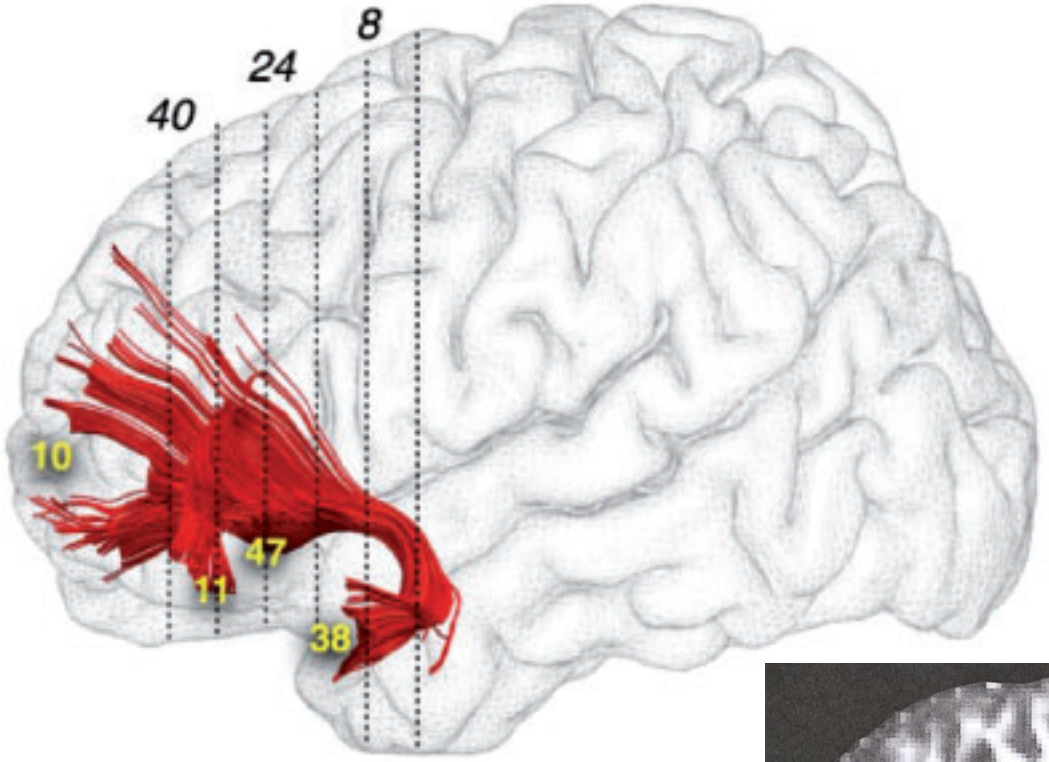
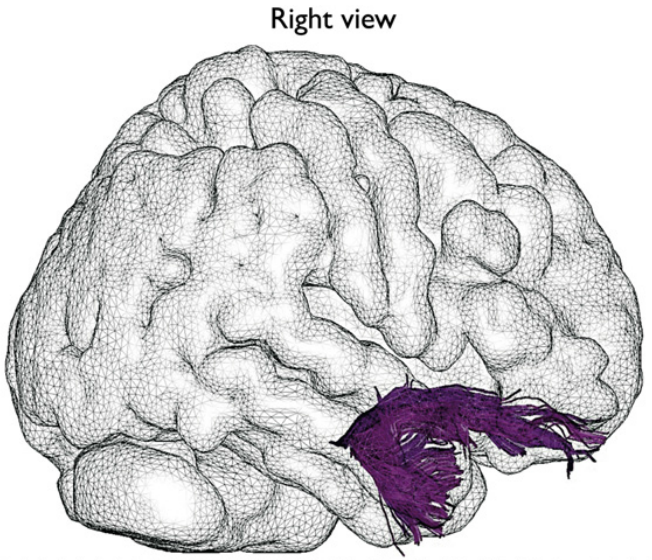
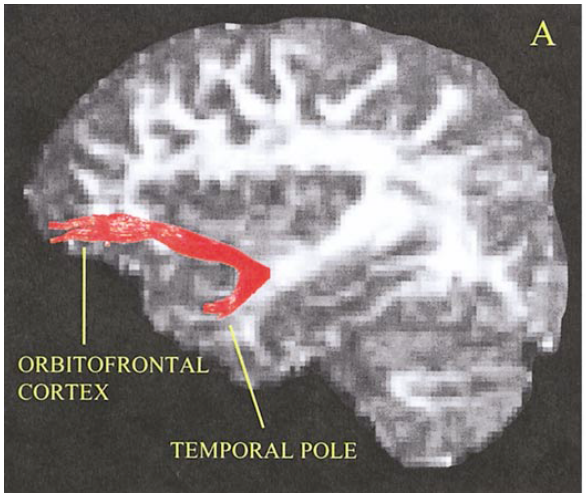
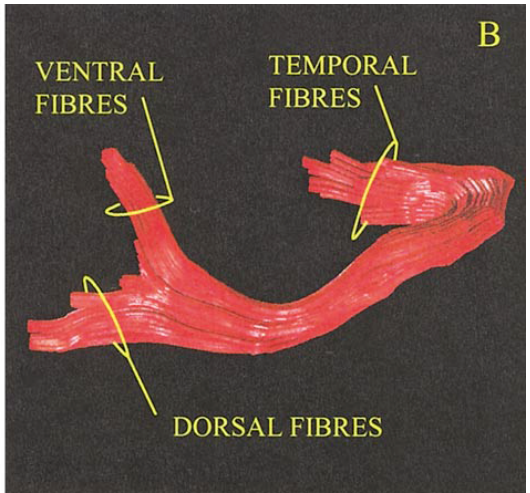
Uncinate Fasciculus





