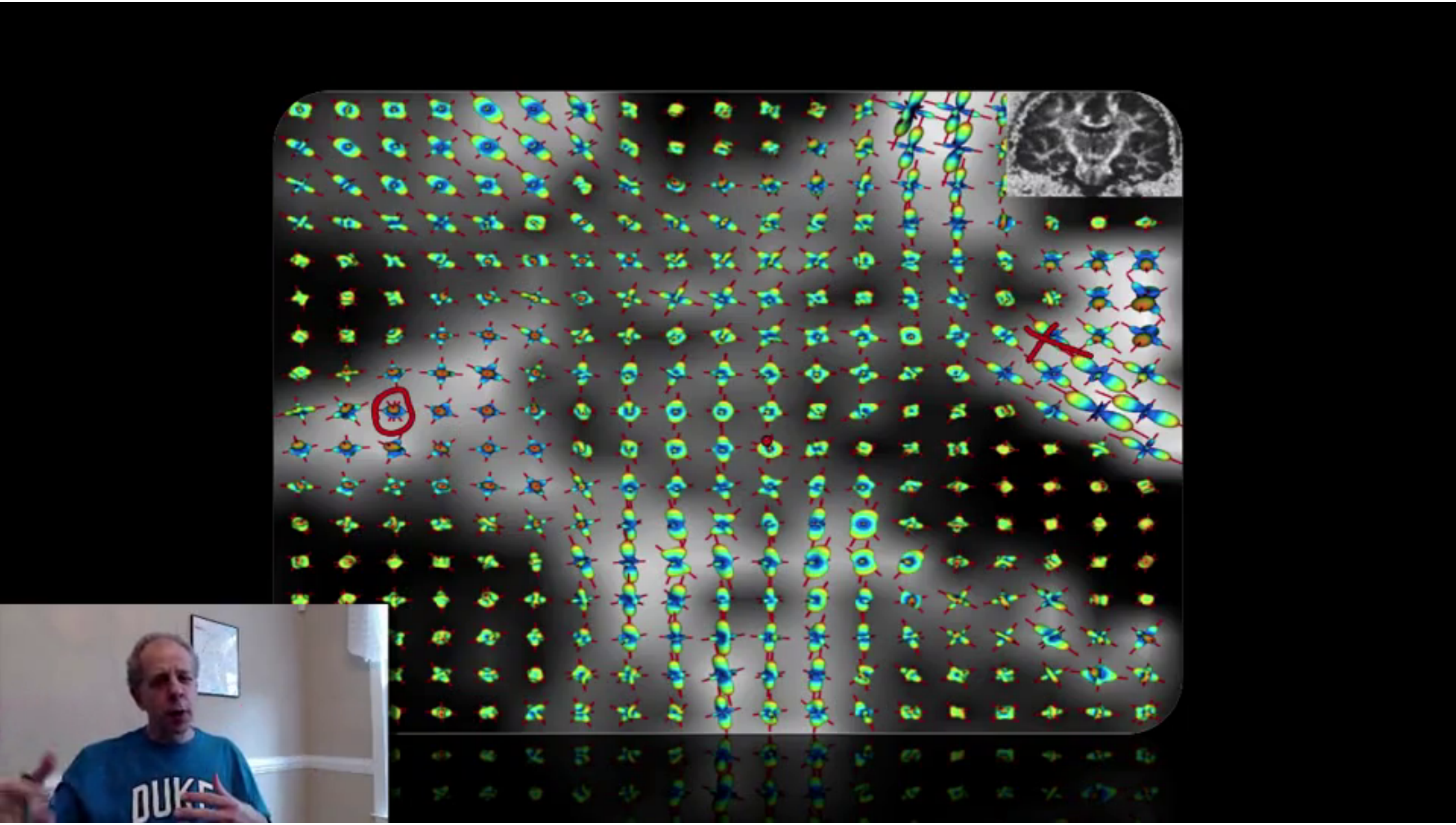


Diffusion-Weighted MR Image

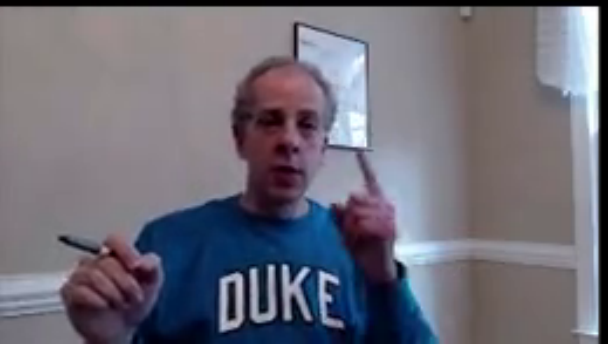


