

SPM8 for Basic and Clinical Investigators

Spatial Normalization



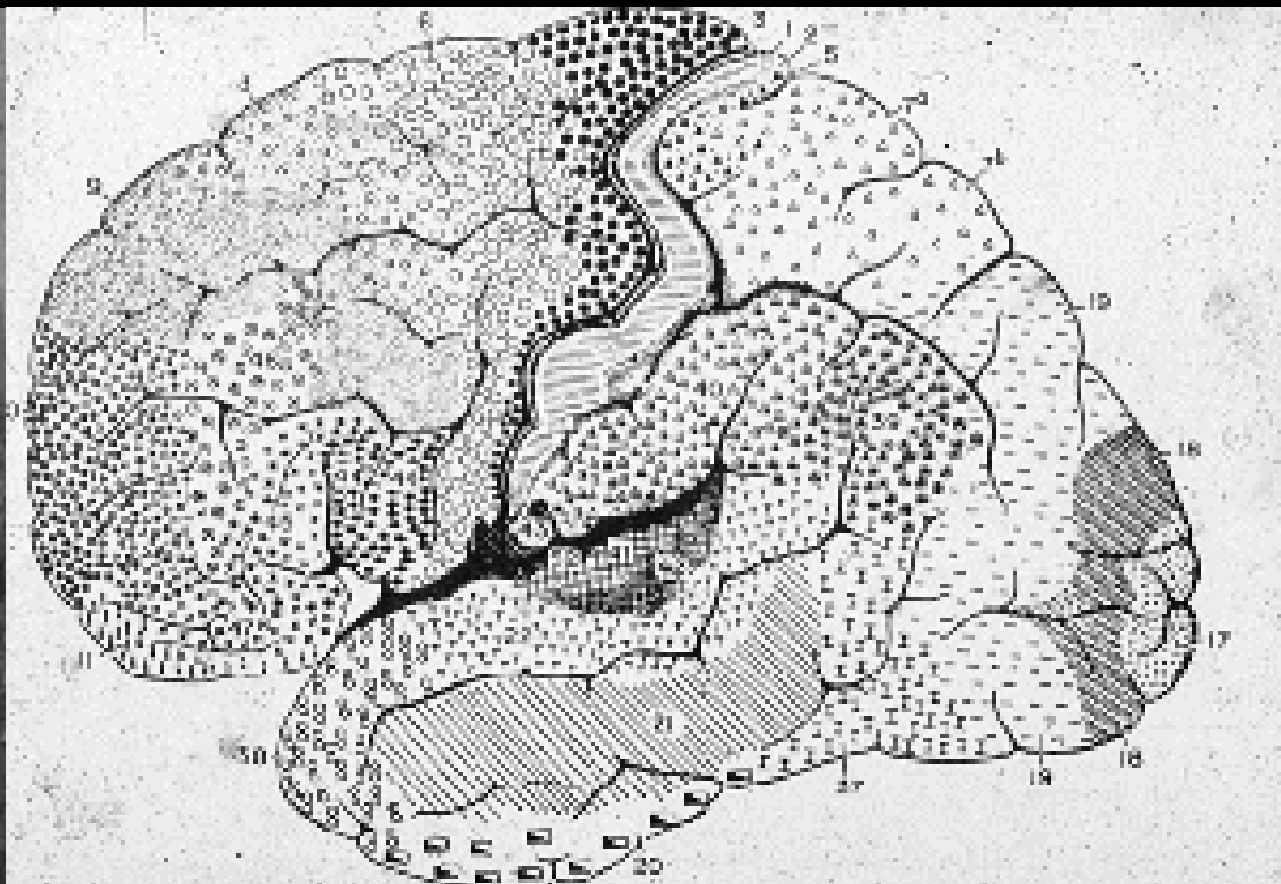
Comparing brains



Spatial Normalization: Why?

- Group averaging
 - Structural
 - Functional
- Labeling





Spatial Normalization: How?

- landmark based
- template based

- linear transformations
- nonlinear transformations

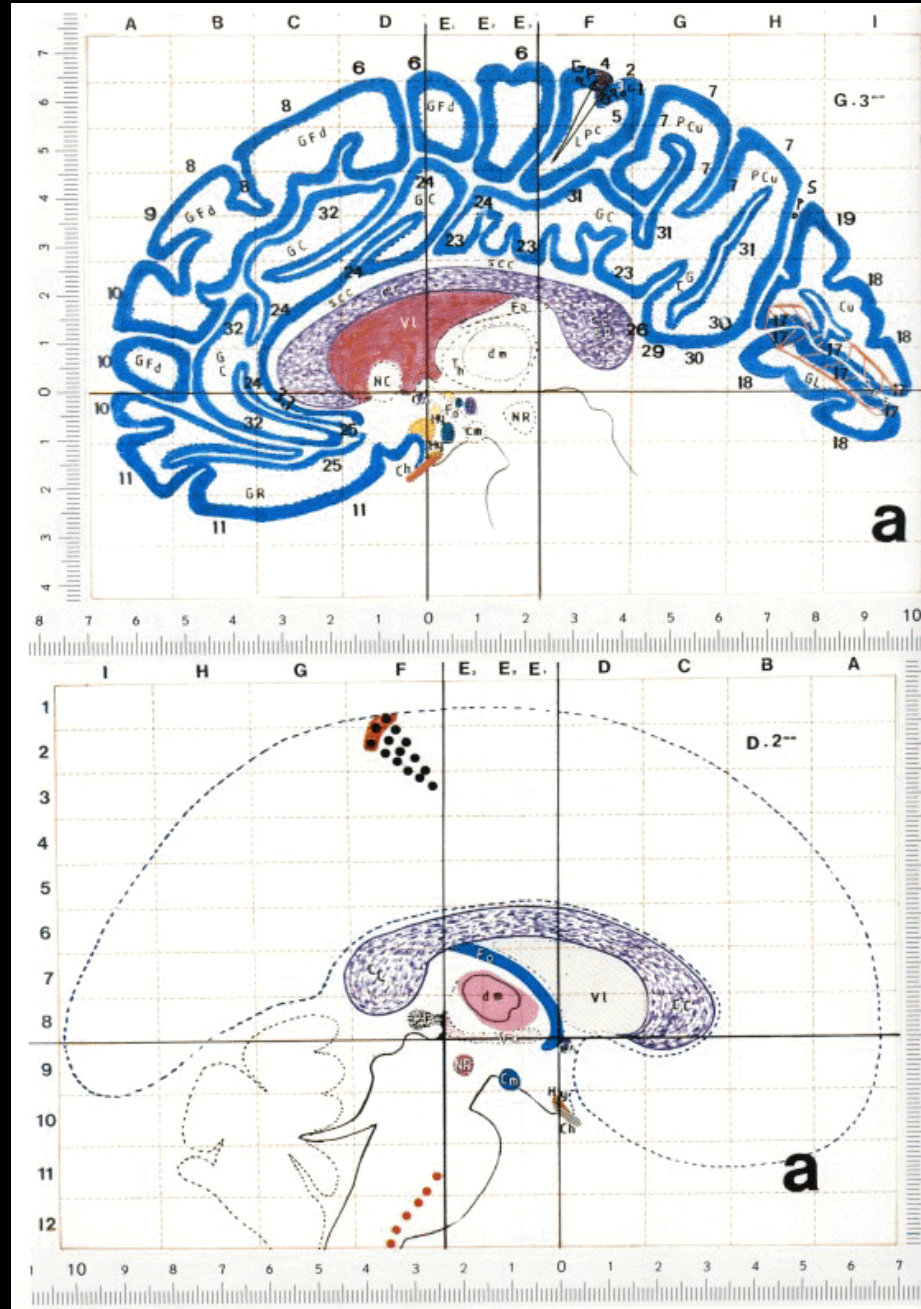
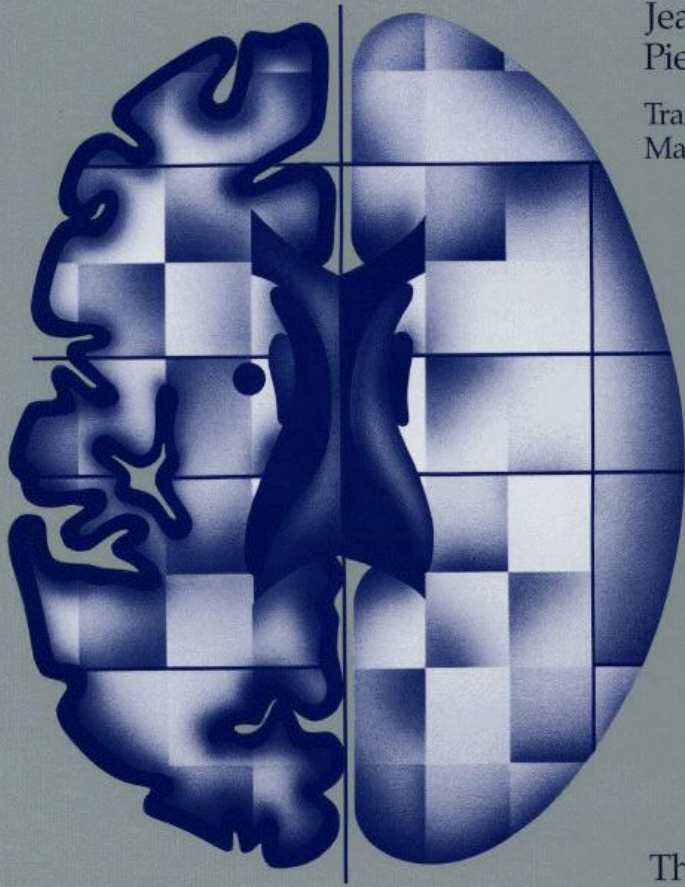
Co-Planar Stereotaxic Atlas of the Human Brain