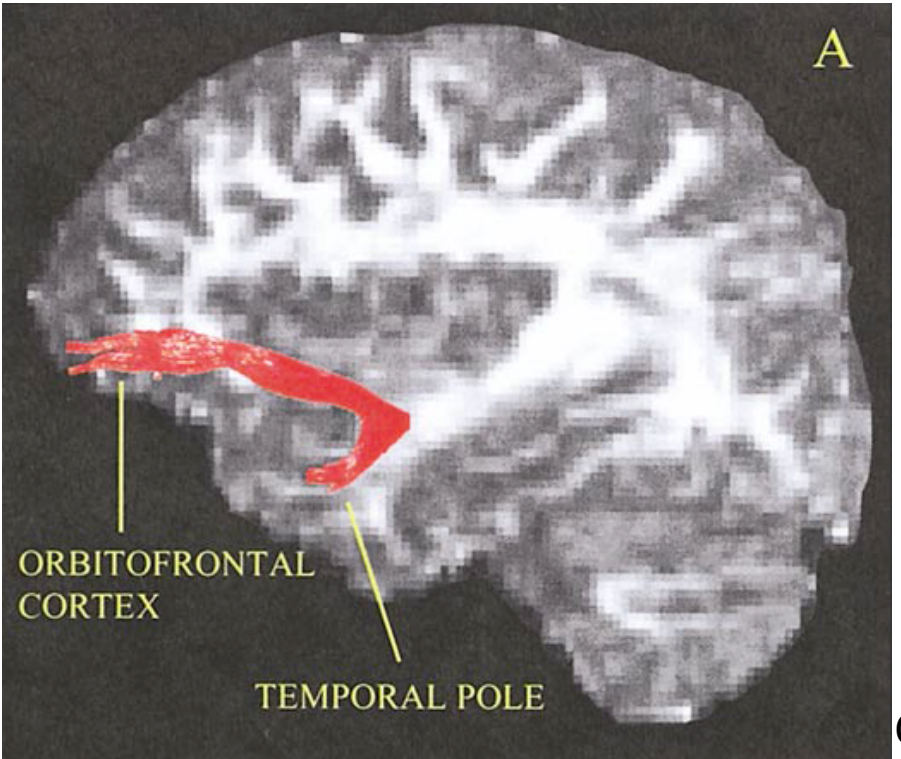


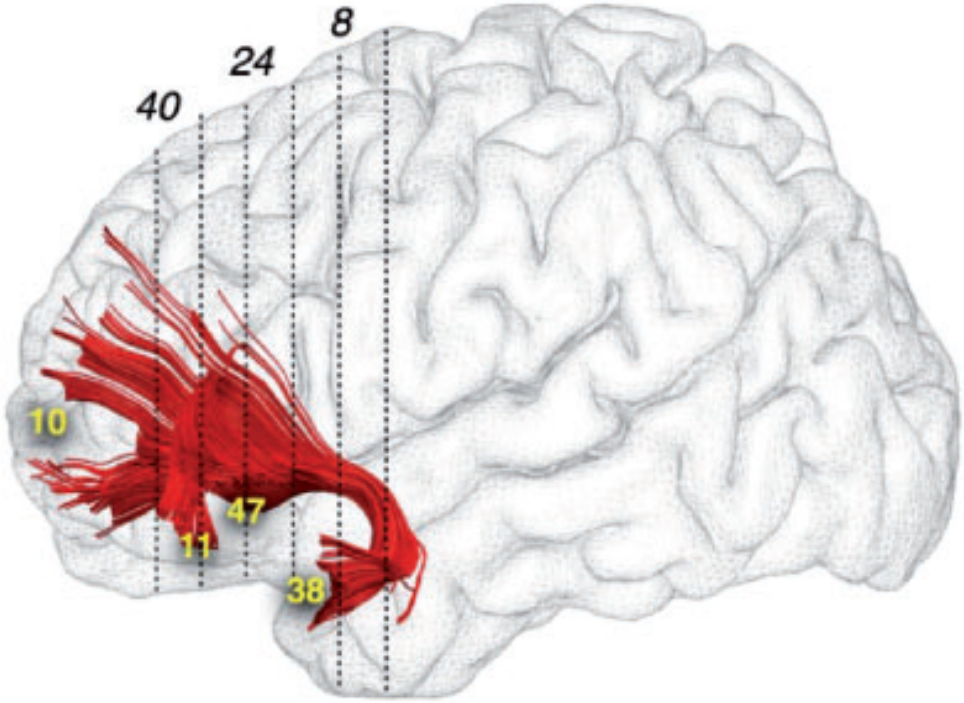


Jessica W. O'Brien
Virtual Neuroanatomy
November 4, 2014

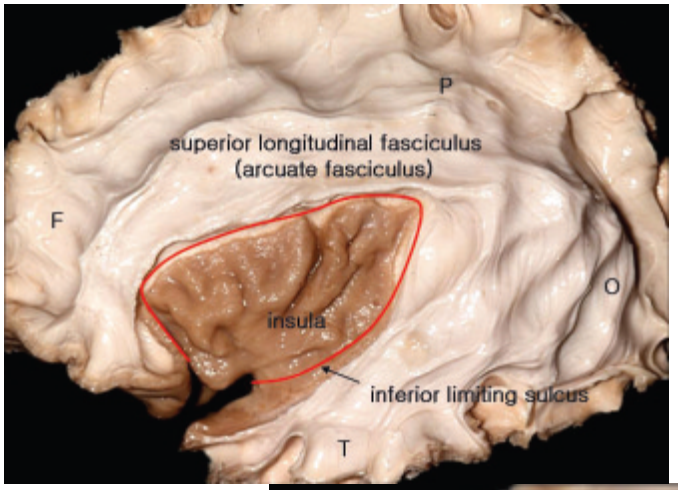
Uncinate Fasciculus

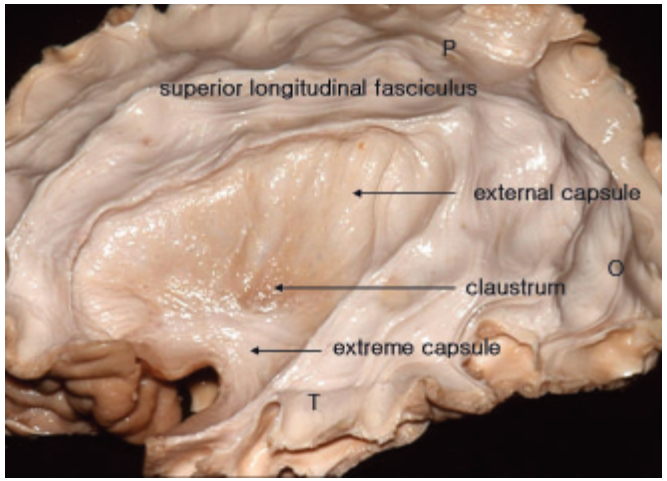
- Bidirectional, long-range white matter tract connecting orbitofrontal cortex with anterior temporal lobes