Diffusion-Weighted MR Image

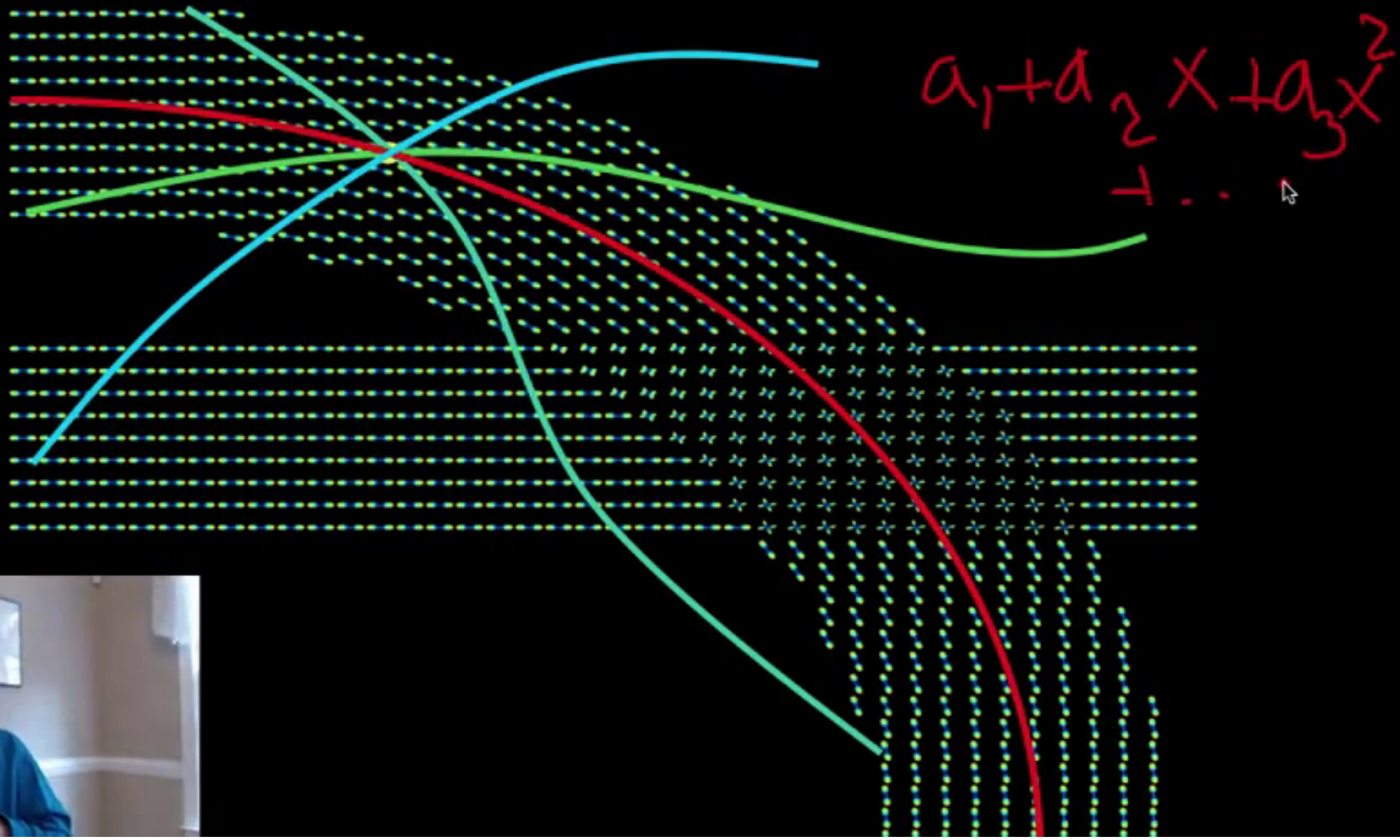




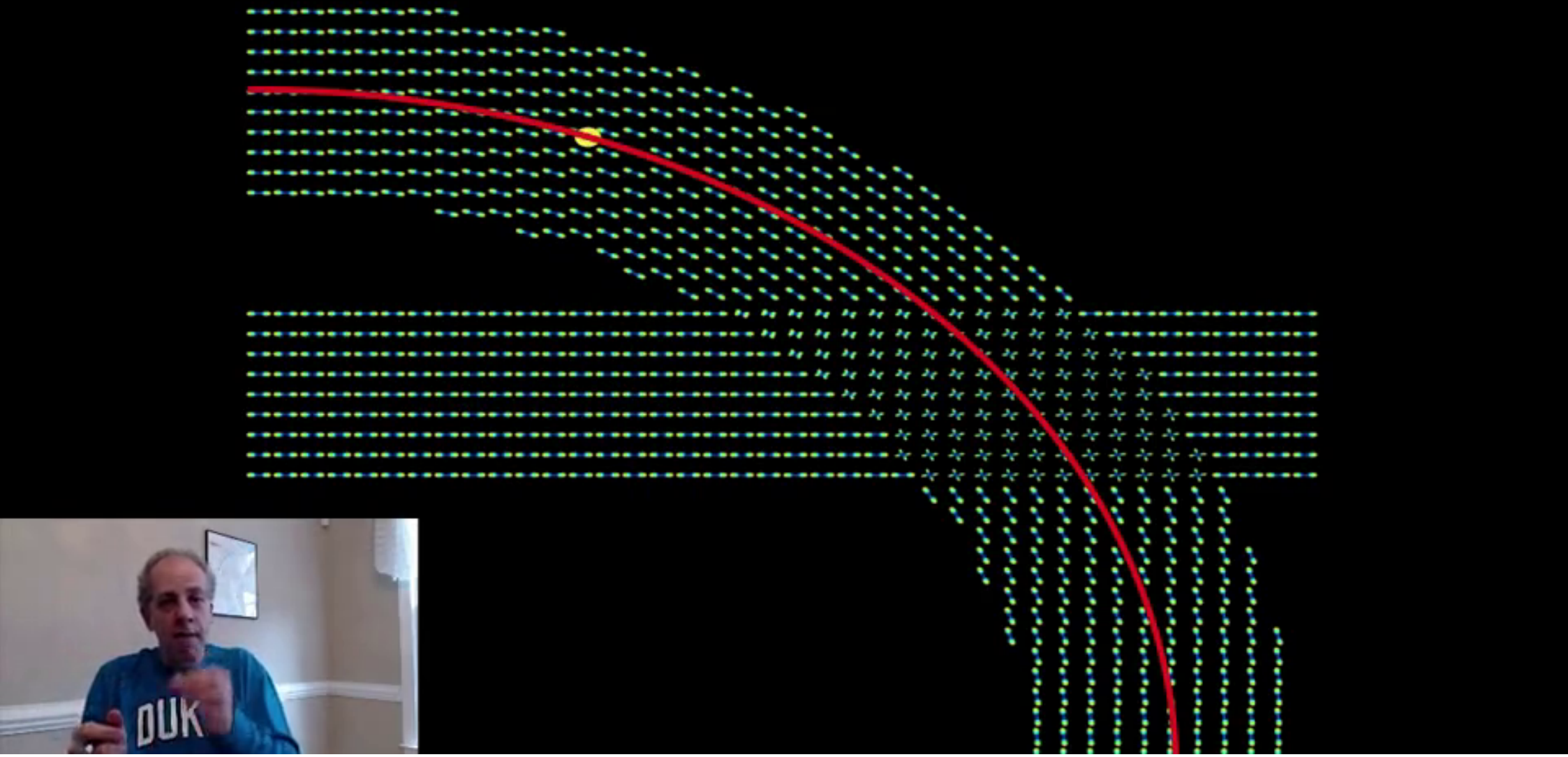
Hough Transform !!!



