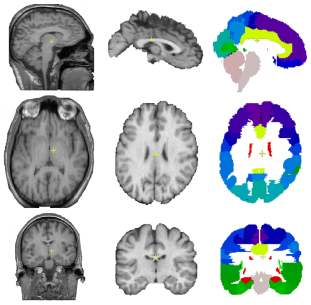
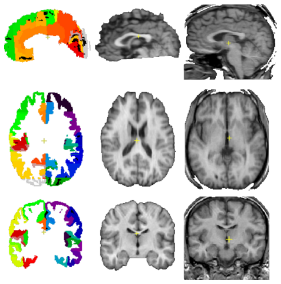
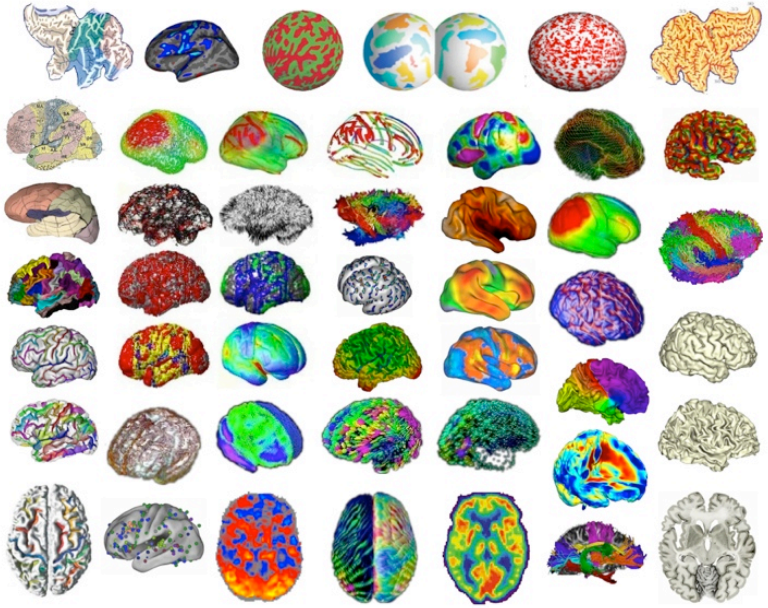
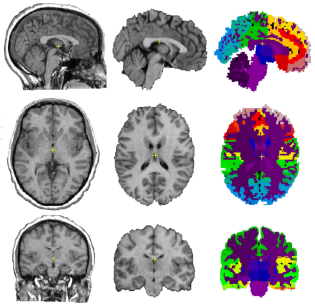
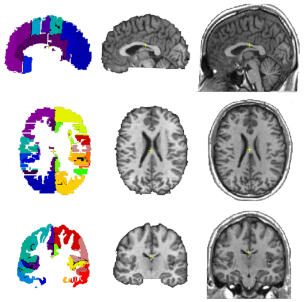