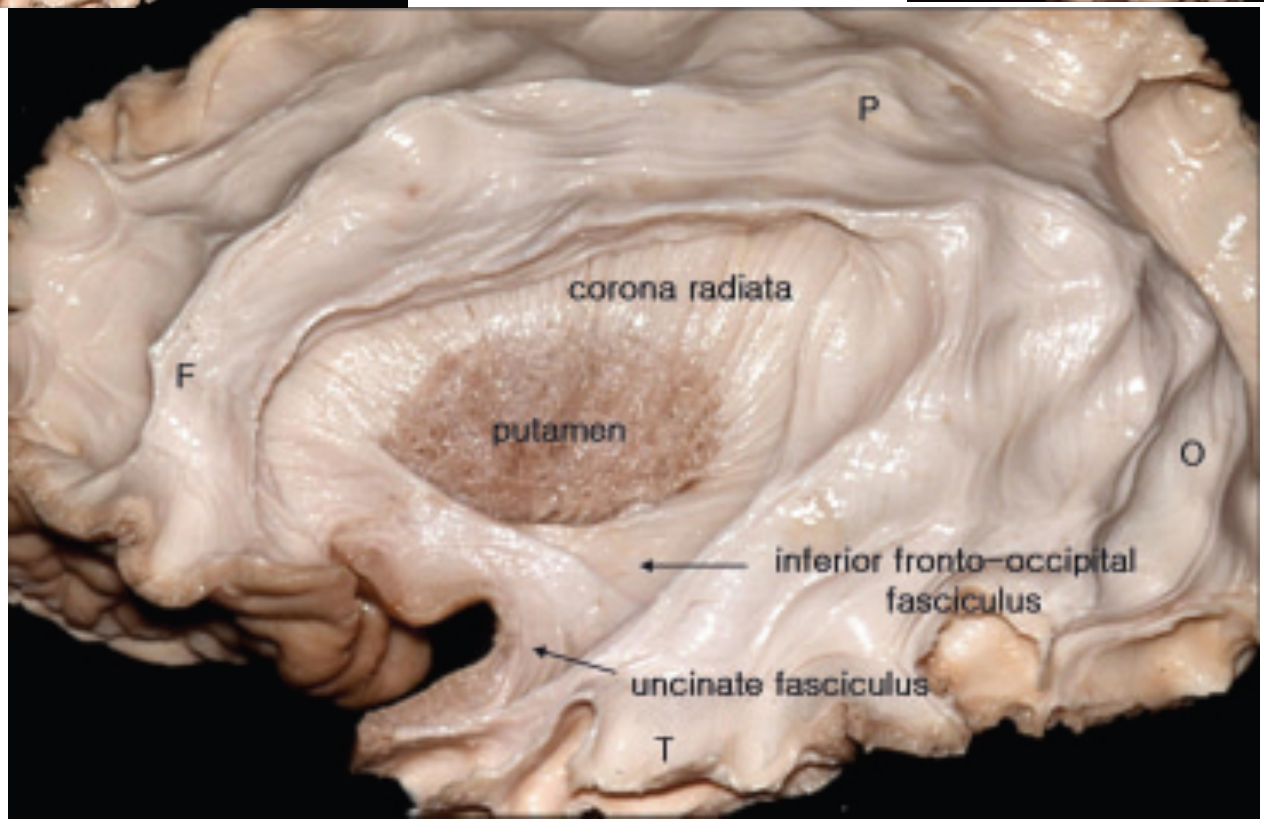




Catani et al., 2002; Thiebaut de Schotten et al., 2012



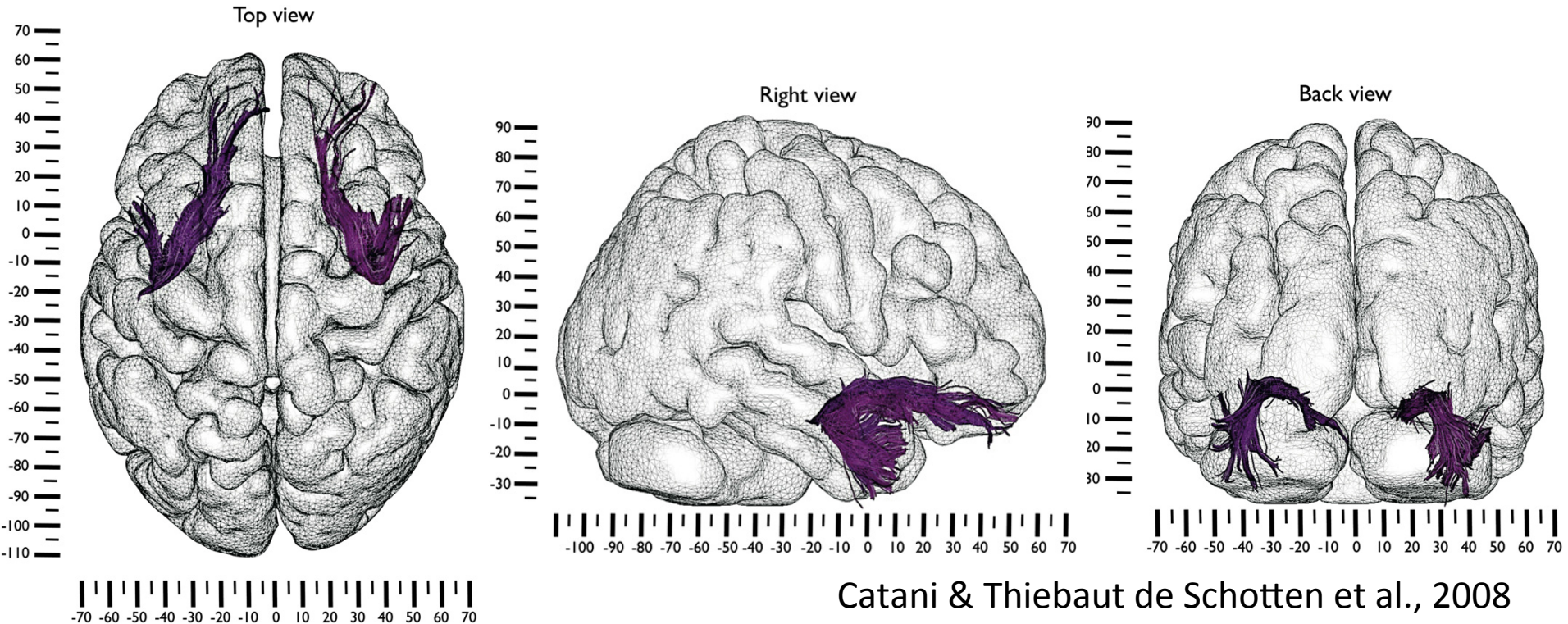




Choi et al., 2010

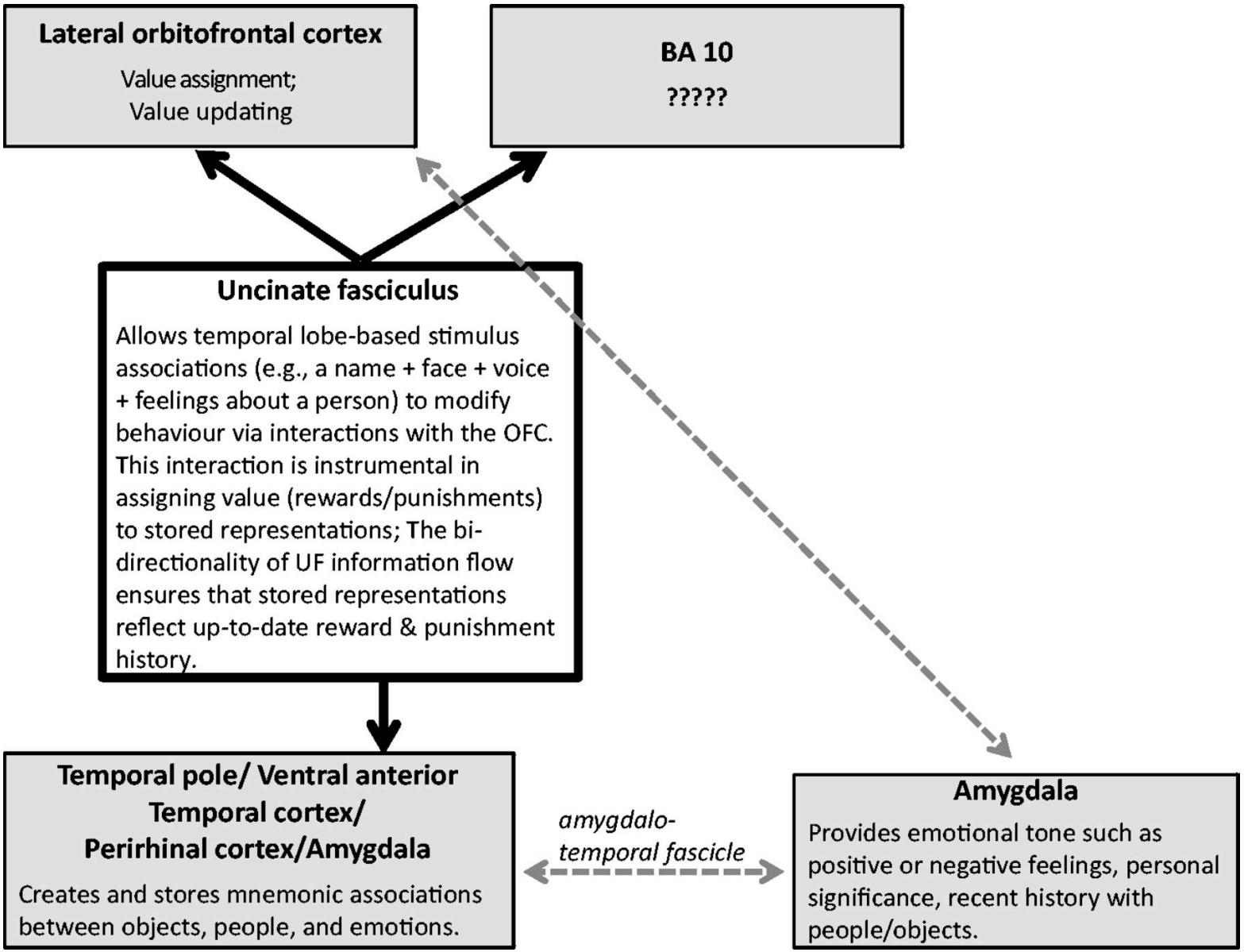
Afferents and Efferents

- The uncinate is monosynaptic and bidirectional, connecting the anterior temporal lobe with the medial and lateral OFC



