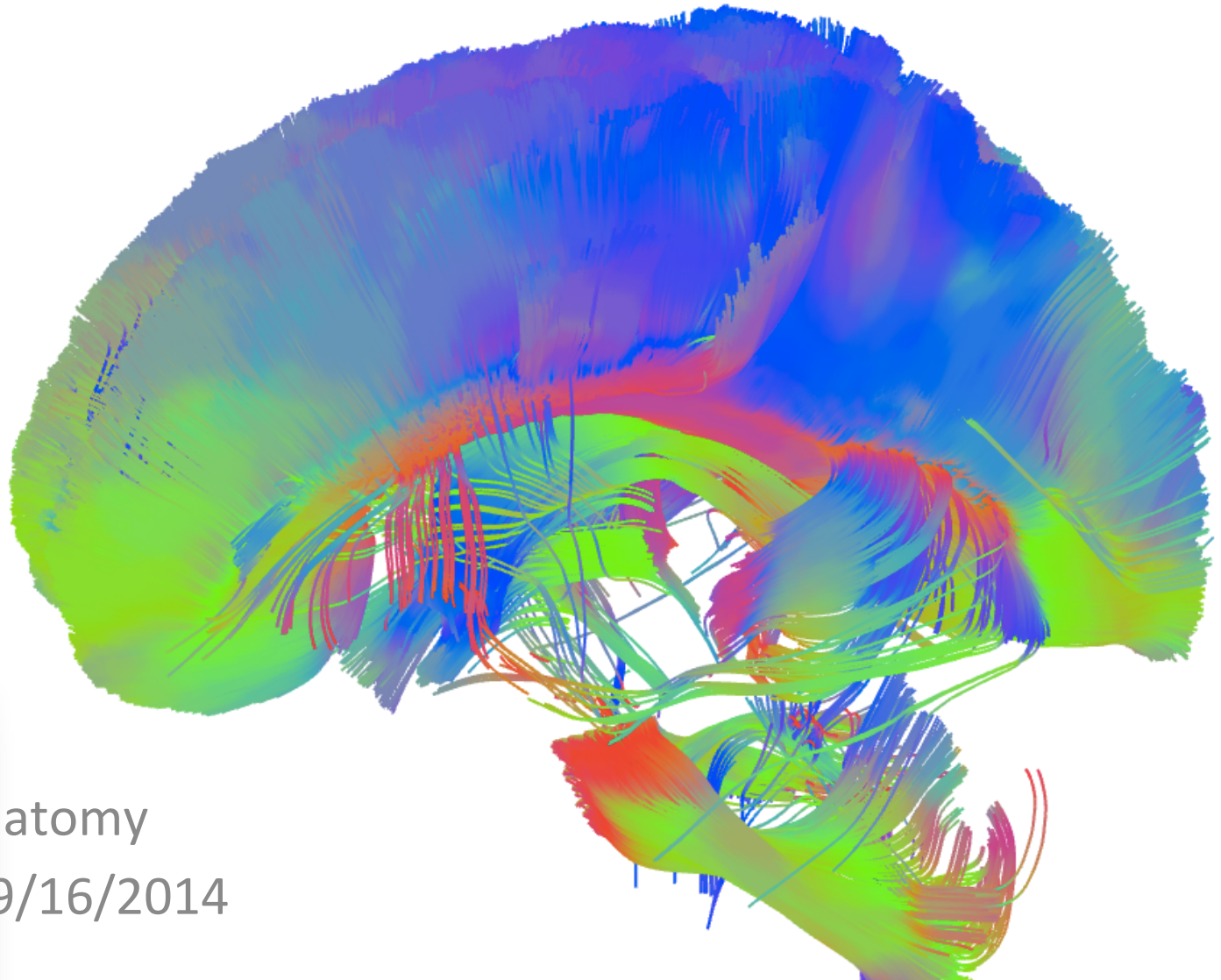


Applied Tractography – Part 3



Virtual Neuroanatomy

Lecture Date: 09/16/2014

Goals

- A. Explore approaches to whole-brain tractography.
- B. Understand rendering & visualization options.

Whole-brain tractography

Rather than select for a group of streamlines that pass through a certain region of interest, look at as many possible connections as you can.