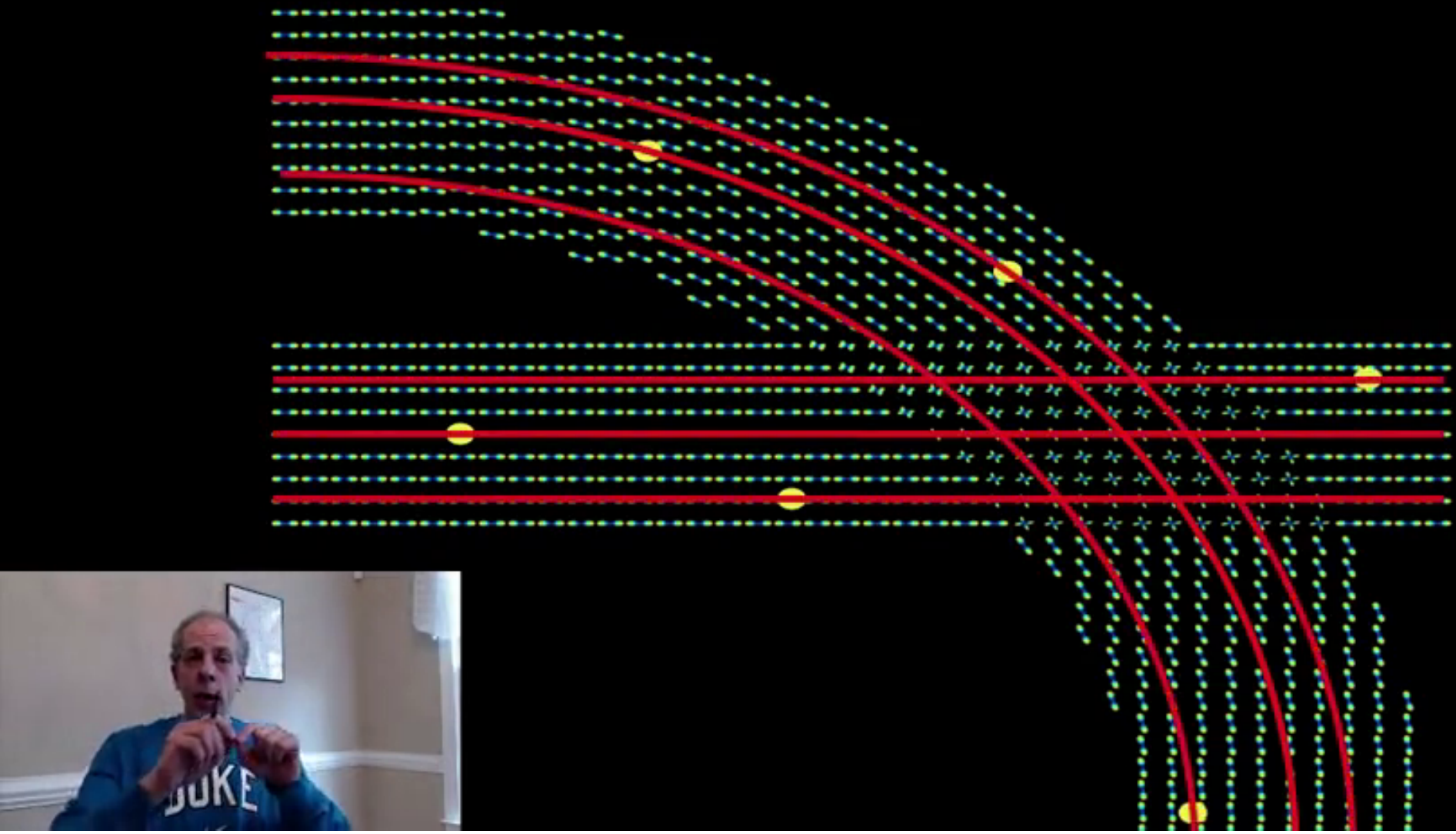
Hough Transform !!!