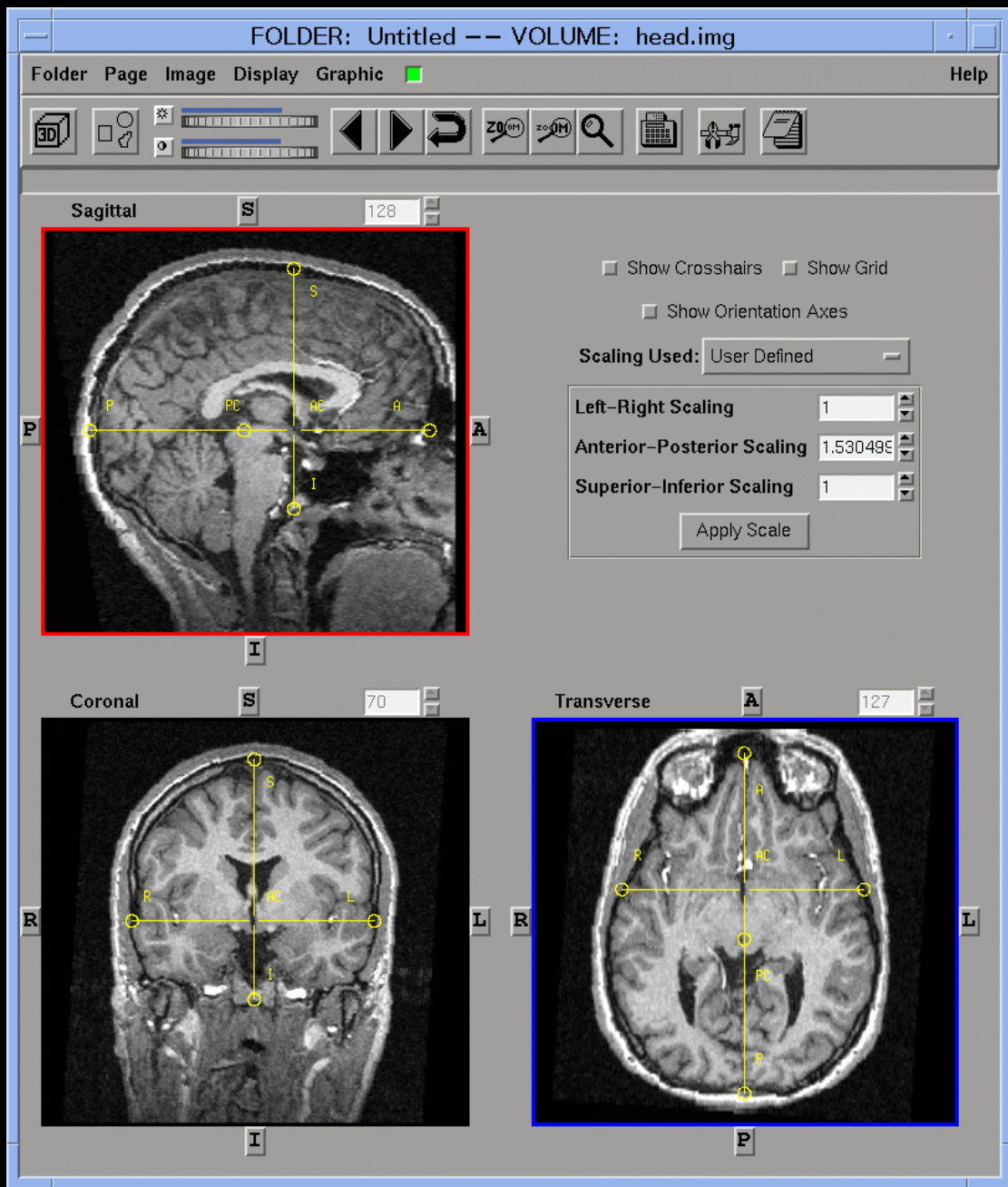
3-Dimensional Proportional System: An Approach to Cerebral Imaging