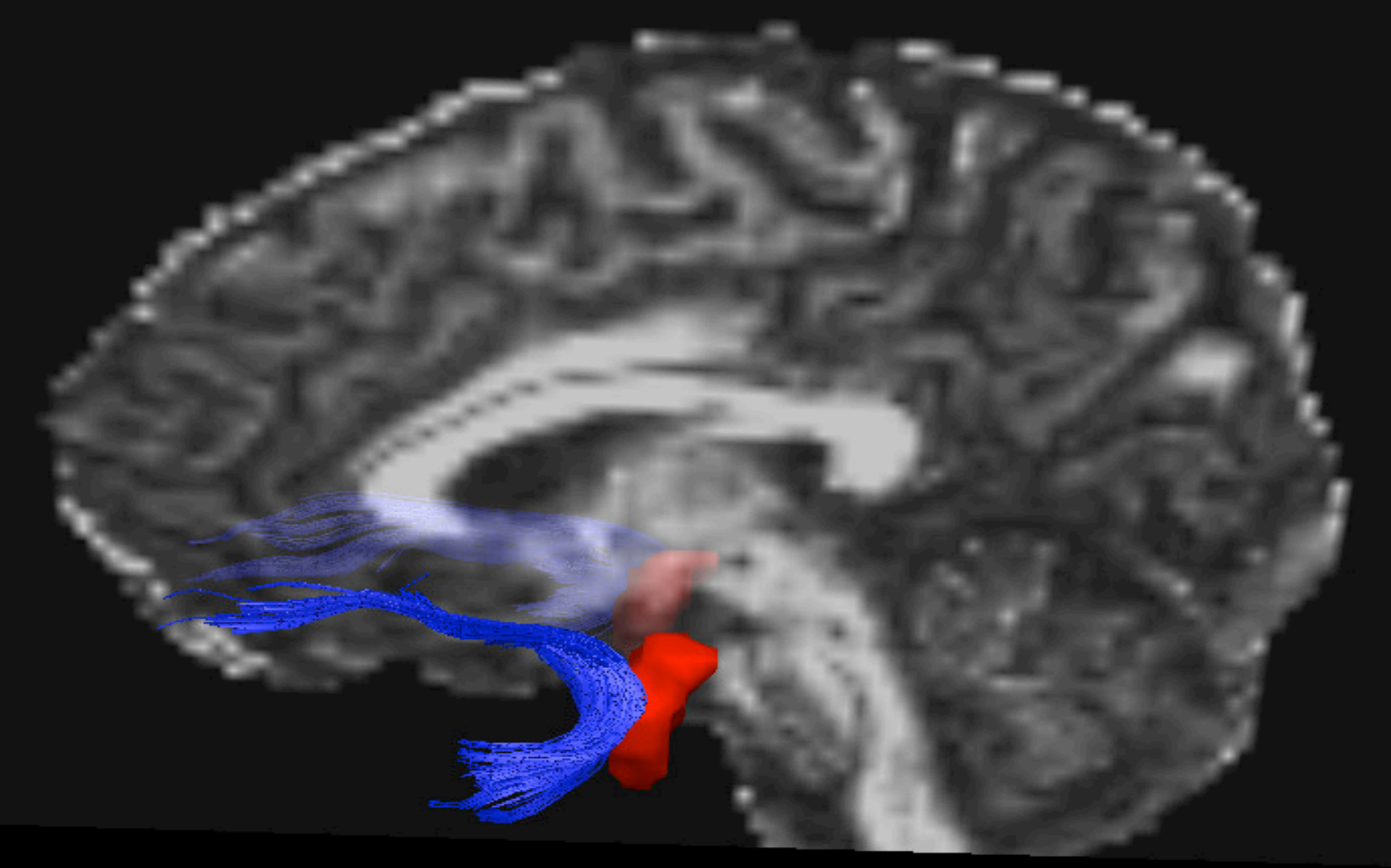
Catani & Thiebaut de Schotten et al., 2008

A Proposed Model of UF Function

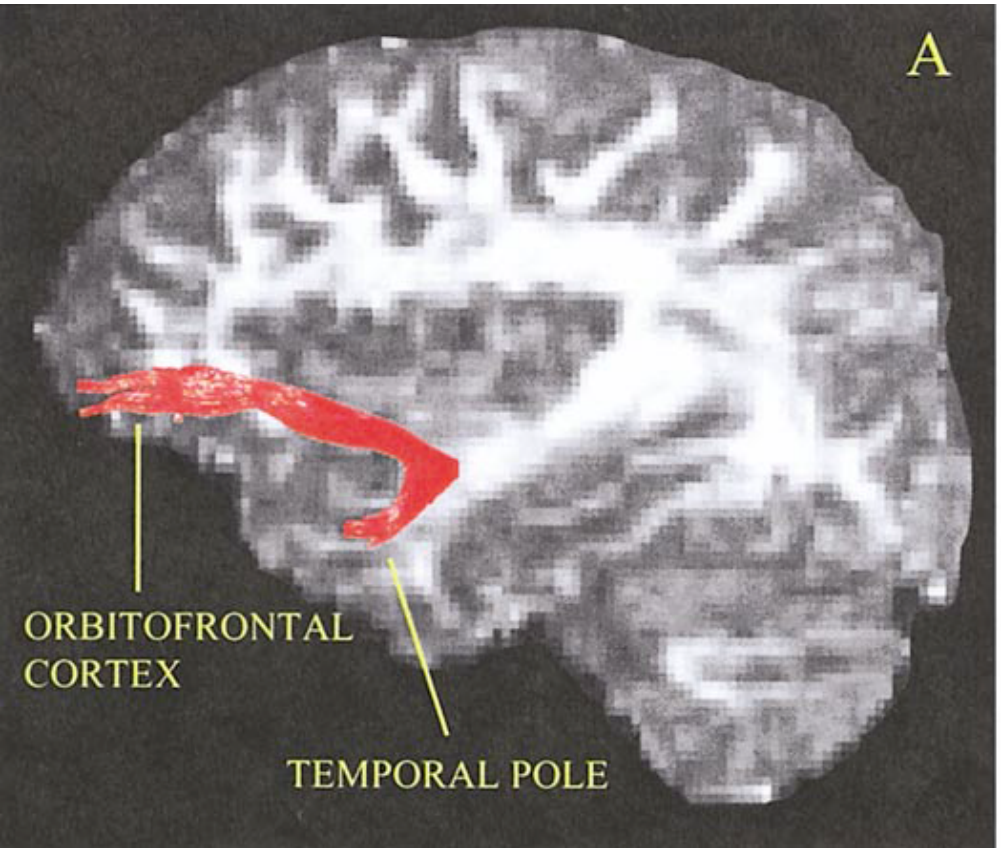


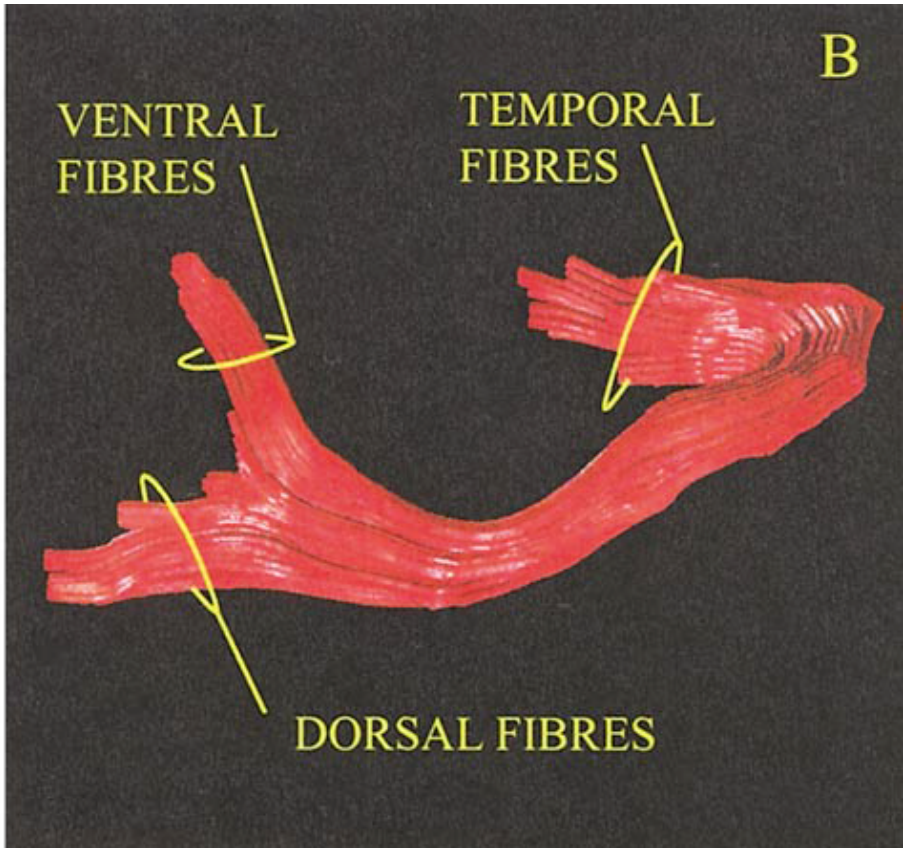
Afferents and Efferents

- The exact cortical connections of the uncinate fasciculus are still a matter of debate, especially with regards to the amygdala and hippocampus