Whole-brain tractography

/Users/timothy/Classes/VirtualNeuroanatomy_2014/Templates/CMU-80-20140805build.reg2.mean.fib.gz

Edit Regions Tracts Slices View Options

Region List

Name	Type	Color
------	------	-------

Diffusion : +isosurface Full : Contrast 1.07 Offset 0.00

Options

Tracking...

- Term... qa
- Thre... 0.05000
- Angu... 75
- Step... 0.50
- Smo... 0.70
- Min... 10.0
- Max... 200.0
- Seed... Random
- Seed... Subvoxel
- Ran... Off
- Direc... Trilinear
- Trac... Streamline(E)

Region Window

qa0 No ov

Contrast 1.07 Offset 0.00

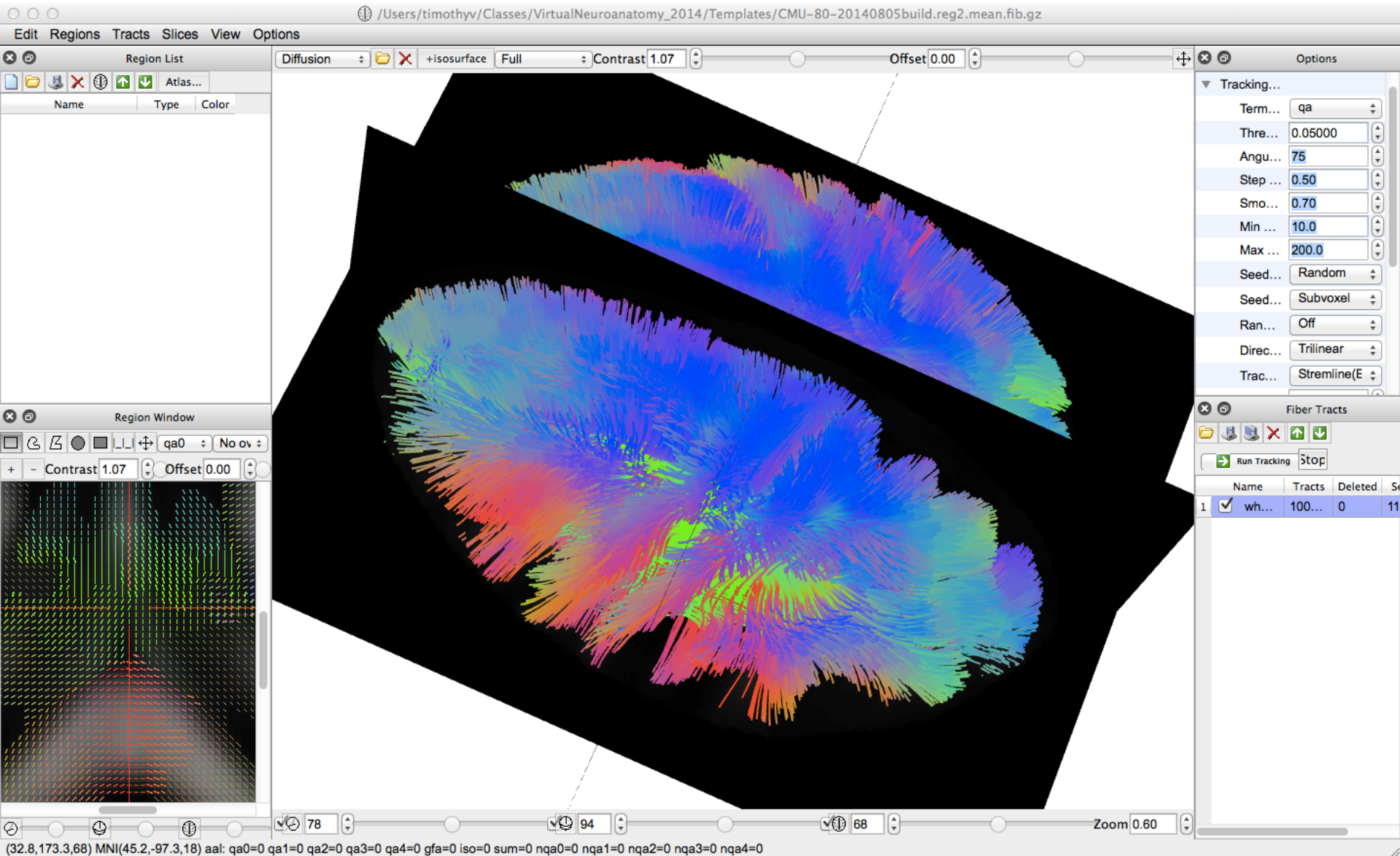
Fiber Tracts

Run Tracking Stop

Name	Tracts	Deleted	S
1 ✓ wh...	100...	0	11

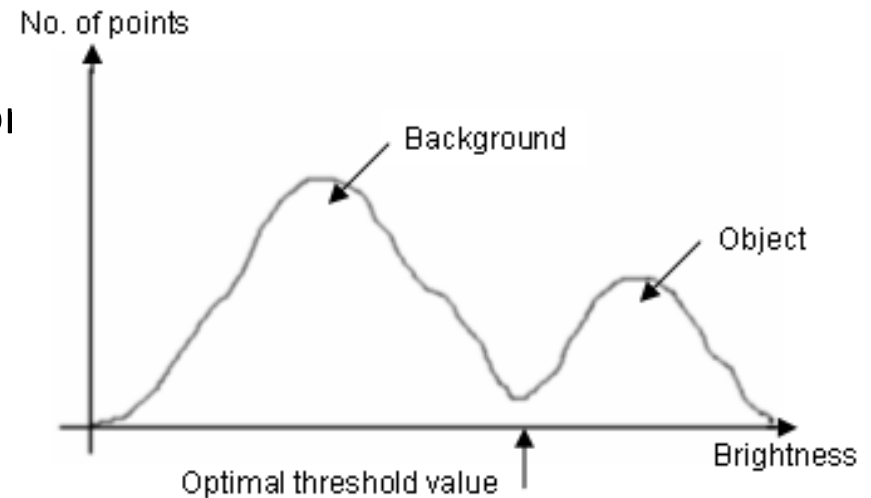
78 94 68 Zoom 0.60

(32.8,173.3,68) MNI(45.2,-97.3,18) aal: qa0=0 qa1=0 qa2=0 qa3=0 qa4=0 gfa=0 iso=0 sum=0 nqa0=0 nqa1=0 nqa2=0 nqa3=0 nqa4=0



Otsu's method

A computer vision method for finding a clear separation between two distributions of values (in our case, gray vs. white matter). - Nobuyuki Otsu (1979). "A threshold selection method from gray-level histograms". IEEE Trans. Sys., Man., Cyber. 9 (1): 62–66.