Jean Talairach
Pierre Tournoux

Translated by
Mark Rayport

Thieme



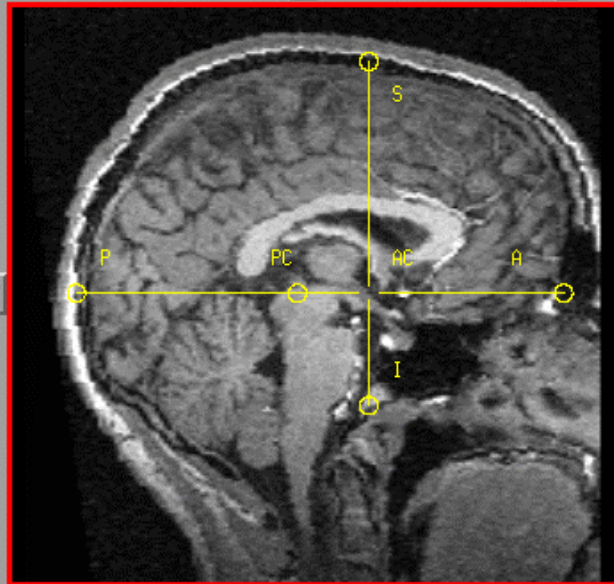


Spatial
Normalization
to
Talairach Atlas
using landmarks

Sagittal

S

128



Show Crosshairs Show Grid

Show Orientation Axes

Scaling Used: User Defined

Left-Right Scaling 1

Anterior-Posterior Scaling 1.53049E

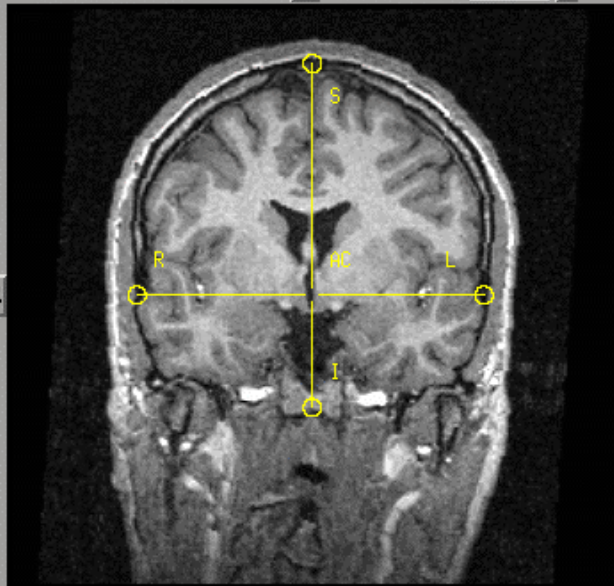
Superior-Inferior Scaling 1

Apply Scale

Coronal

S

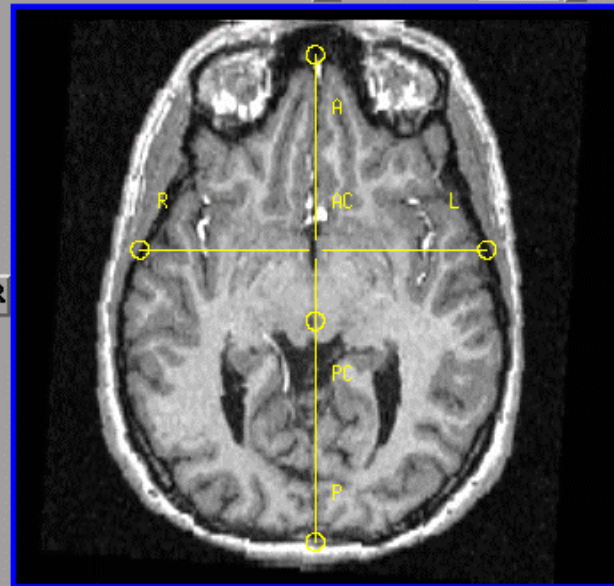
70



Transverse

A

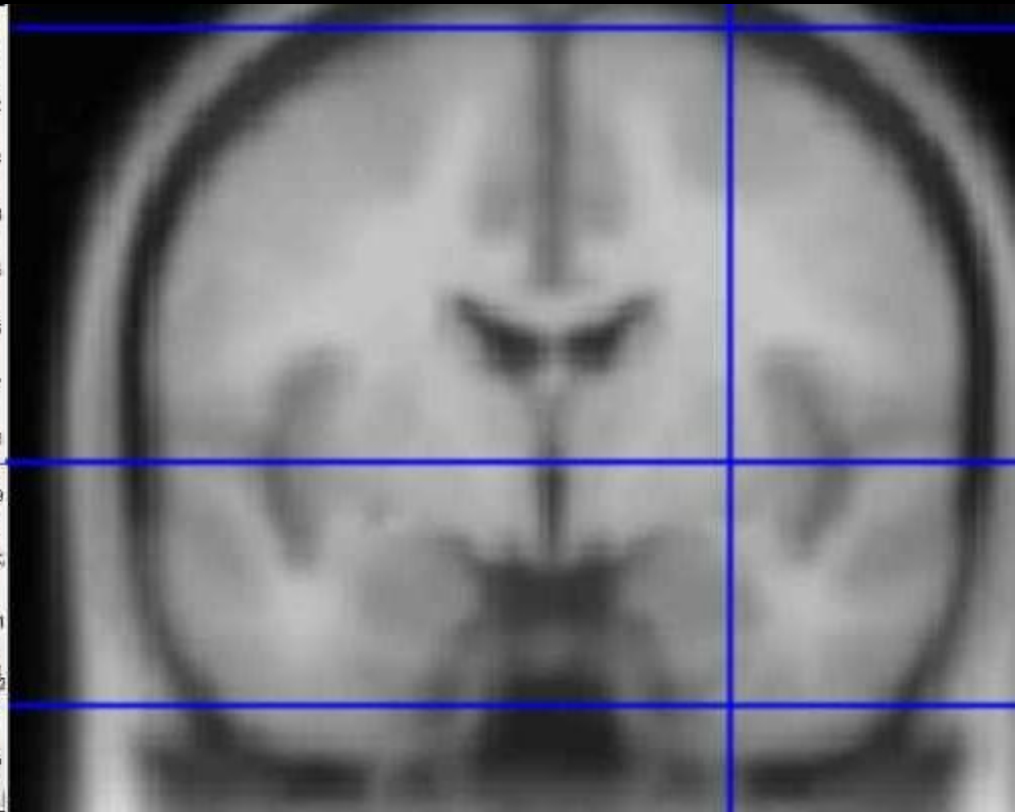
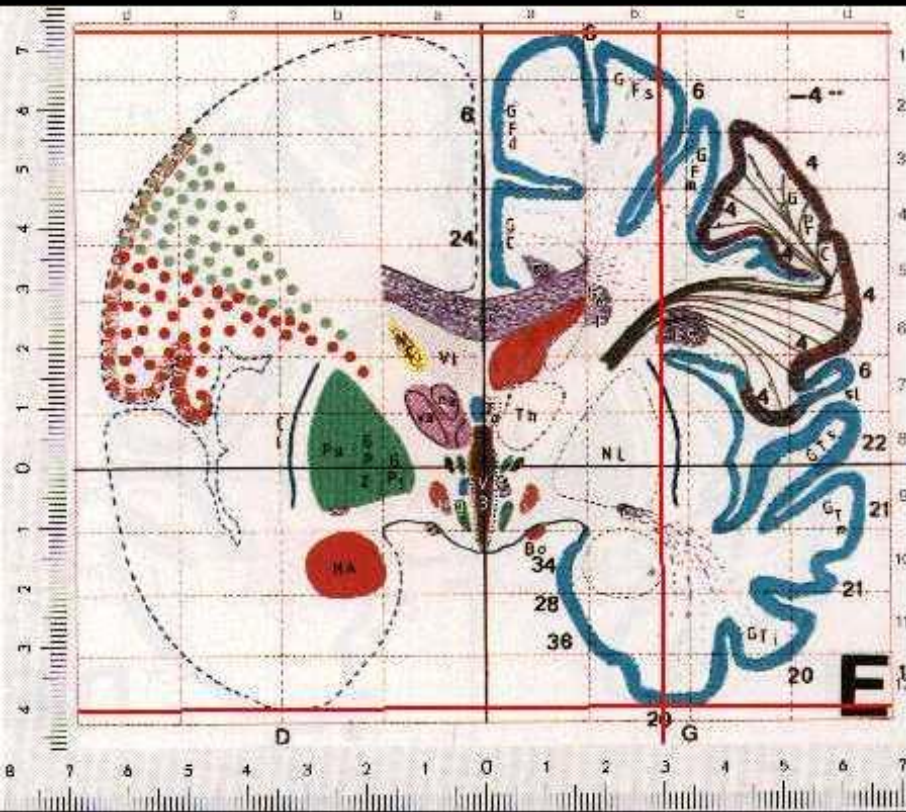
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Standard spaces