Hough Transform !!!



Hough Transform !!!



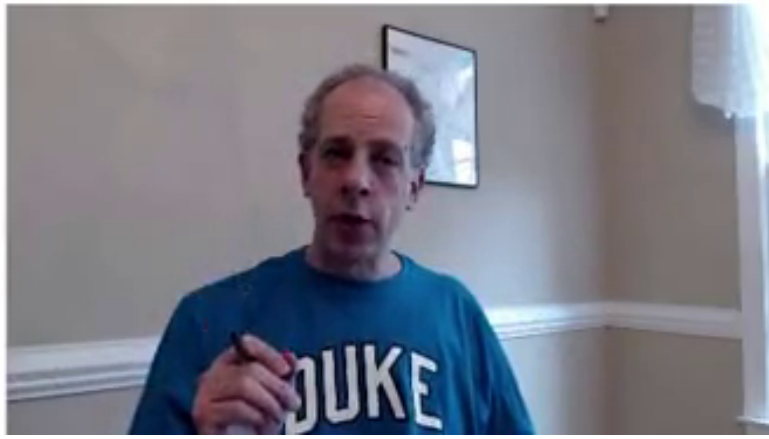

DUKE

Brain Imaging: Deep Brain Stimulation

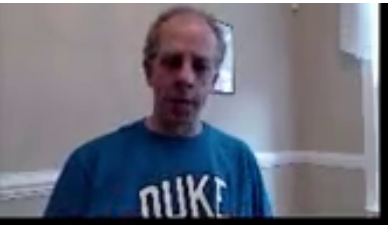
Image and Video Processing: From Mars to Hollywood with a Stop at the Hospital

Guillermo Sapiro

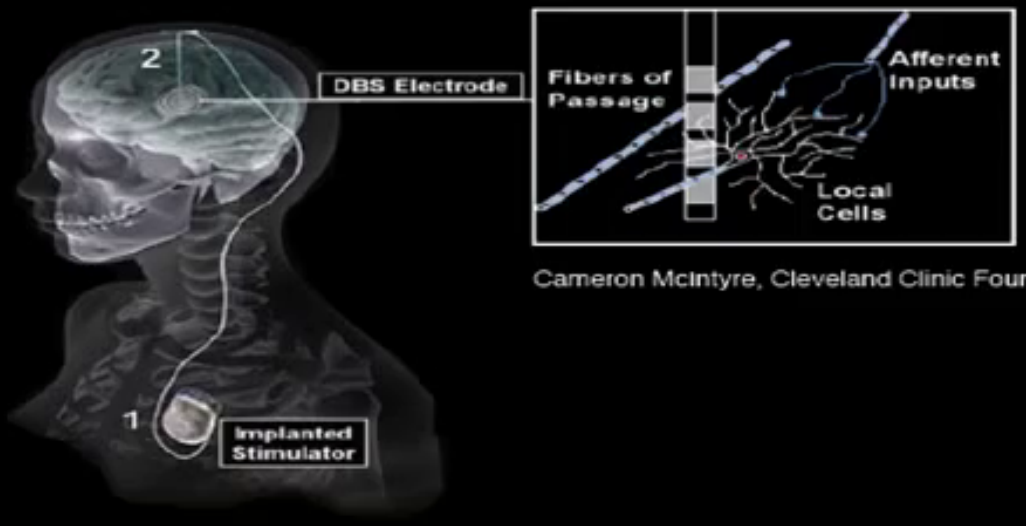
Duke
UNIVERSITY



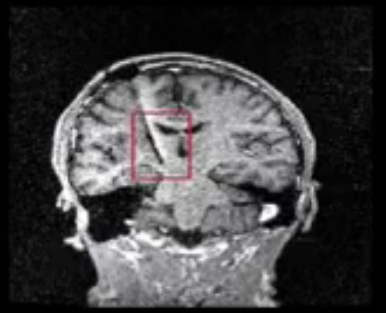
Thanks to Lenglet, Aganj, Harel, Duchin, SIS

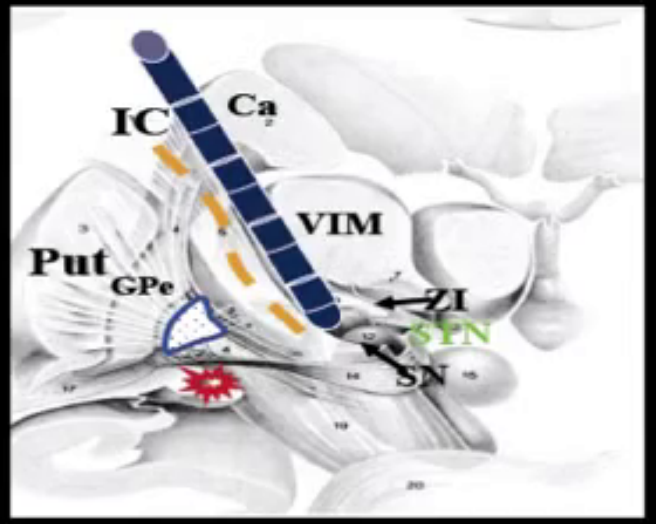


Deep Brain Stimulation (DBS)