Original

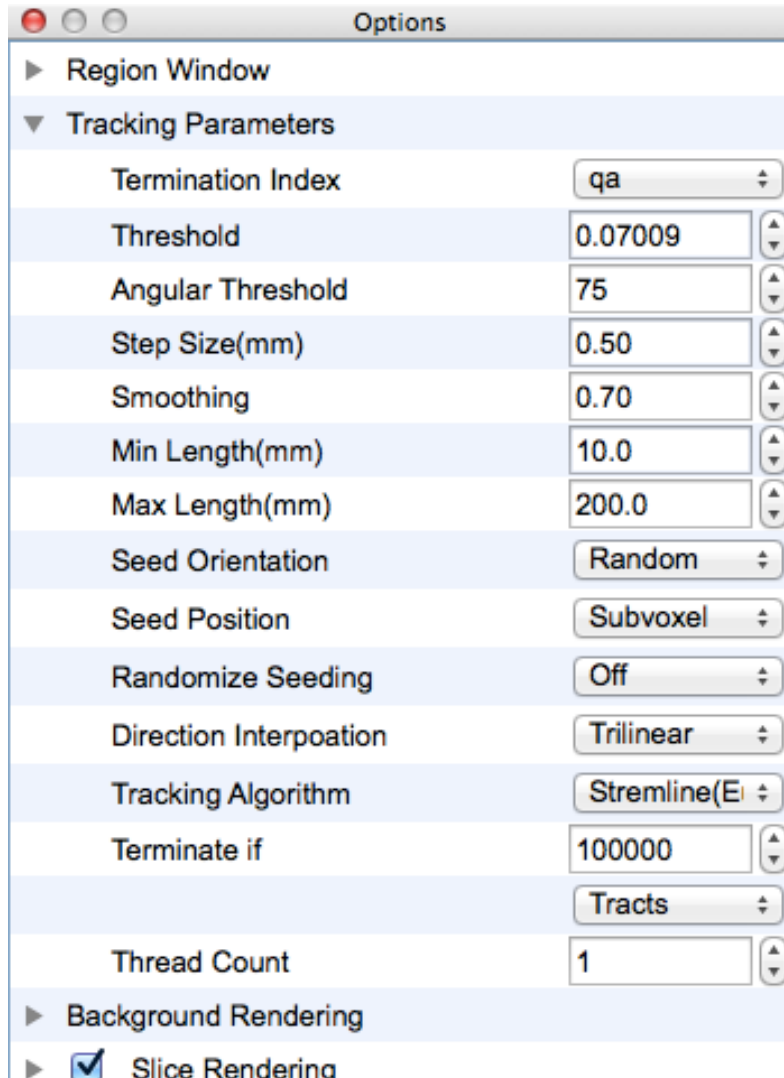


Binary after Otsu's thresholding