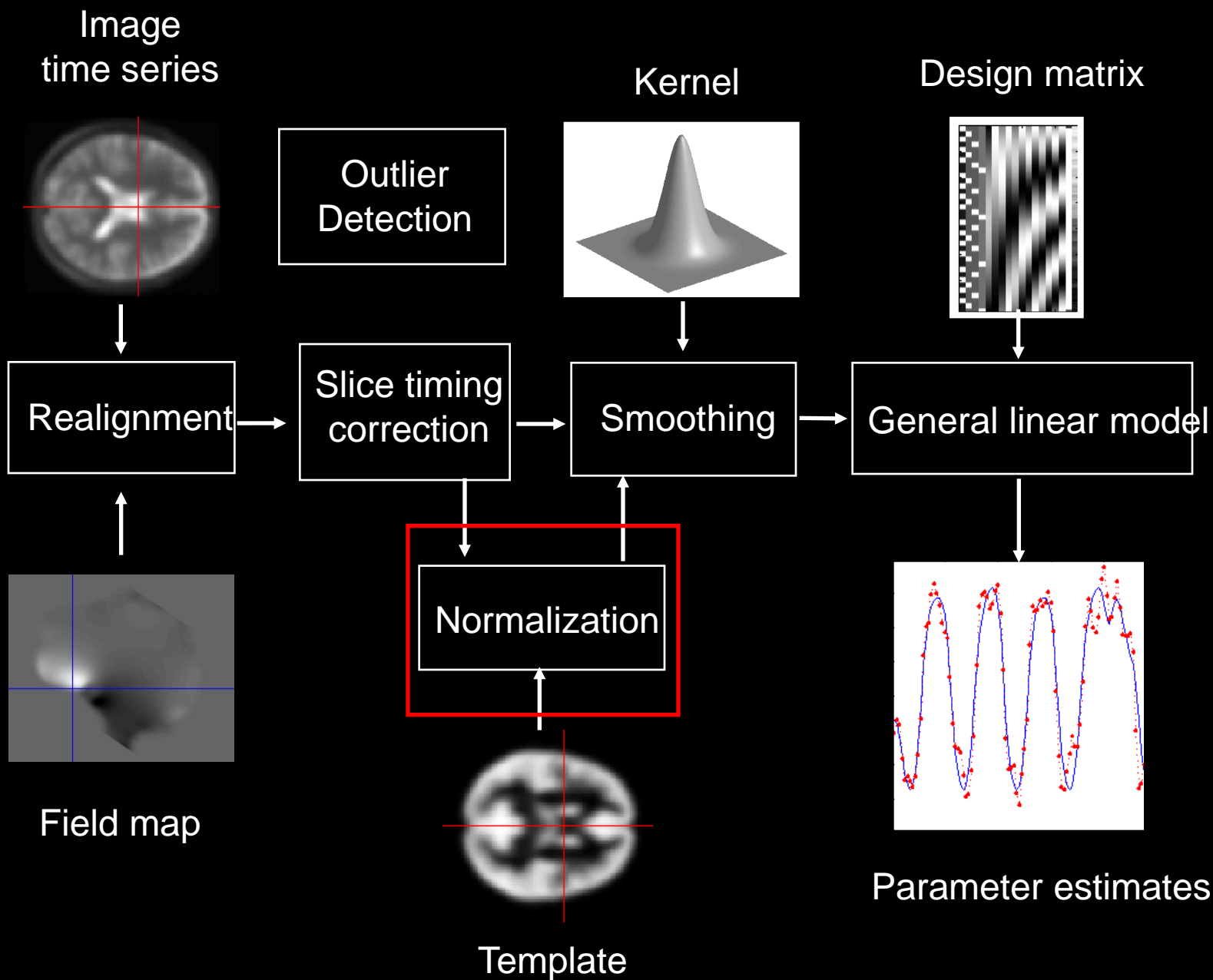
Talairach Atlas

MNI/ICBM AVG152 Template



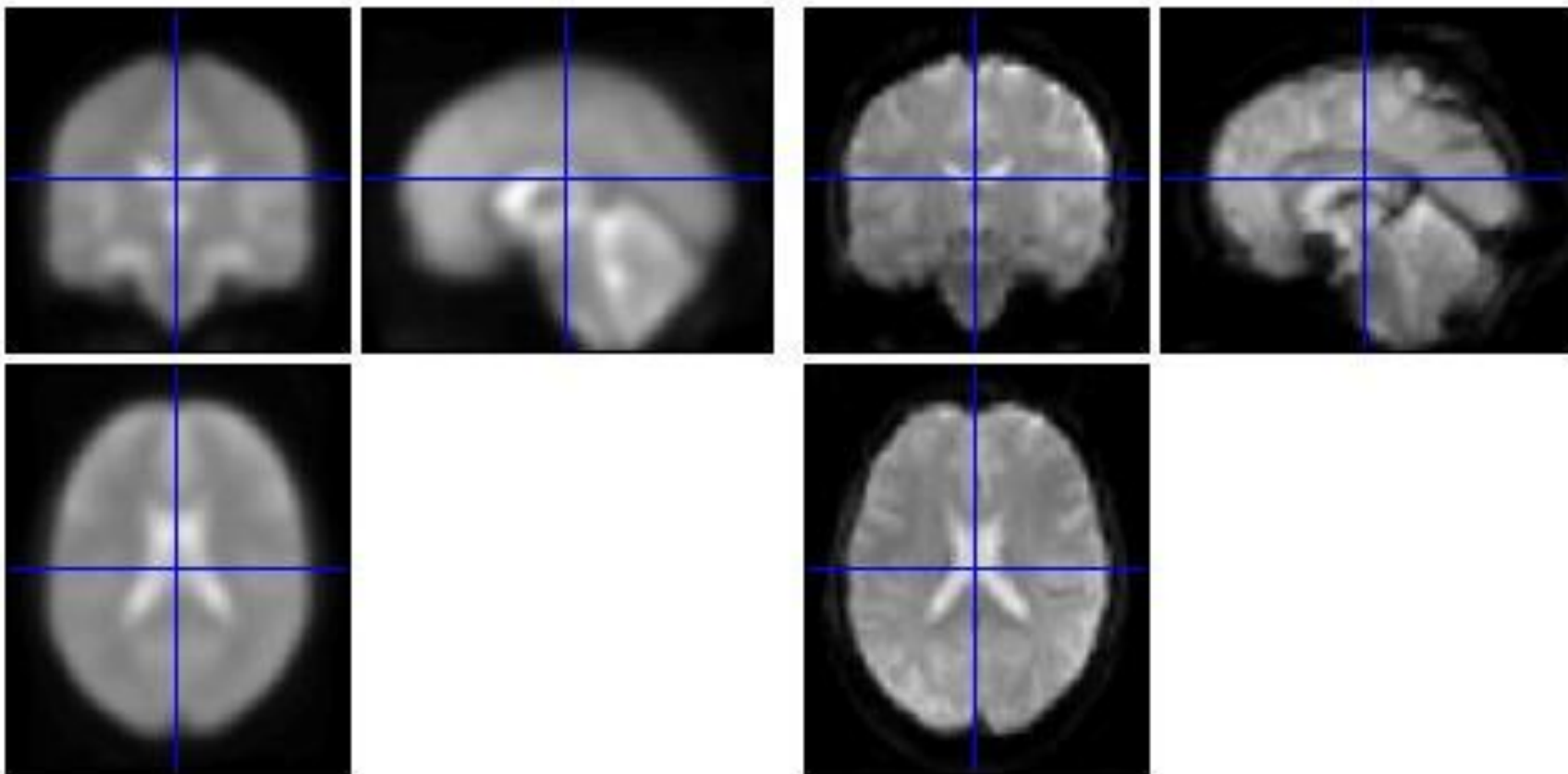
The MNI template follows the *convention* of T&T, but doesn't match the *particular brain*