Brain labeling





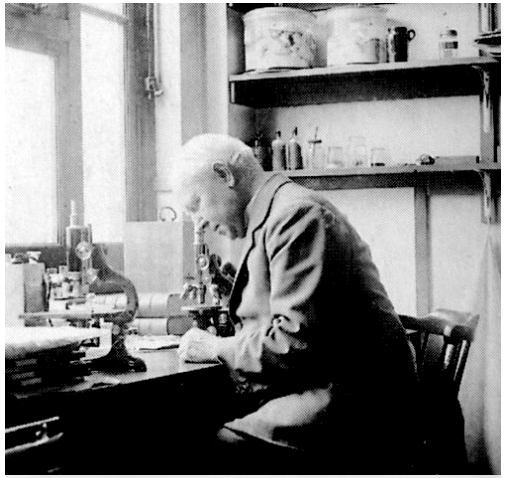


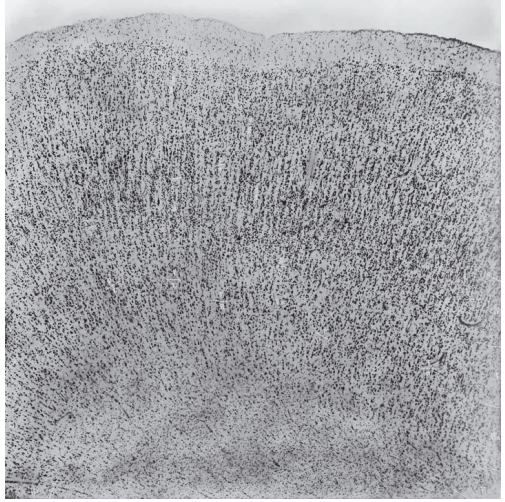


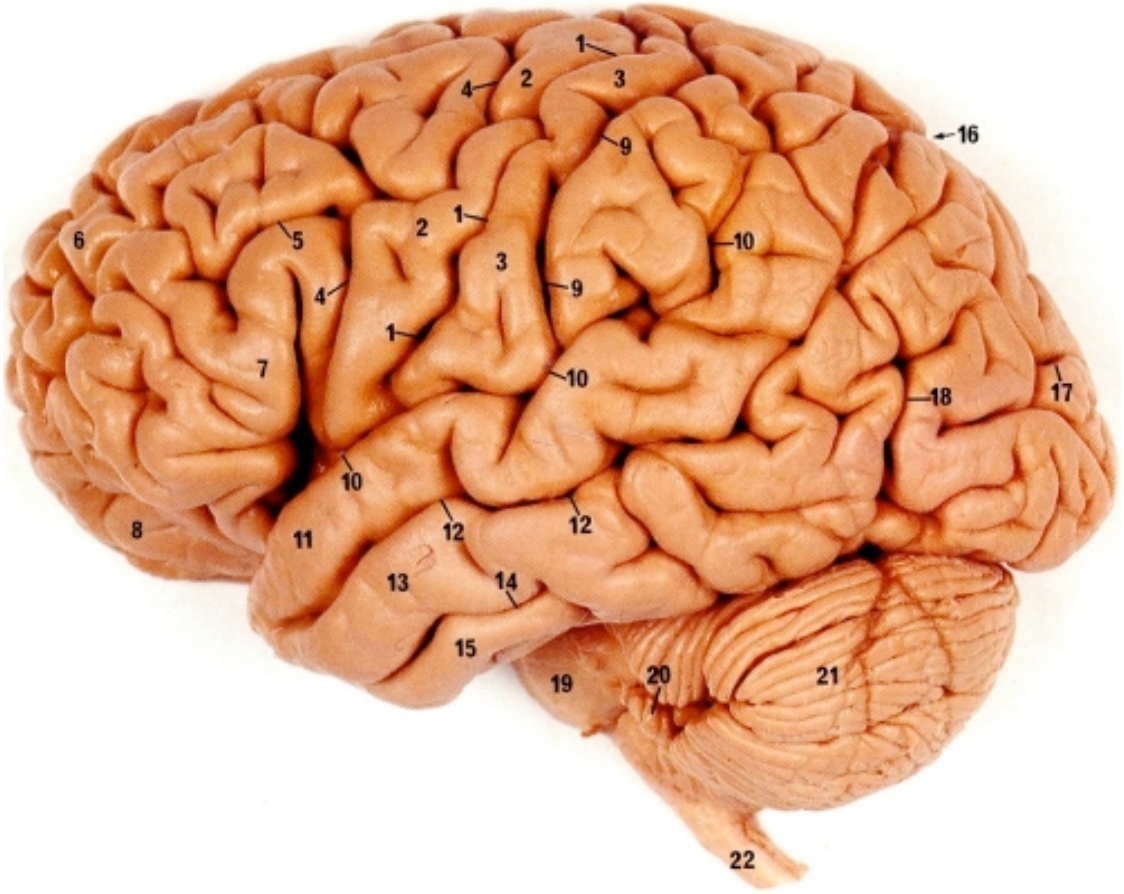
arno klein
arno@binarybottle.com
http://www.mindboggle.info/lectures

brain anatomy

histology (microscopic)
gross anatomy (macroscopic)