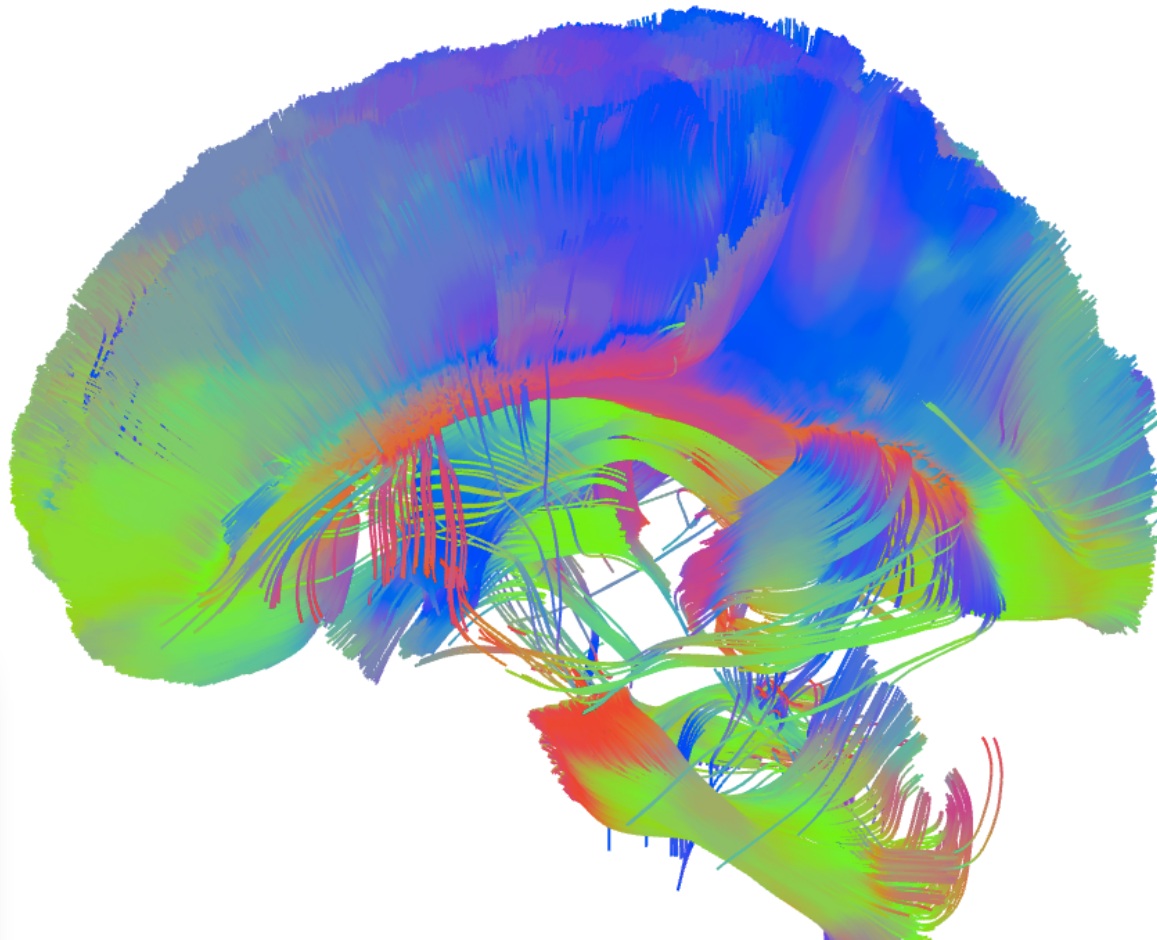
Otsu's method

Default = $0.6 * \text{Otsu's threshold}$

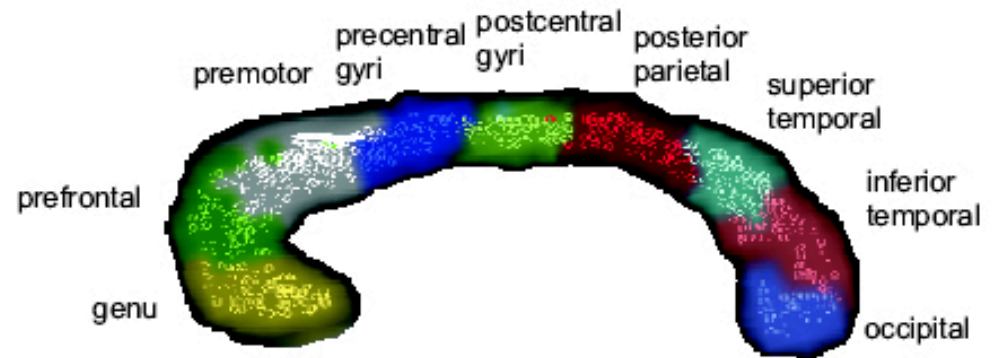