Recommended reading: <http://imaging.mrc-cbu.cam.ac.uk/imaging/MniTalairach>



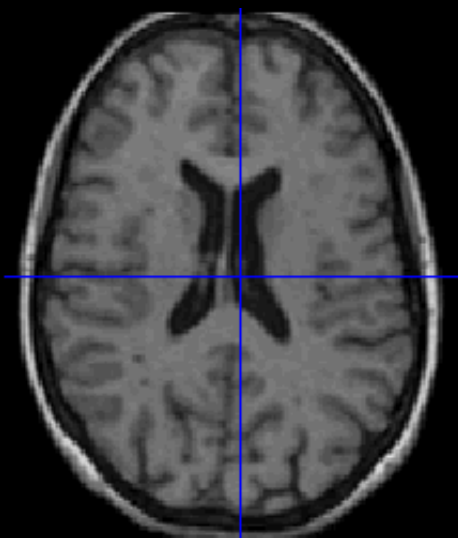
EPI Template

Normalized EPI Volume

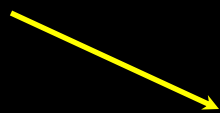


Spatial Normalization

- Direct
- Indirect
- Dartel



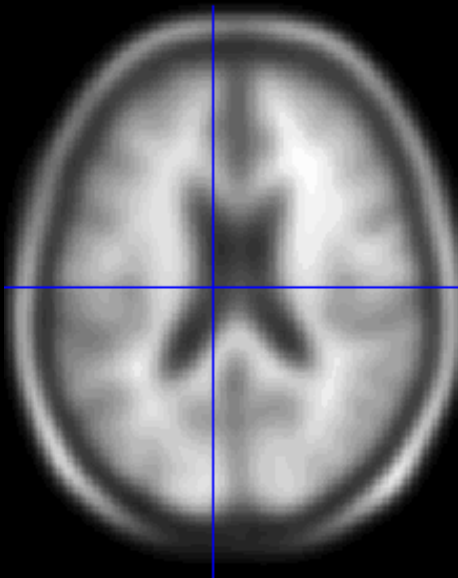
**ORIGINAL
IMAGE**