uncinate fasciculus
amygdala

Three Segments

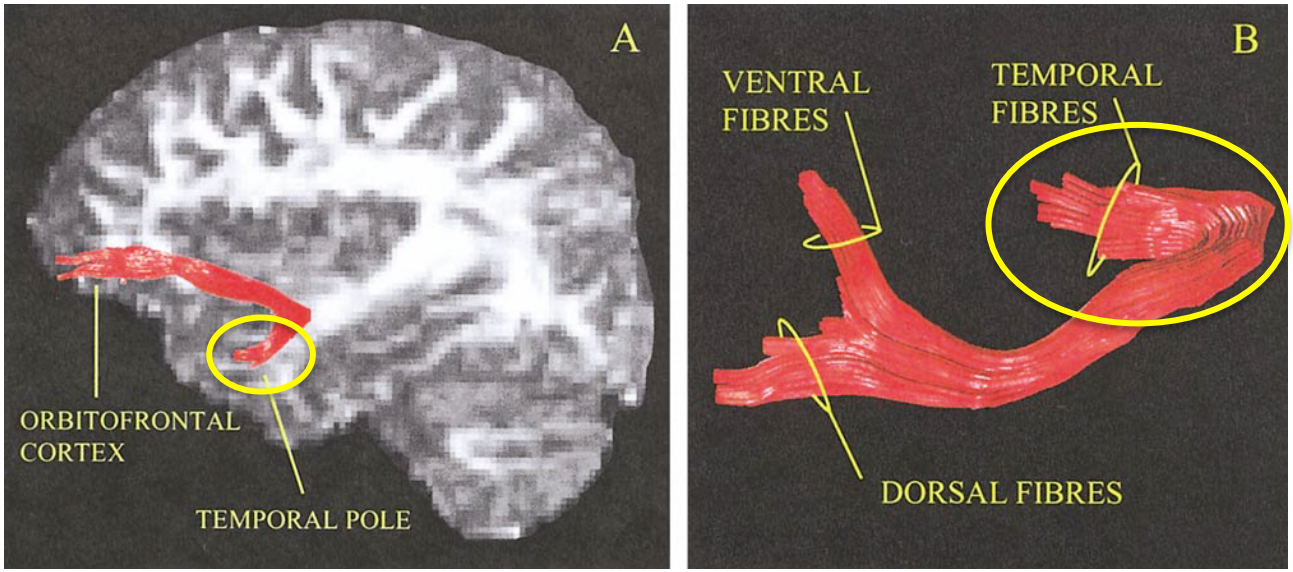




Catani et al., 2002

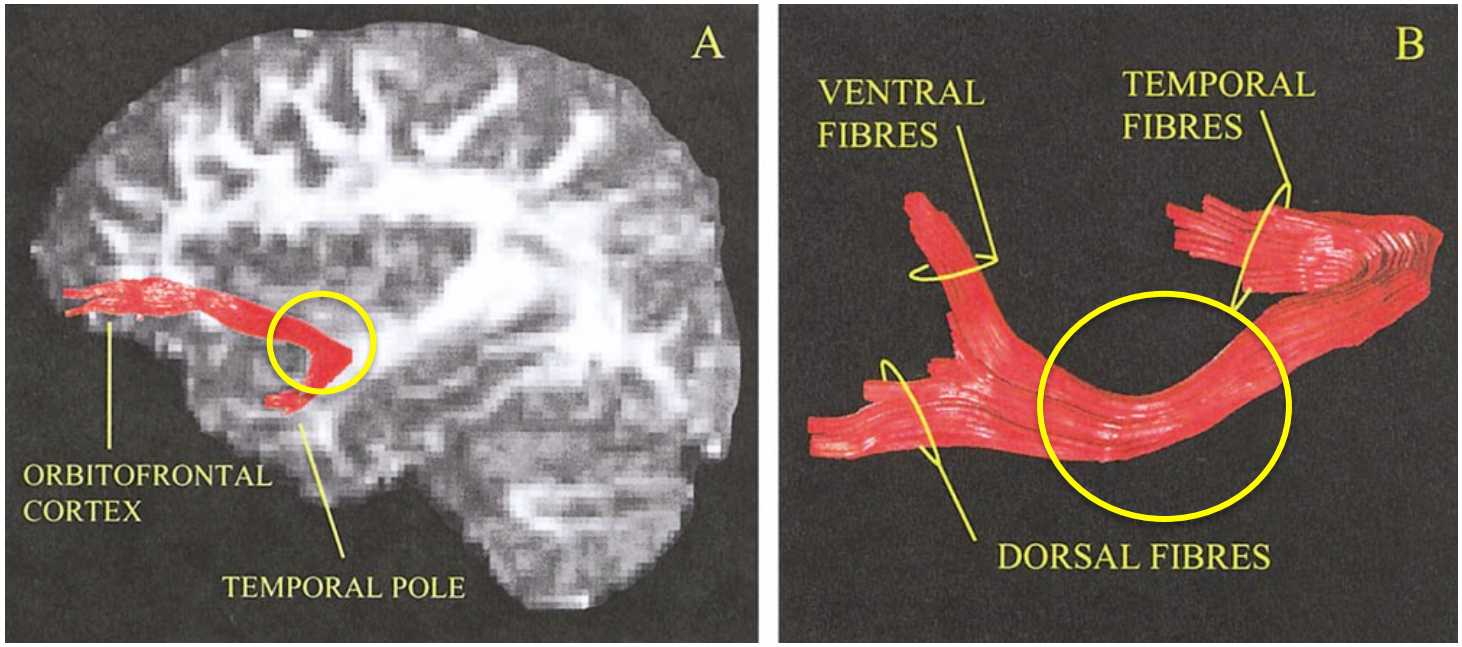
Afferents and Efferents

– Dorsal/temporal Segment
  - Originates from the uncus (BA35), entorhinal/perirhinal cortices (i.e. cortical nuclei of the amygdala, BA28/34/36) and temporal pole (BA20/38)
  - Contains uncinate cell bodies