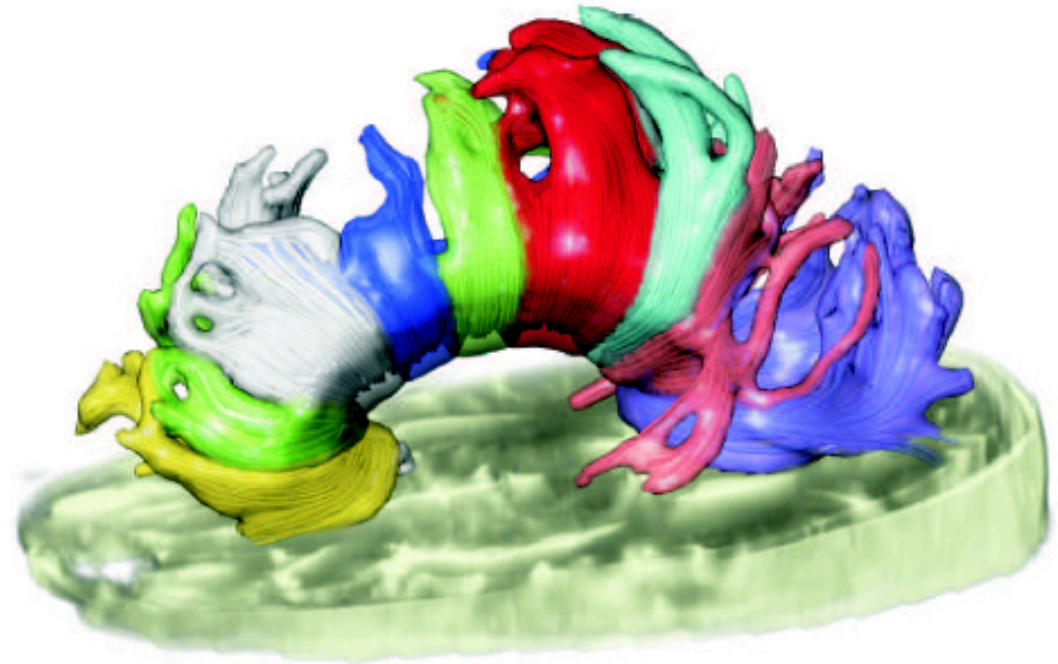
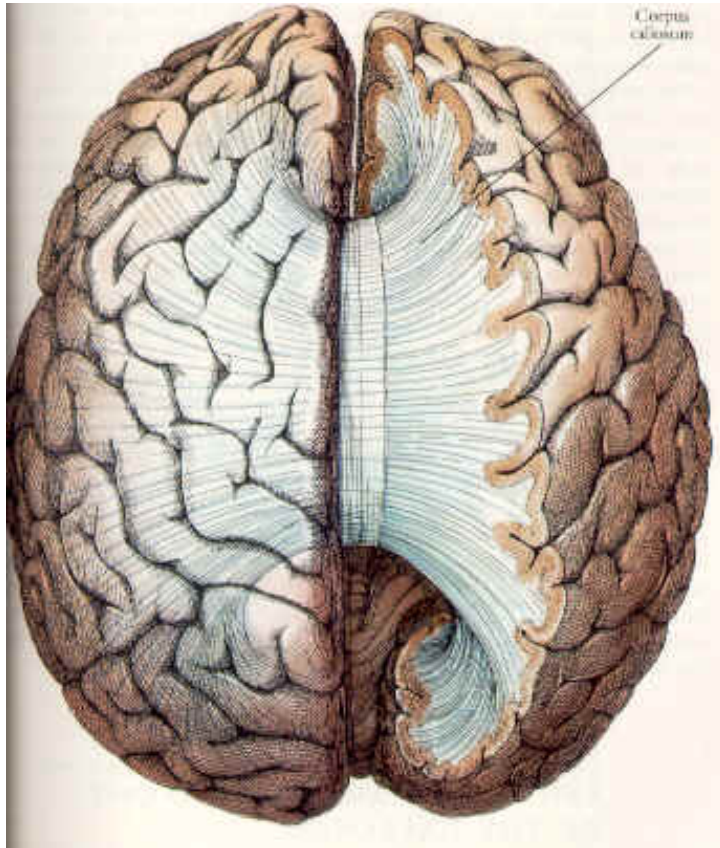