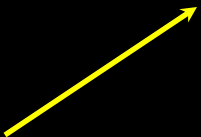
**SPATIAL
NORMALIZATION**



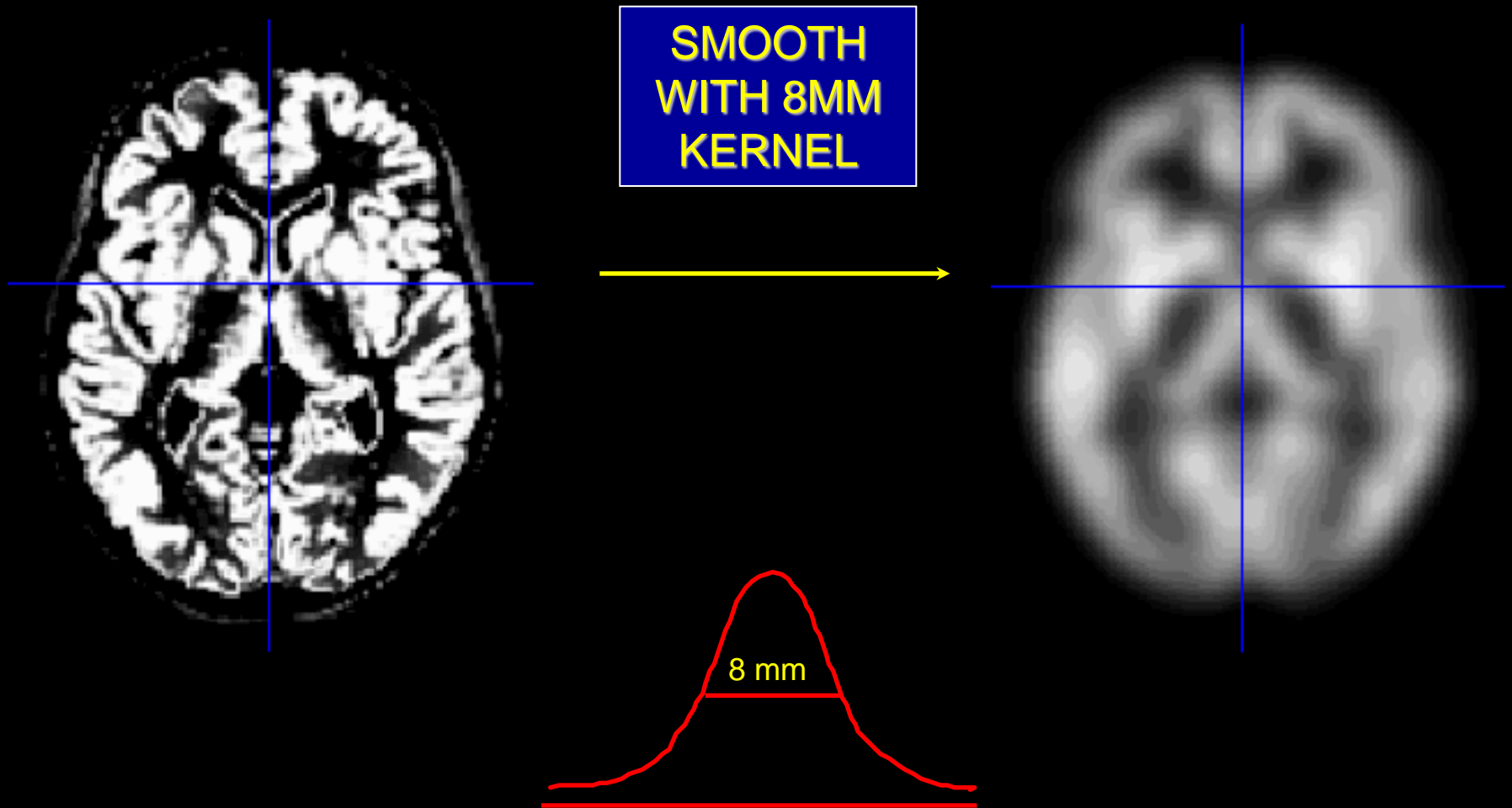
**SPATIALLY
NORMALIZED
IMAGE**



**TEMPLATE
IMAGE**

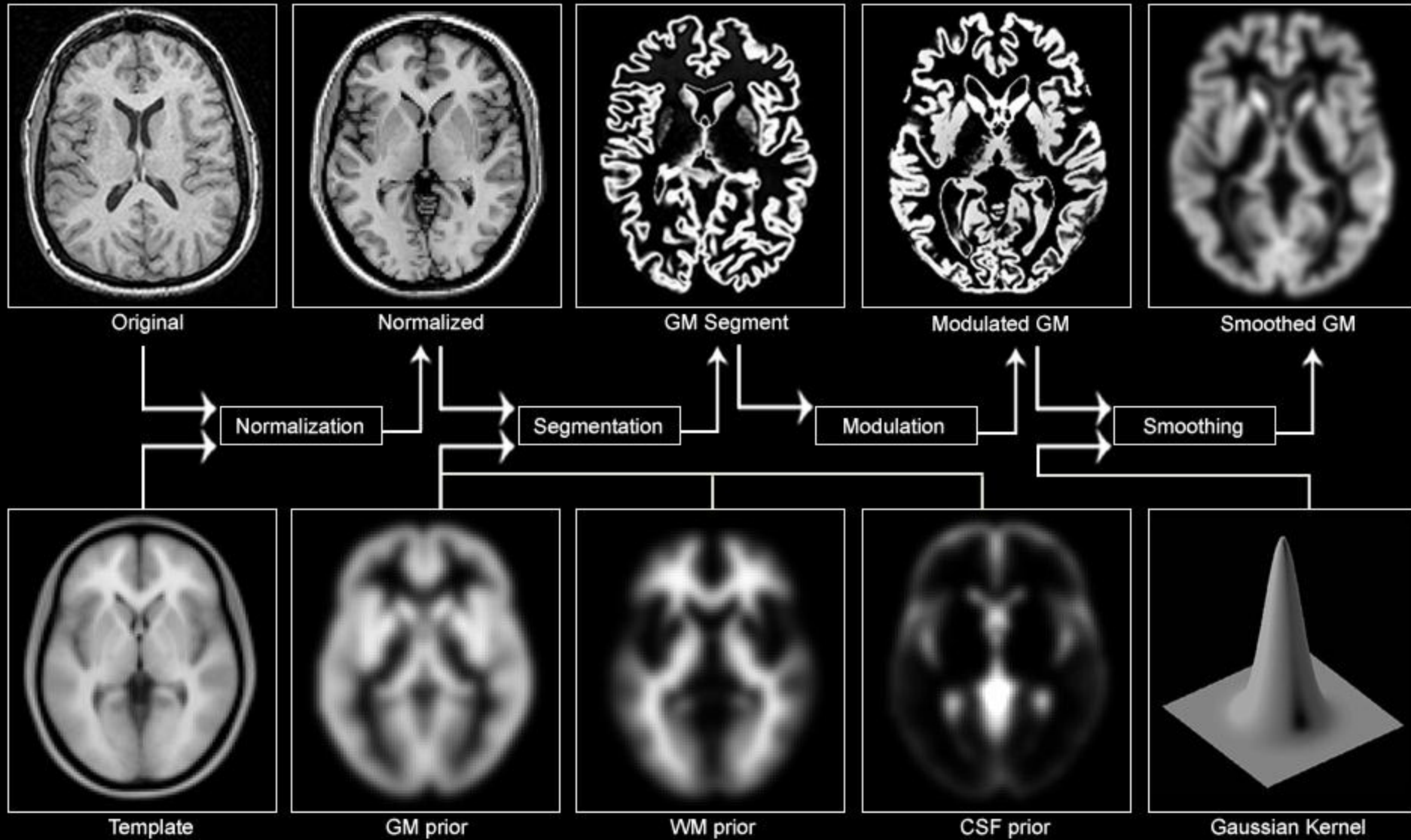


Smoothing

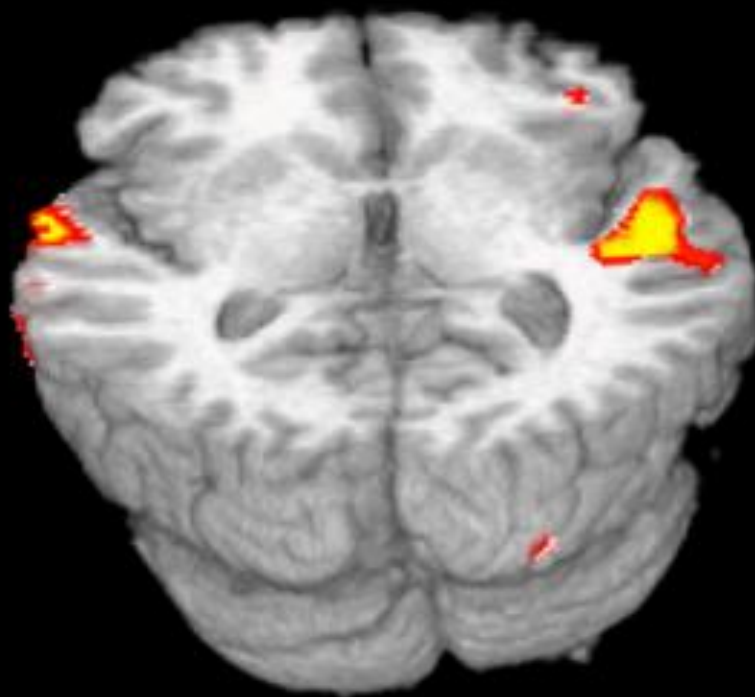
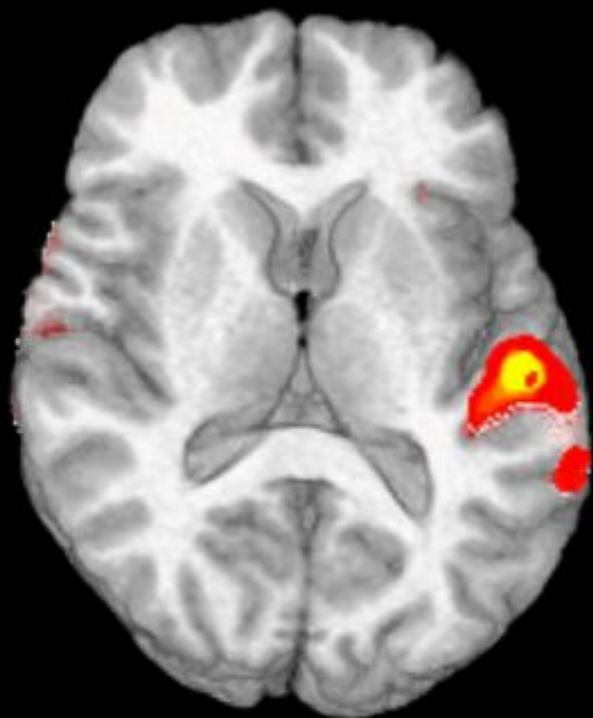