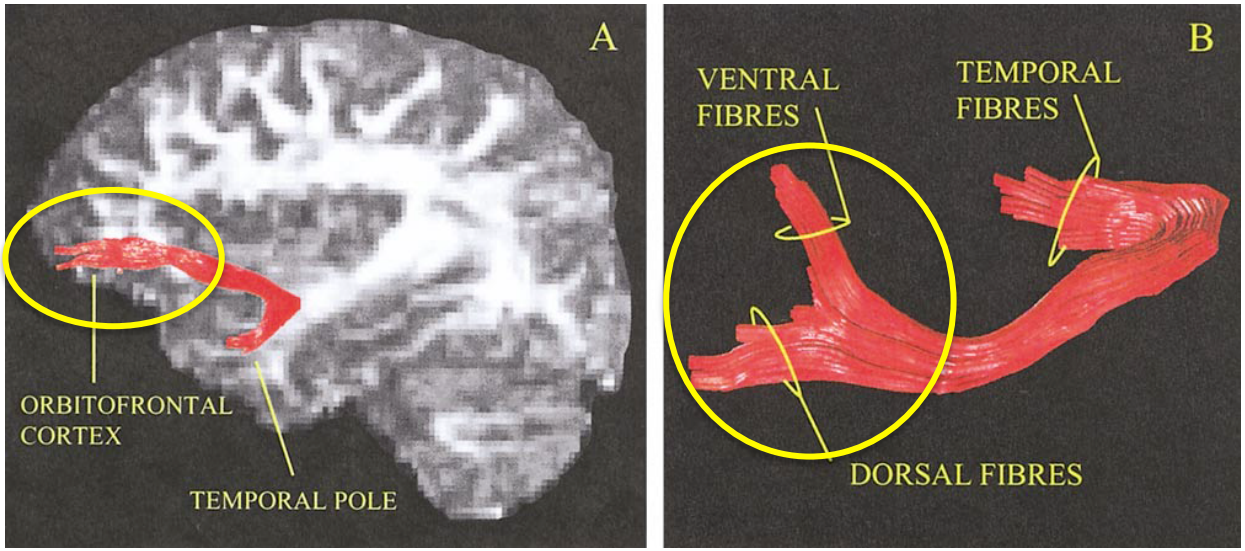
Afferents and Efferents

– Middle/insular
  - Passes up over the lateral nucleus of the amygdala and near/through the external capsule and extreme capsule

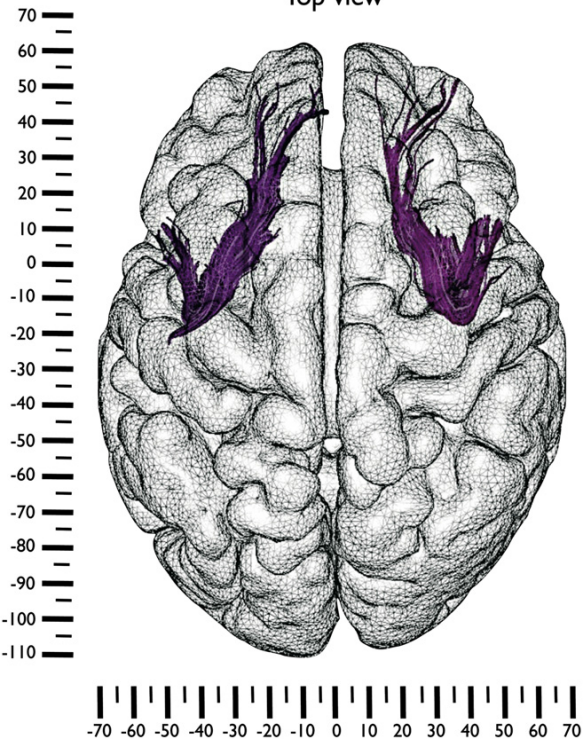


Afferents and Efferents

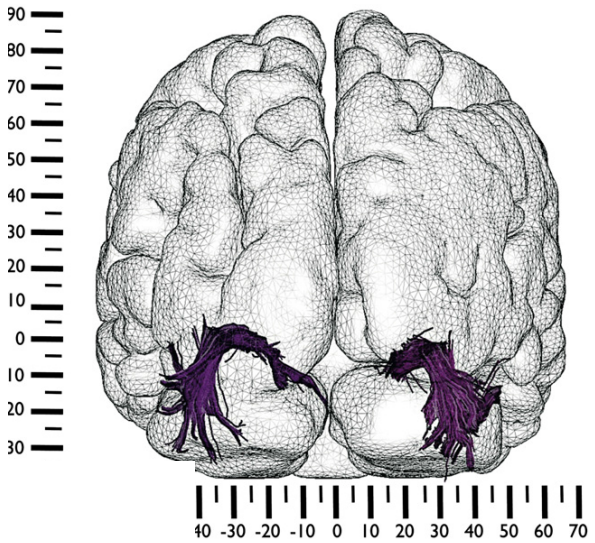
- Ventral/frontal
  - Horizontal fan-shaped extension into the orbital frontal lobe
  - Fan splits into two branches
    - Larger ventro-lateral terminates in lateral OFC
    - Smaller medial branch to frontal pole