“Dissection” hotkeys

Parameter	Function
Cut	Command+D (OSX) or Ctrl+D (Windows)
Keep	Command+S (OSX) or Ctrl+S (Windows)



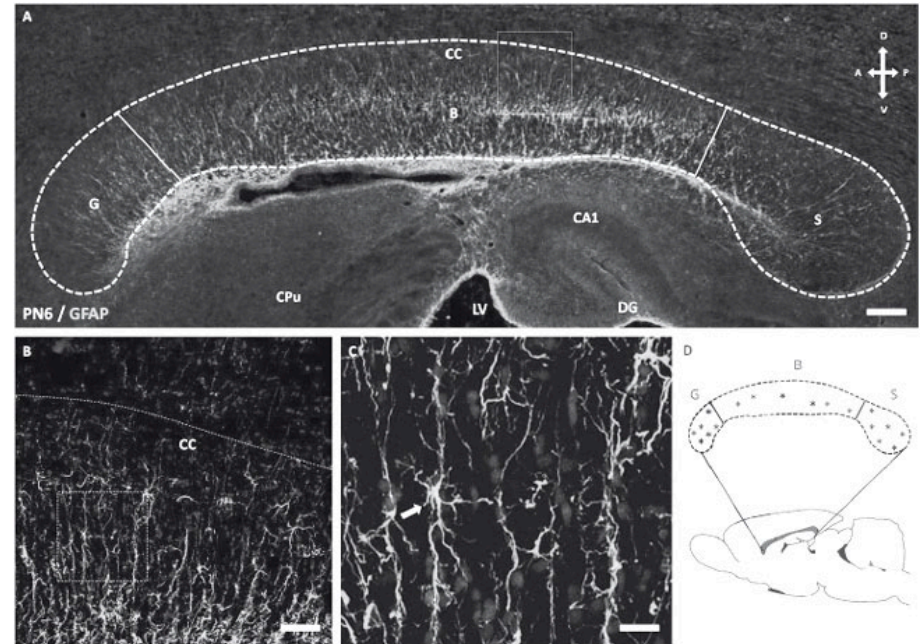
Today's Tract: The corpus callosum



Today's Tract: The corpus callosum

Three Major Sections:

- 1. Genu:** Connects frontal cortices, primarily orbitofrontal cortex, anterior cingulate and dorsal prefrontal.
- 2. Middle/Body:** Connects caudal frontal, motor and parietal areas.
- 3. Splenium:** Connects occipital striate areas.



Download the DSI template

- The Human Brain: An Introduction to Its Functional Anatomy. John Nolte. Mosby; 2002.
-

Data sets: Below includes data sets for various class projects that are freely distributed for educational purposes.

- [Single subject acquisition](#) (50d DTI with $b=2000$ & 257d DSI with $b_{max} = 5000$).
 - [80 Subject DSI Template](#) (205d DSI, $b_{max} = 5000$)
 - [80 Subject T1-weighted Template](#) (270d 3-shell, $b_{max} = 3000$)
-

Lectures & Readings: Note, PDF links are only for course use. They will be removed within 2 weeks of the second lecture.

Tractography Test

How can you capture a complete a picture as possible of the corpus callosum?

- Three major sections
- Most lateral coverage possible
- Least Amount of noise