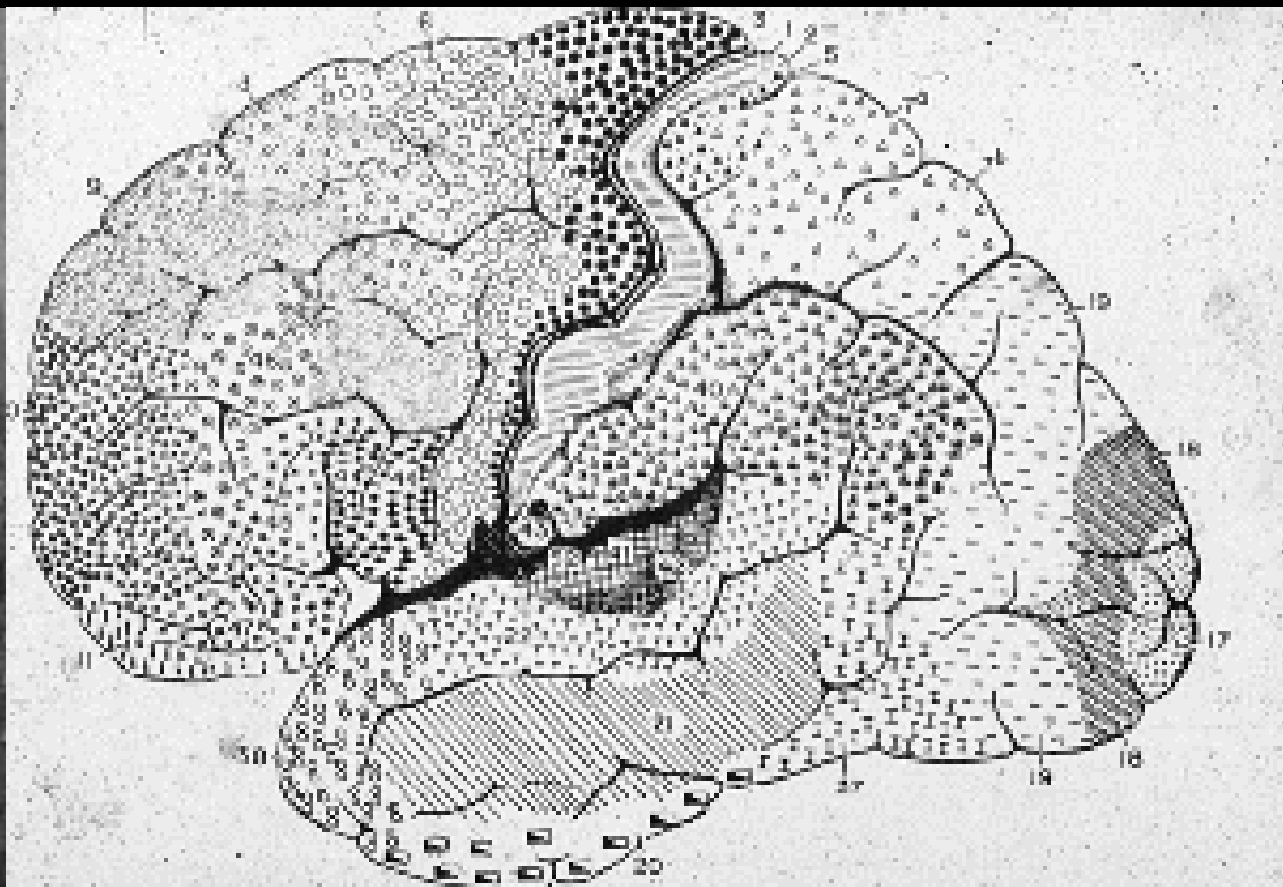
Voxel-Based Morphometry

Pre-processing Overview

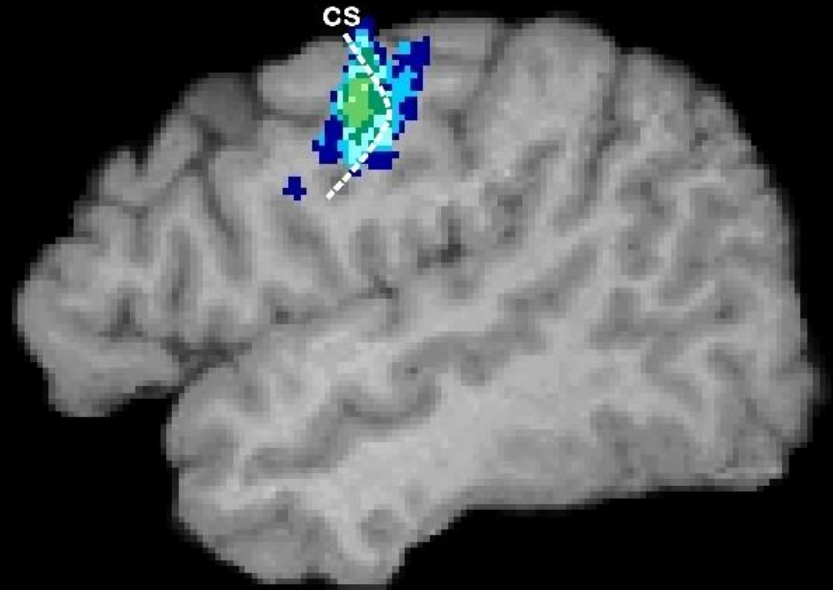
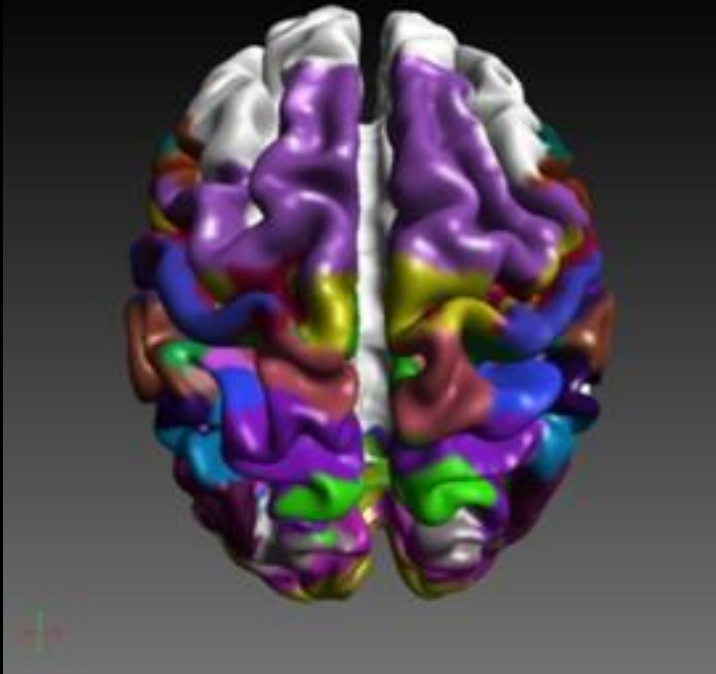


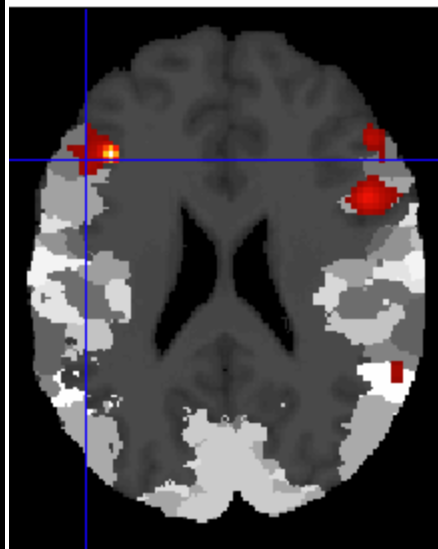
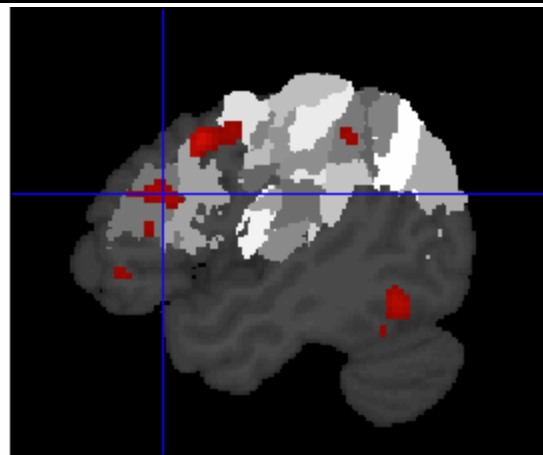
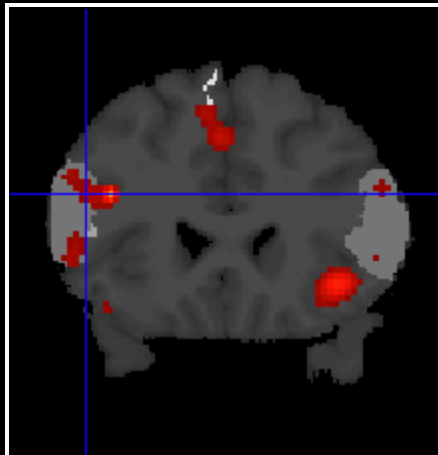
Clinical language mapping





SPM Anatomy Toolbox





Cluster 4: x= -47 y= +2 z= +46 (MNI: -4...