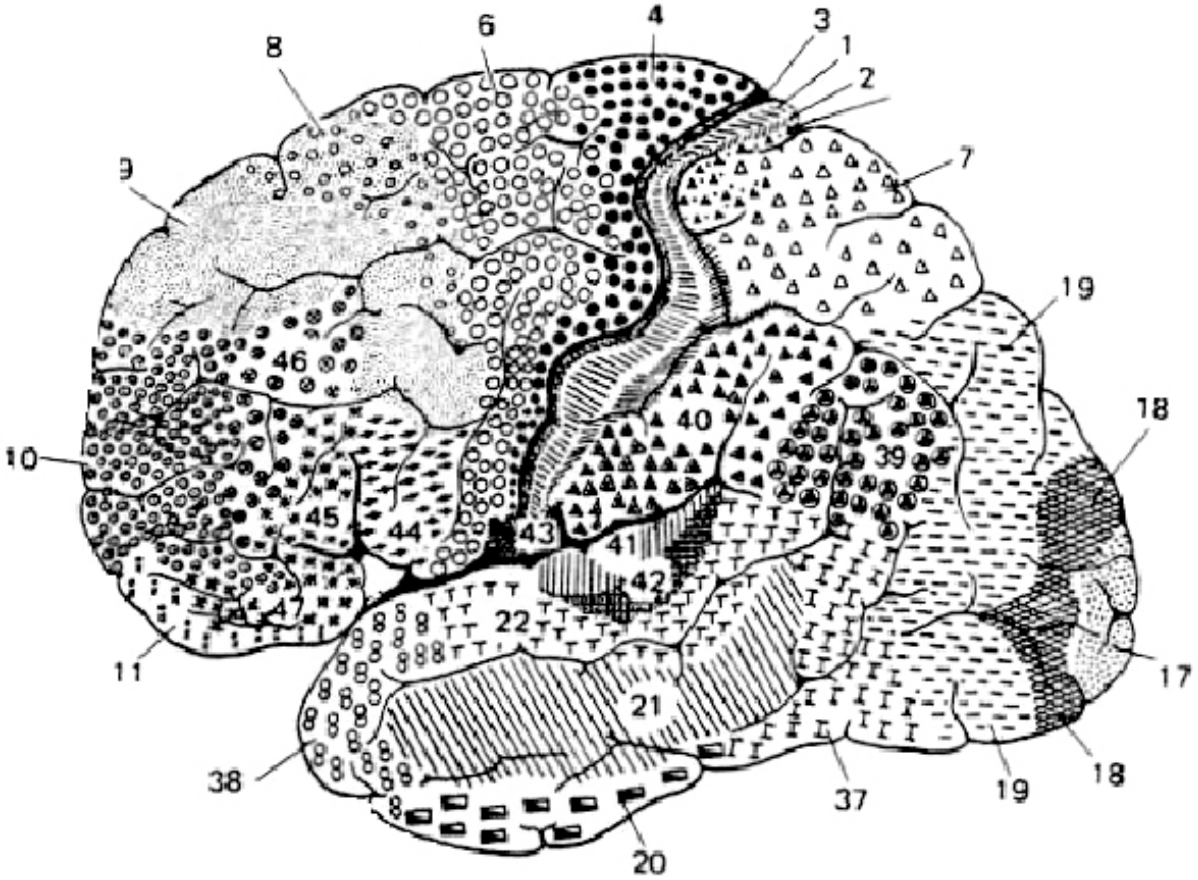




brain anatomy

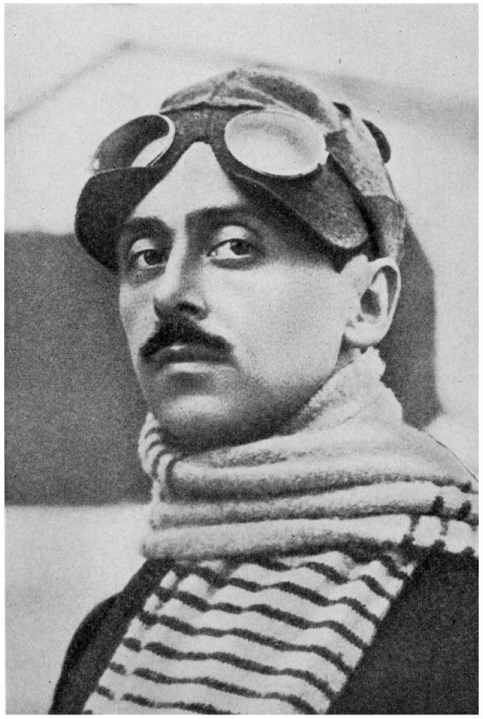
histology (microscopic)