Cameron McIntyre, Cleveland Clinic Foundation



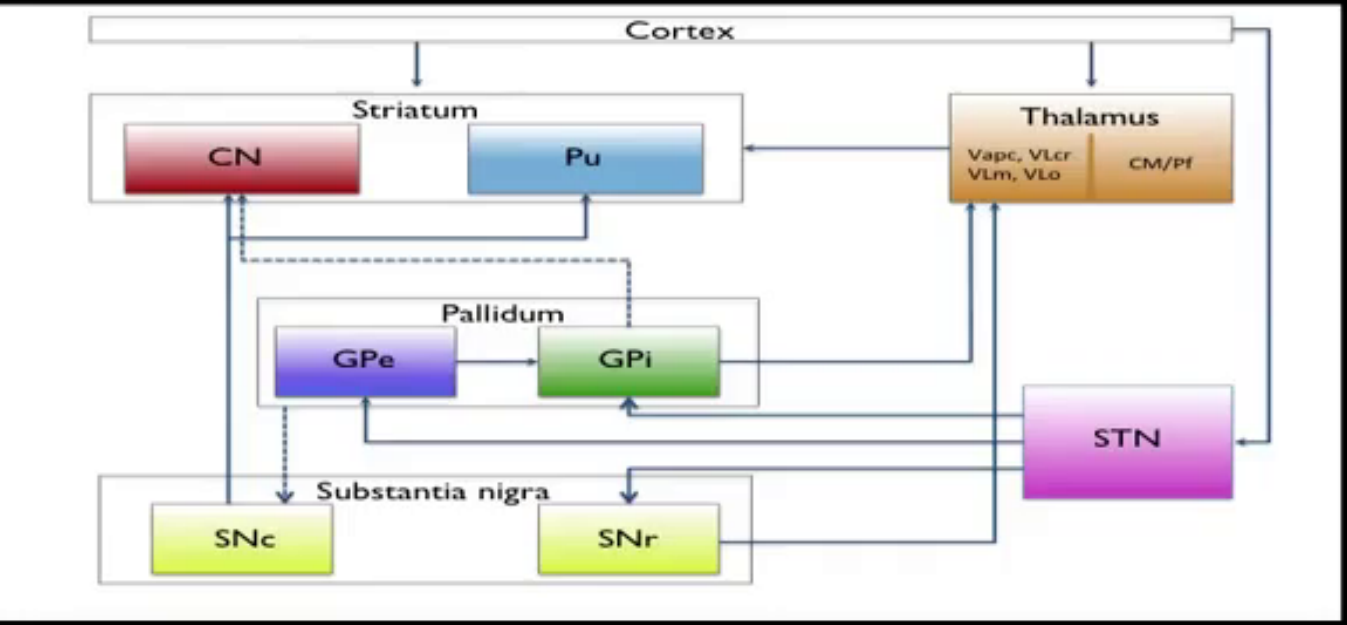


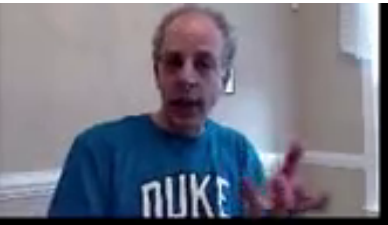
Successful DBS surgery is critically dependent on precise placement of DBS electrodes into target structures

Students: A good place to take a break if needed.