Cluster 4 (342 vox): Face data ($u > 0.00$, $k > 0$)

17.8% of cluster in left Area 44 (6.0% activated)

14.3% of cluster in left Area 6 (1.1% activated)

0.1% of cluster in left Area 4p (0.1% activated)

No maximum selected

(1) x= -44 y= +10 z= +41; T = +0.76 (MNI: -44+14+36)

[Left Middle Frontal Gyrus - Probably GM [63/82]]

-> Assigned to Area 44, Probability: 40% [20-50%]

(2) x= -52 y= +8 z= +45; T = +0.18 (MNI: -52+12+40)

[Left Precentral Gyrus - Probably GM [63/13]]

-> Assigned to Area 44, Probability: 40% [40-50%]

(3) x= -42 y= -8 z= +45; T = +0.12 (MNI: -42+4+40)

[Left Precentral Gyrus - Probably WM [59/40]]

-> Not assigned, Probability for Area 6: 10% [10-20%]

(4) x= -50 y= -4 z= +49; T = +0.12 (MNI: -50+0+44)

[Left Precentral Gyrus - Probably GM [65/29]]

-> Assigned to Area 6, Probability: 50% [30-70%]

(5) x= -40 y= +2 z= +51; T = +0.11 (MNI: -40+6+46)

[Left Precentral Gyrus - Probably WM [57/41]]

-> Not assigned, Probability for Area 44: 10% [0-10%]

Crosshair Position	
mm:	-48.1 5.8 48.9
vx:	27.9 121.8 107.9
Area:	Area 44

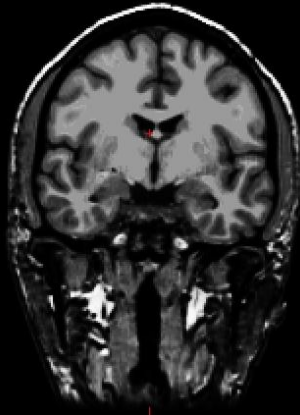
Full Volume	Hide Crosshairs
World Space	NN interp
EXIT	Remove Blobs

S.V.C.	Tab	Plot
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Volume and Surface Labels



orig.mgz



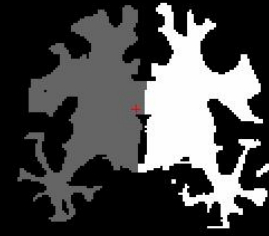
T1.mgz



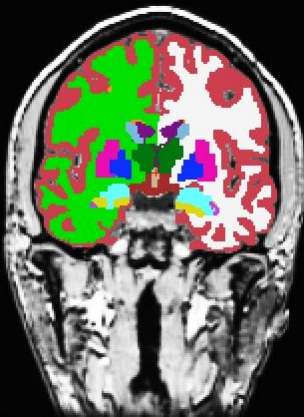
brainmask.mgz



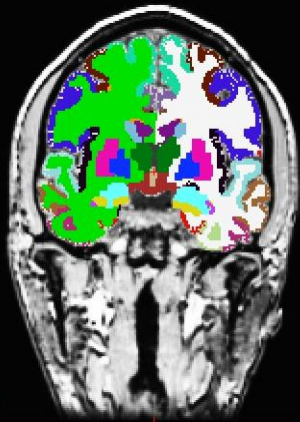
wm.mgz



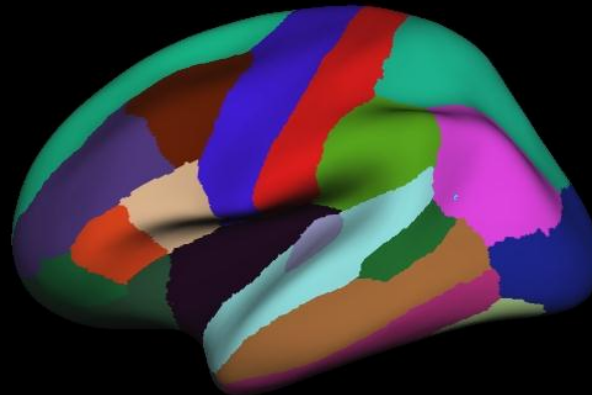
filled.mgz



aseg.mgz

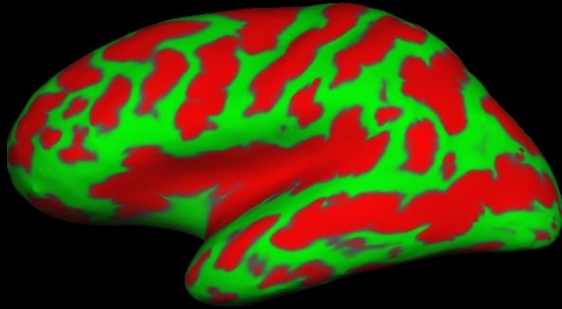


aparc+aseg.mgz

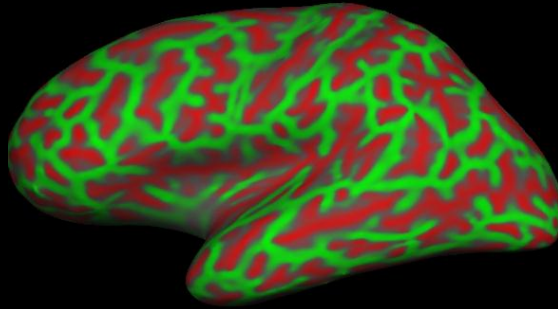


Surface Overlays

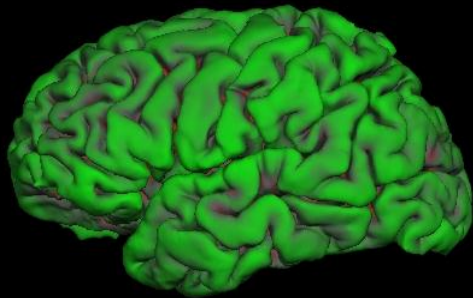
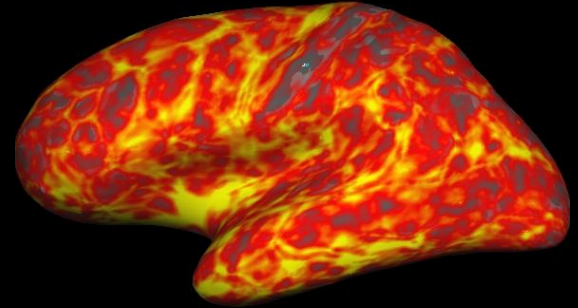
lh.sulc on inflated



lh.curv on inflated



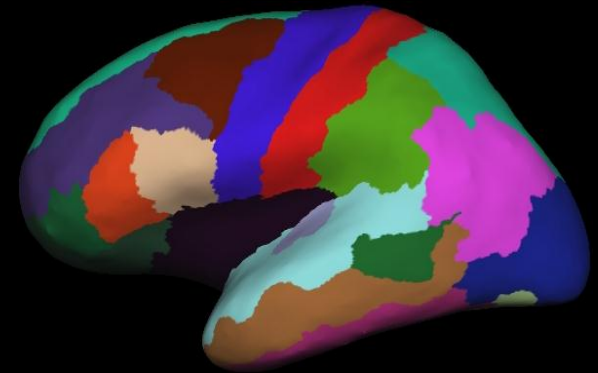
lh.thickness on inflated



lh.sulc on pial



lh.curv on inflated



lh.aparc.annot on inflated