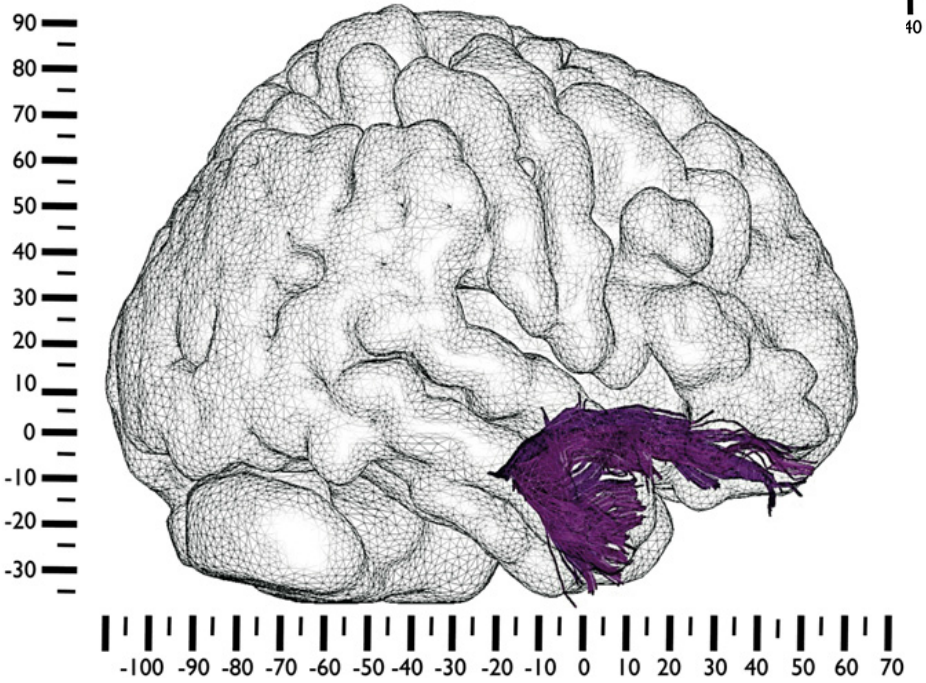
Top view

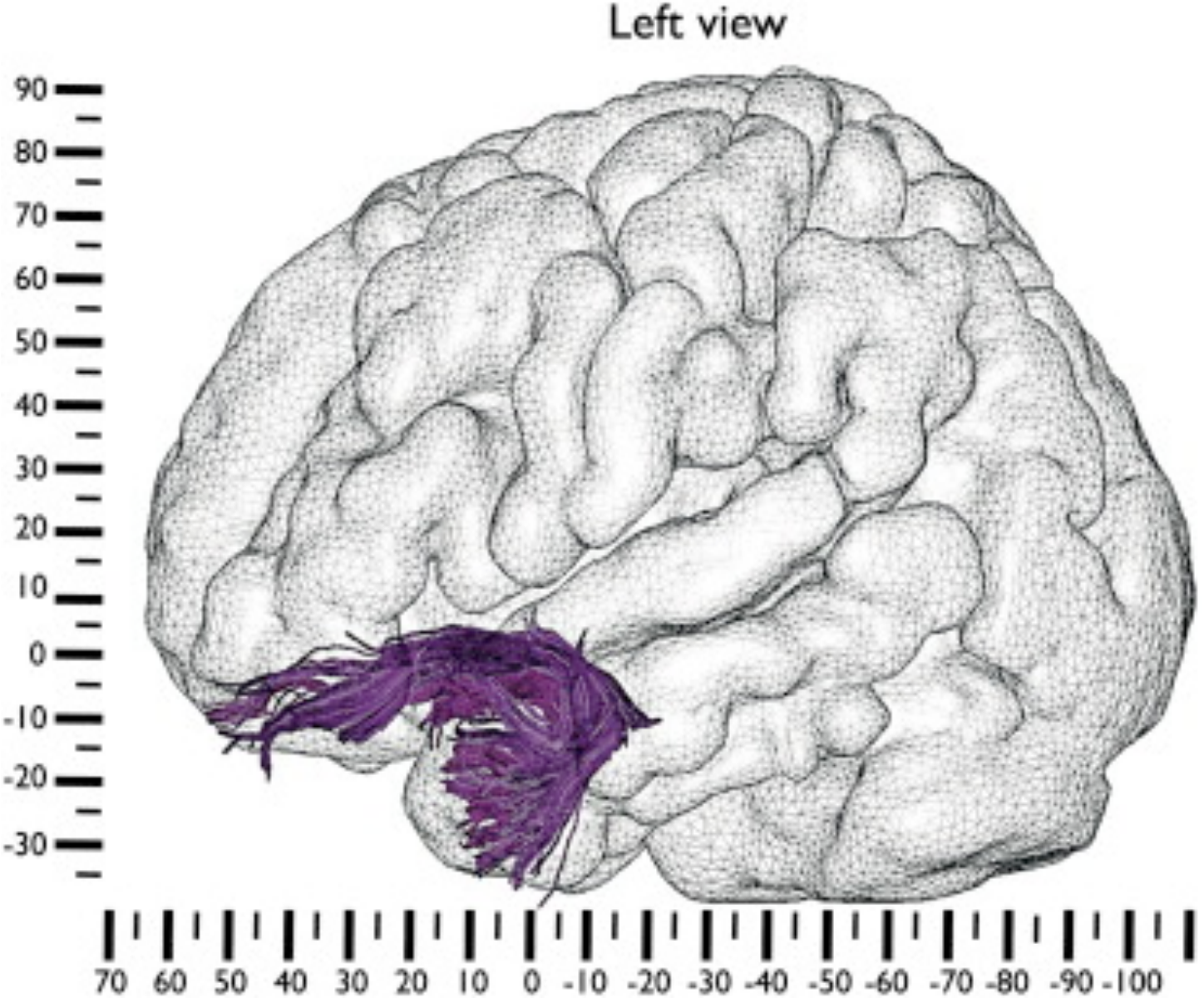


Back view



Right view




Left view
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100

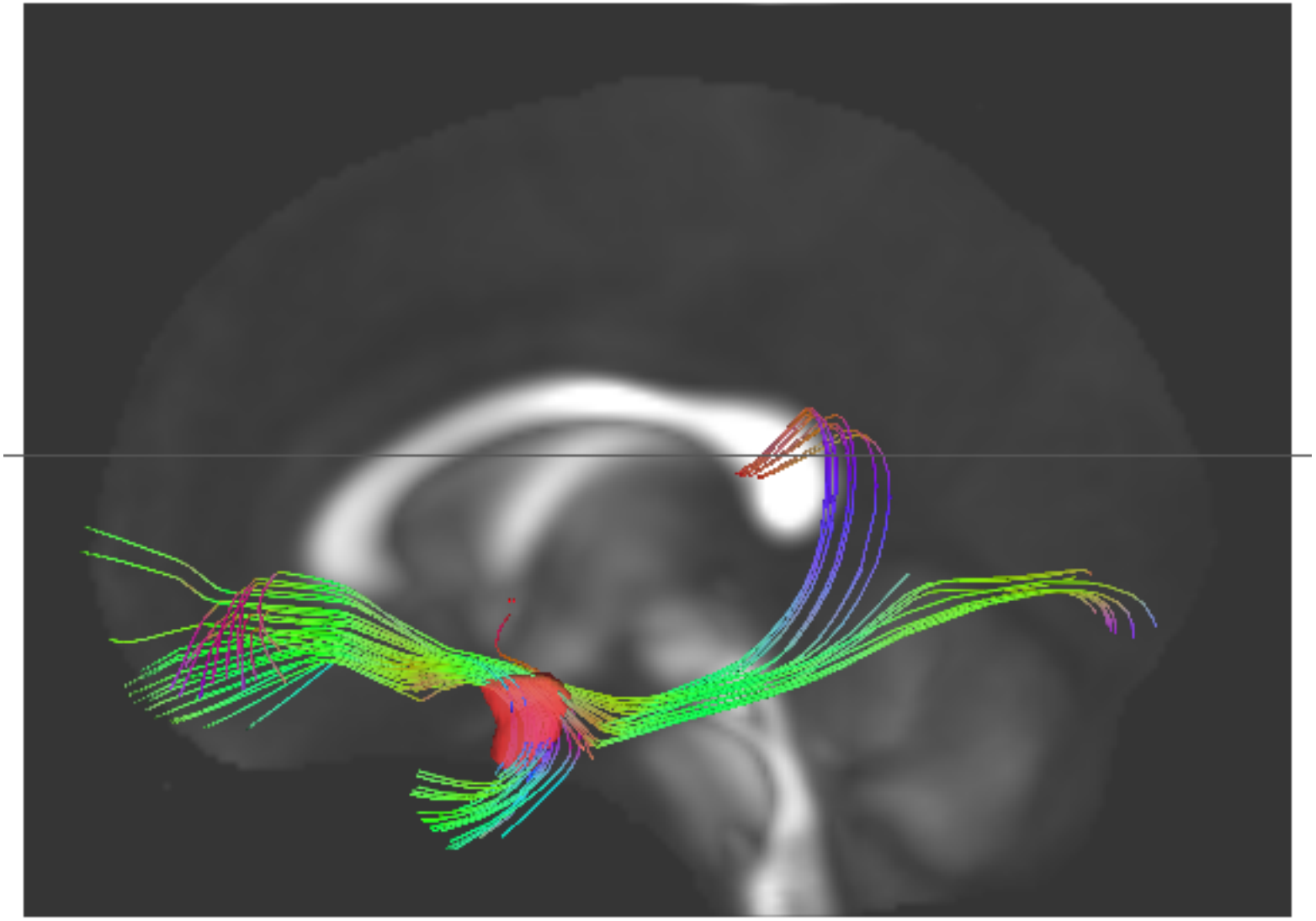
Tractography Goals

- Map the uncinate fasciculus

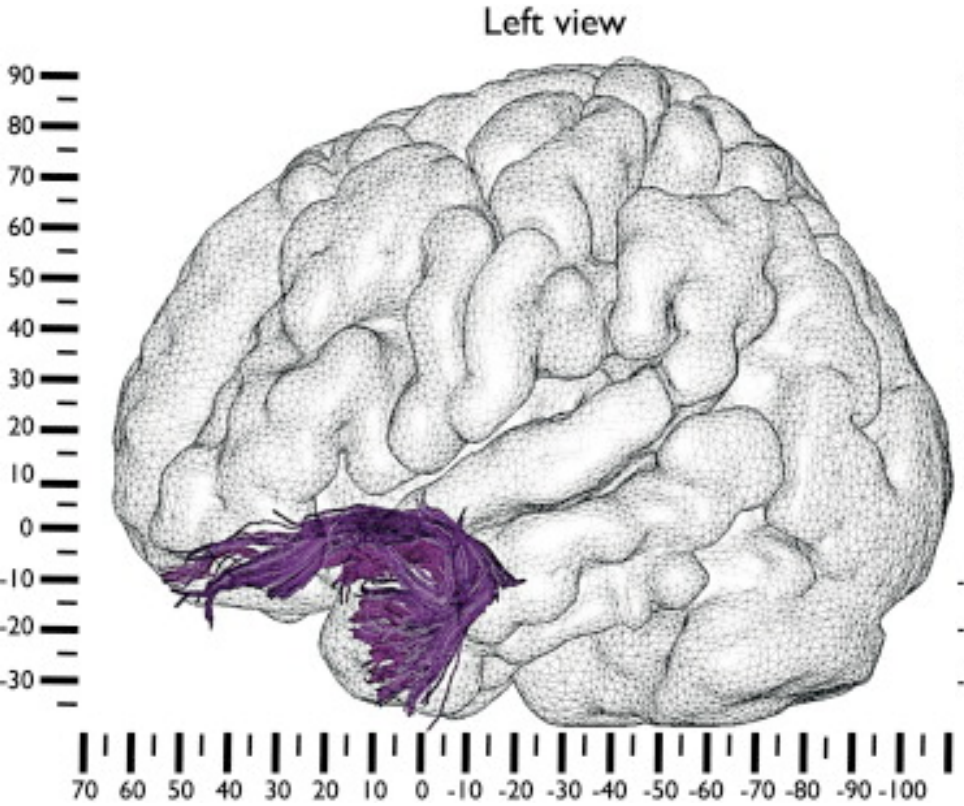
- Explore connectivity between frontal and temporal tracts, the amygdala, and the hippocampus