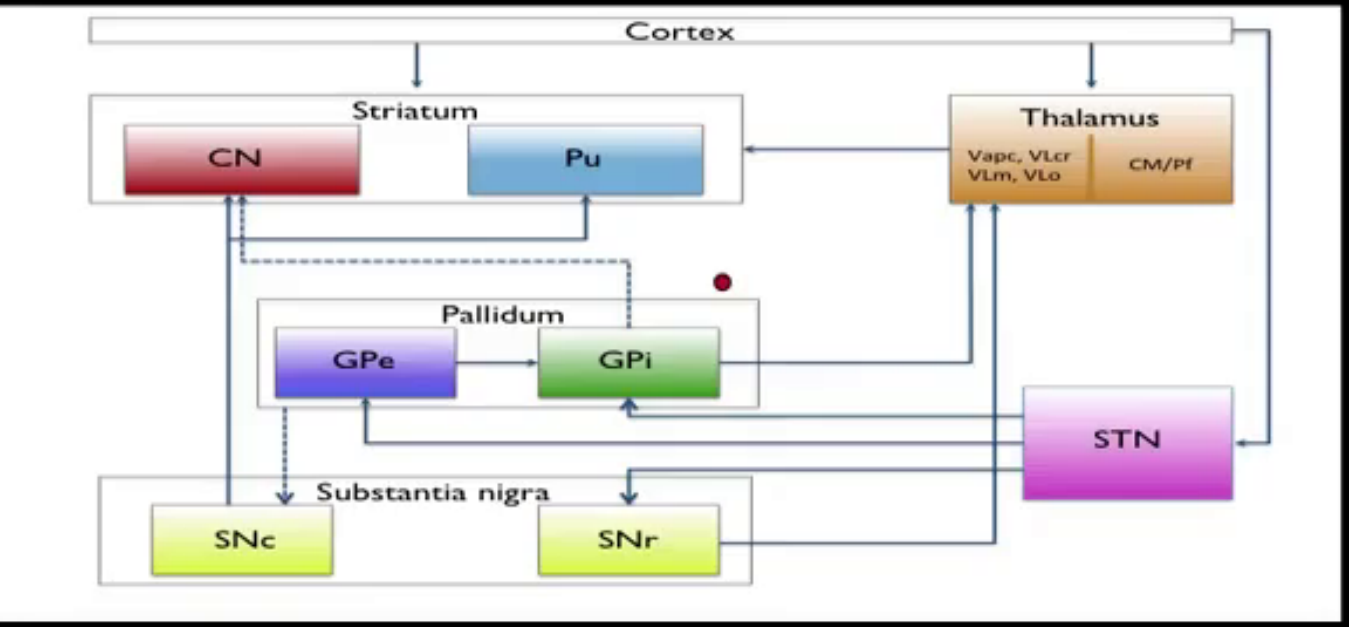
Duke UNIVERSITY

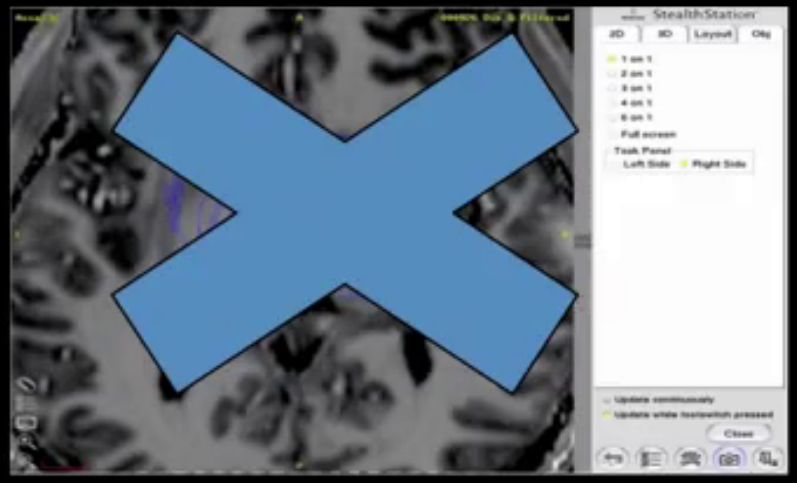
Brain Imaging and DBS

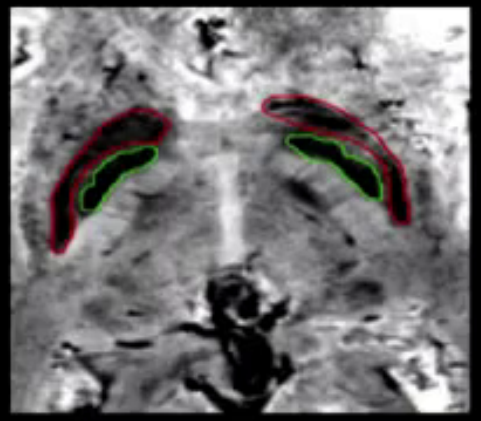


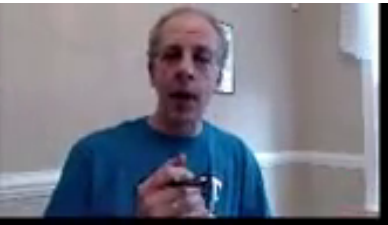


Brain Imaging and DBS

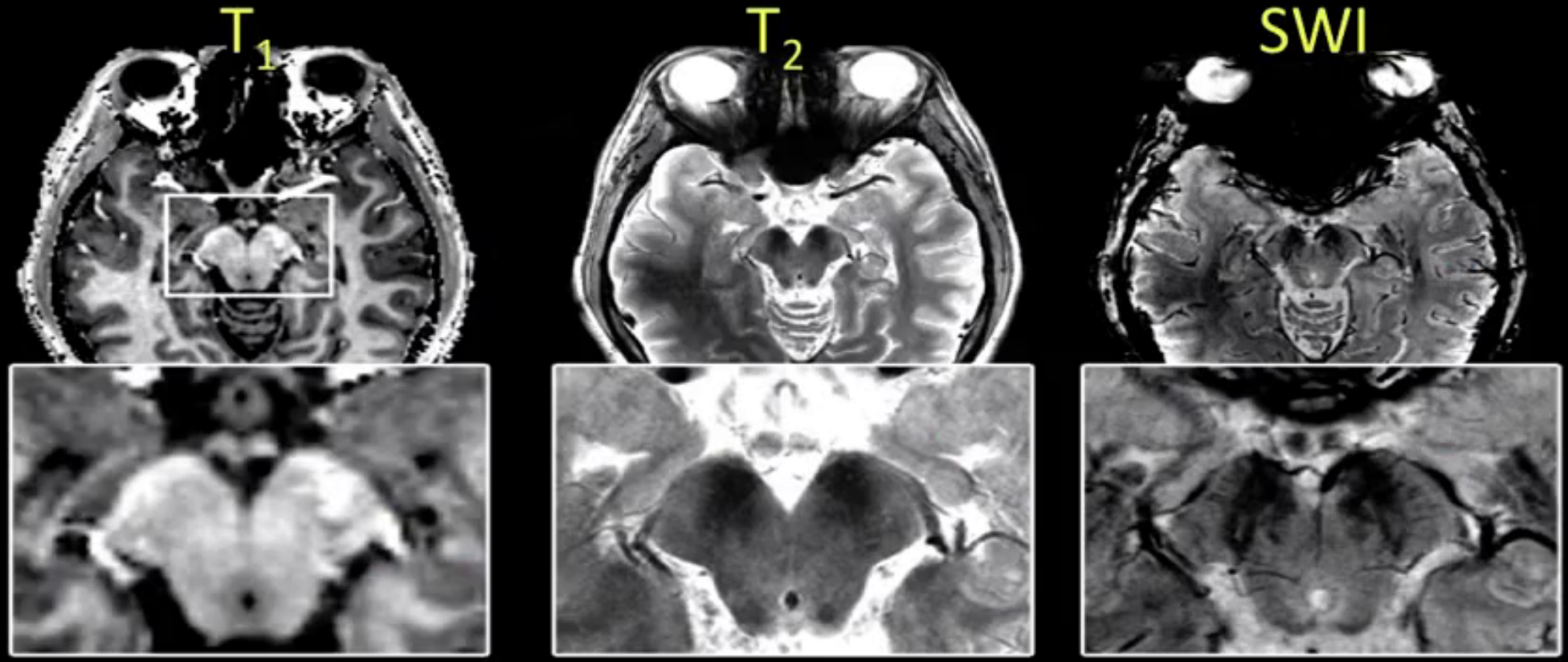


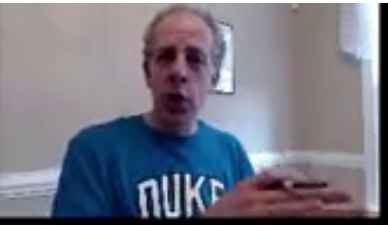




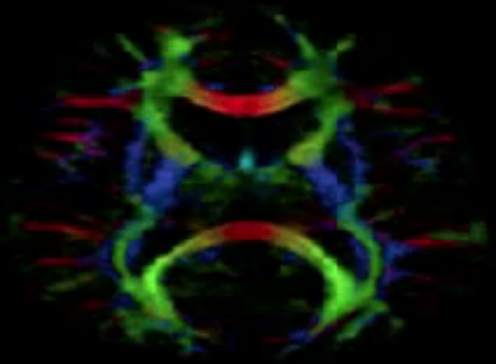


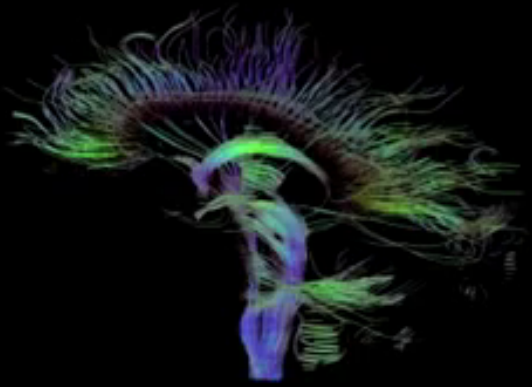
Brain Imaging and DBS

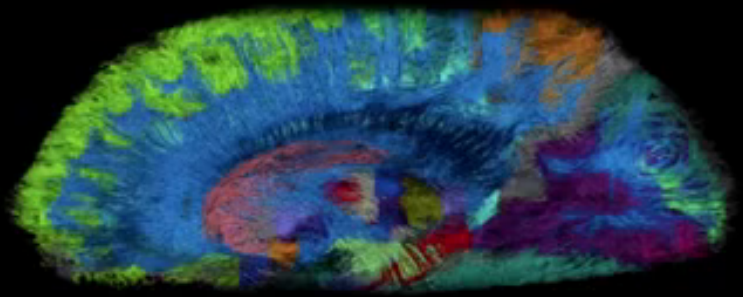


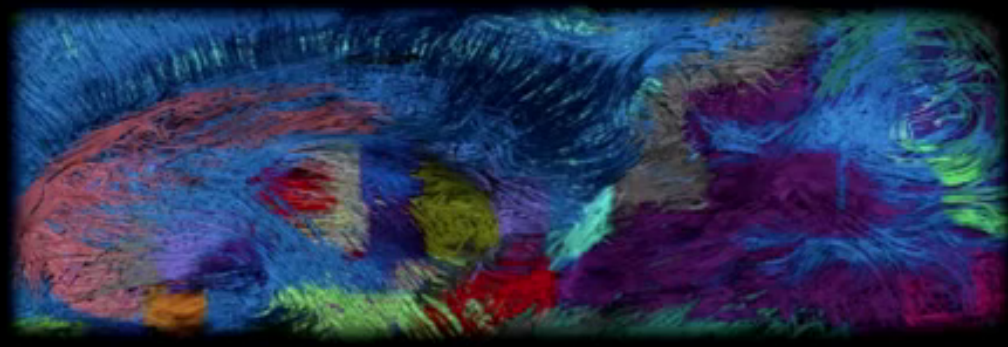


Brain Imaging and DBS

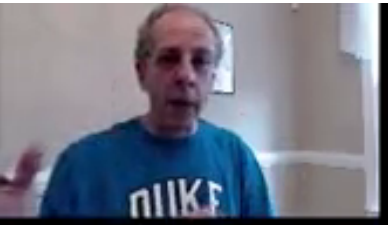




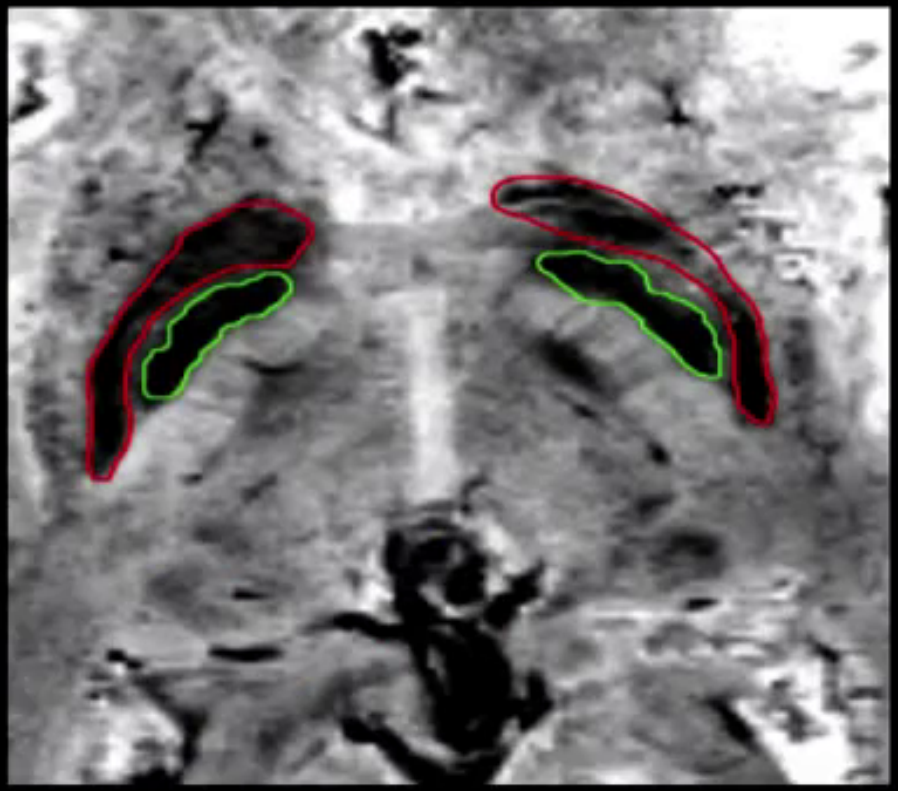