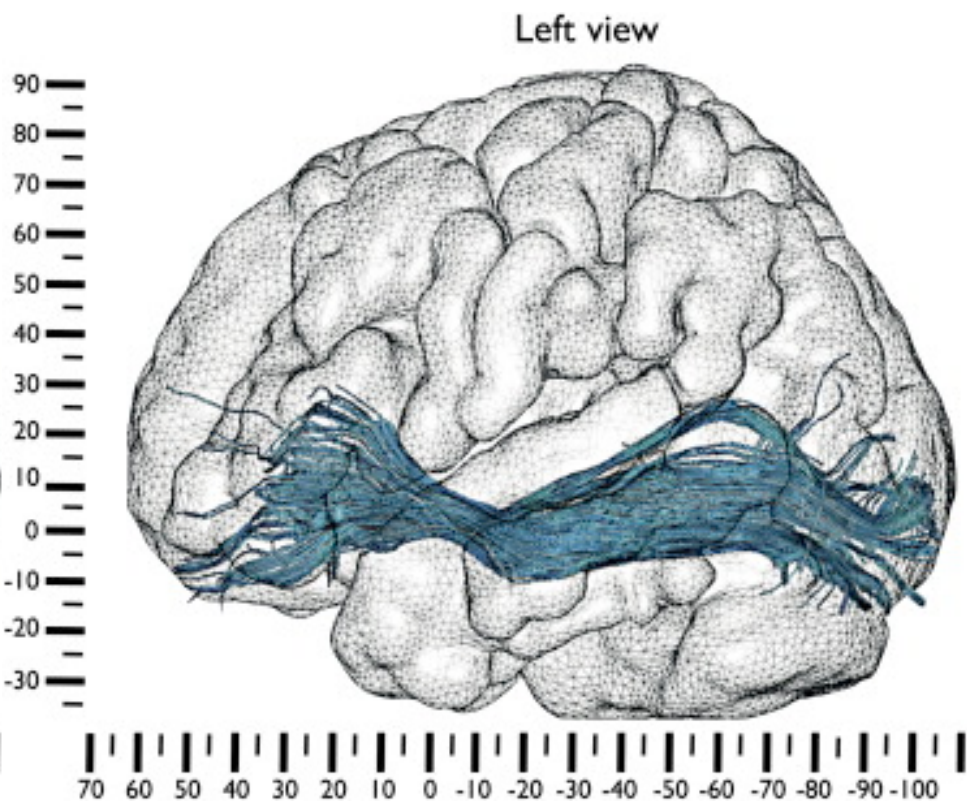
Tractography

1. Load up the CMU-80 fib file
2. Load up the TI image
3. Select Atlas → JHU → Left Uncinate Fasiculus
4. Run tracking, default parameters, UF as ROI



Uncinate vs. IFOF

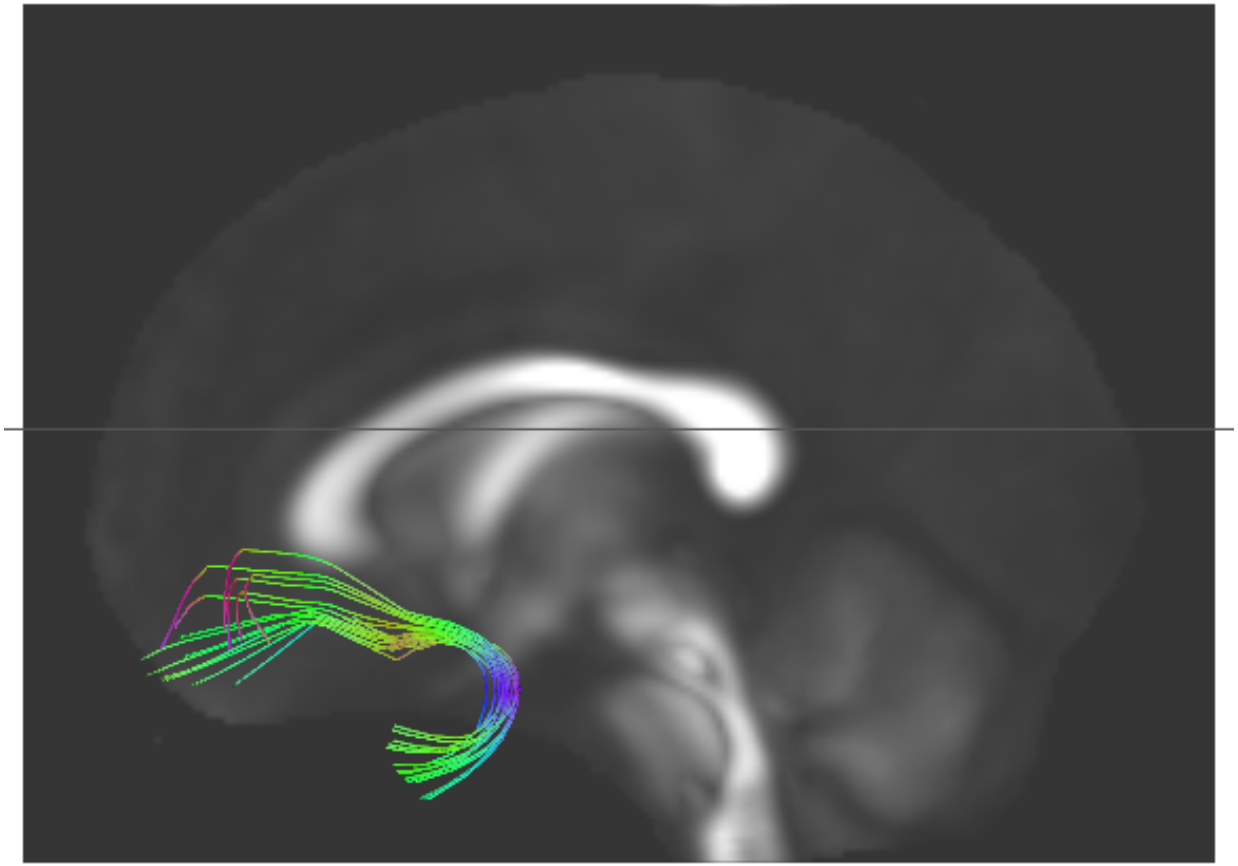




Tractography

1. From the AAL atlas, load:
    1. Frontal_Sup_Orb_L
    2. Frontal_Mid_Orb_L
    3. Frontal_Inf_Orb_L
    4. Merge these ROIs
2. From the AAL atlas, load:
    1. Temporal_Pole_Sup_L
    2. Temporal_Pole_mid_L
    3. Merge these ROIs
3. Run tracking with default parameters (SEEDS NOT TRACTS), both merged regions as ROIs

How can we improve this image?



Exploratory Analyses

1. Save your uncinate tracking as an ROI
2. Load amygdala_L and hippocampus_L from AAL atlas
3. Examine tracts running between Temporal Pole ROI and amygdala
4. Examine tracts running between OFC ROI and amygdala
5. Repeat for hippocampus
6. What does the overlap between these fibers and the uncinate ROI you saved look like?