Human, 7T, 1.5 x 1.5 x 1.5 mm^3
Tractography – Paul Thompson, UCLA



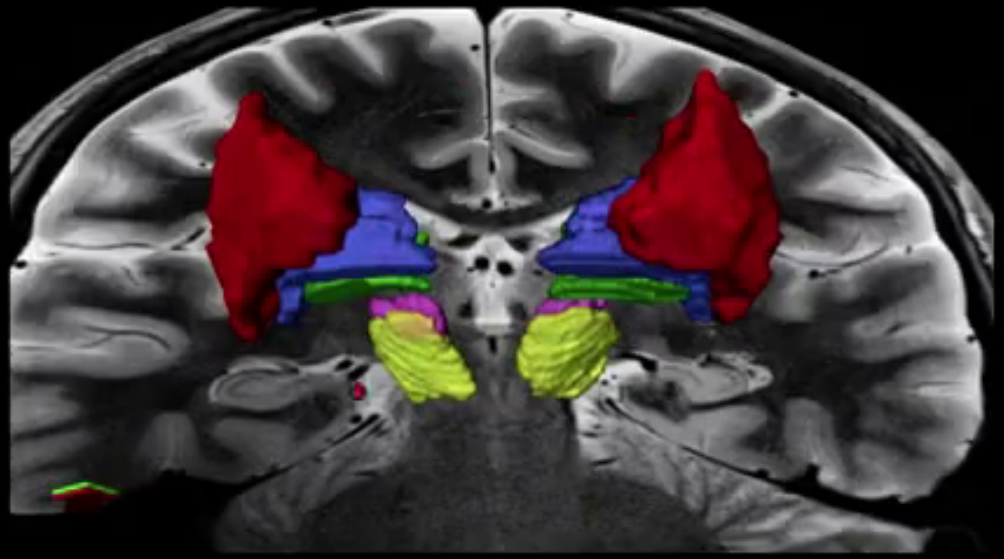
Brain Imaging and DBS

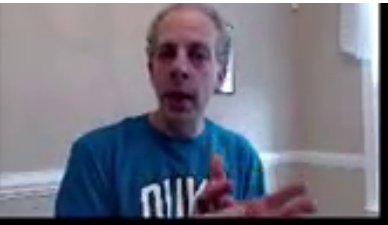


GP = Globus pallidus

GPi = DBS Target for Dystonia

Brain Imaging and DBS: ROI





Brain Imaging and DBS: DWI