Korbinian Brodmann
(1868-1918)



brain anatomy

histology (microscopic)



Constantin von Economo
(1876-1931)

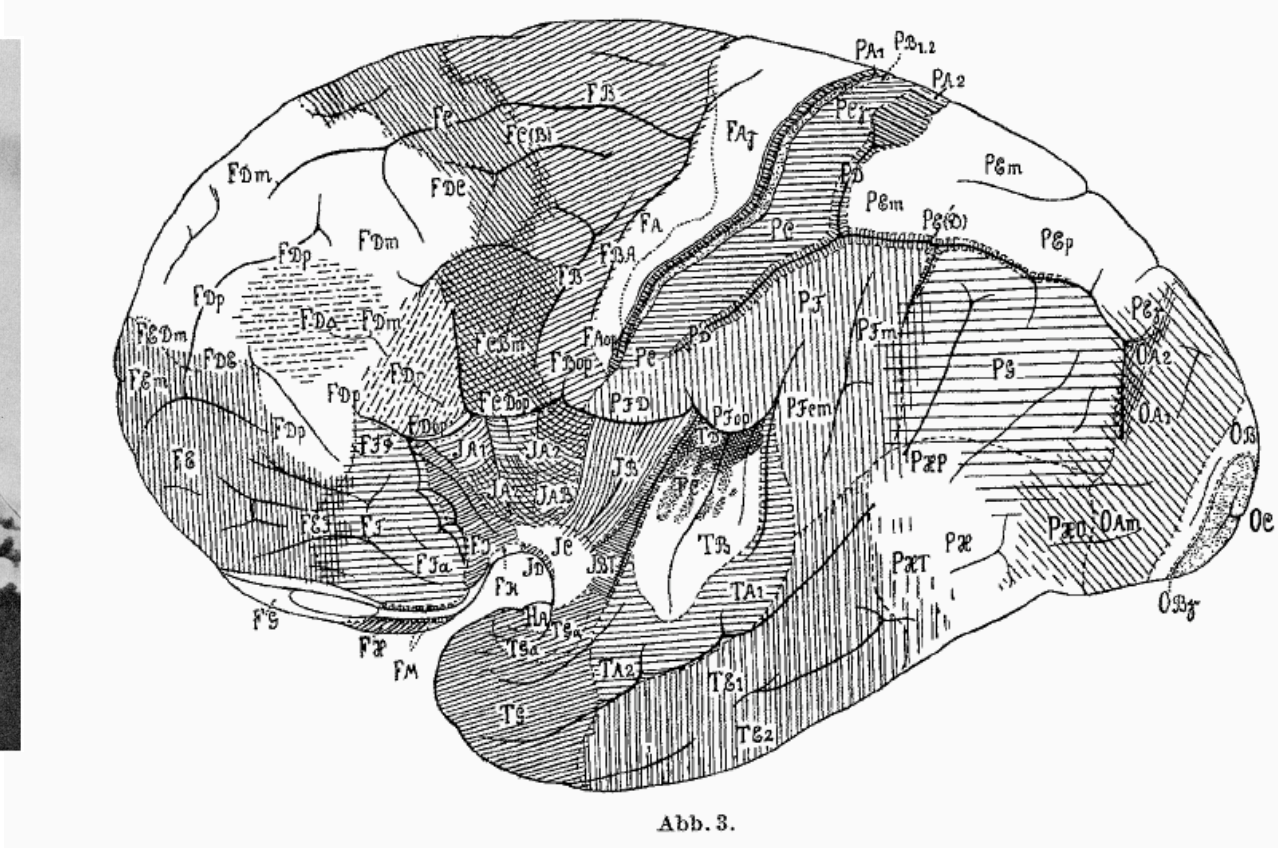
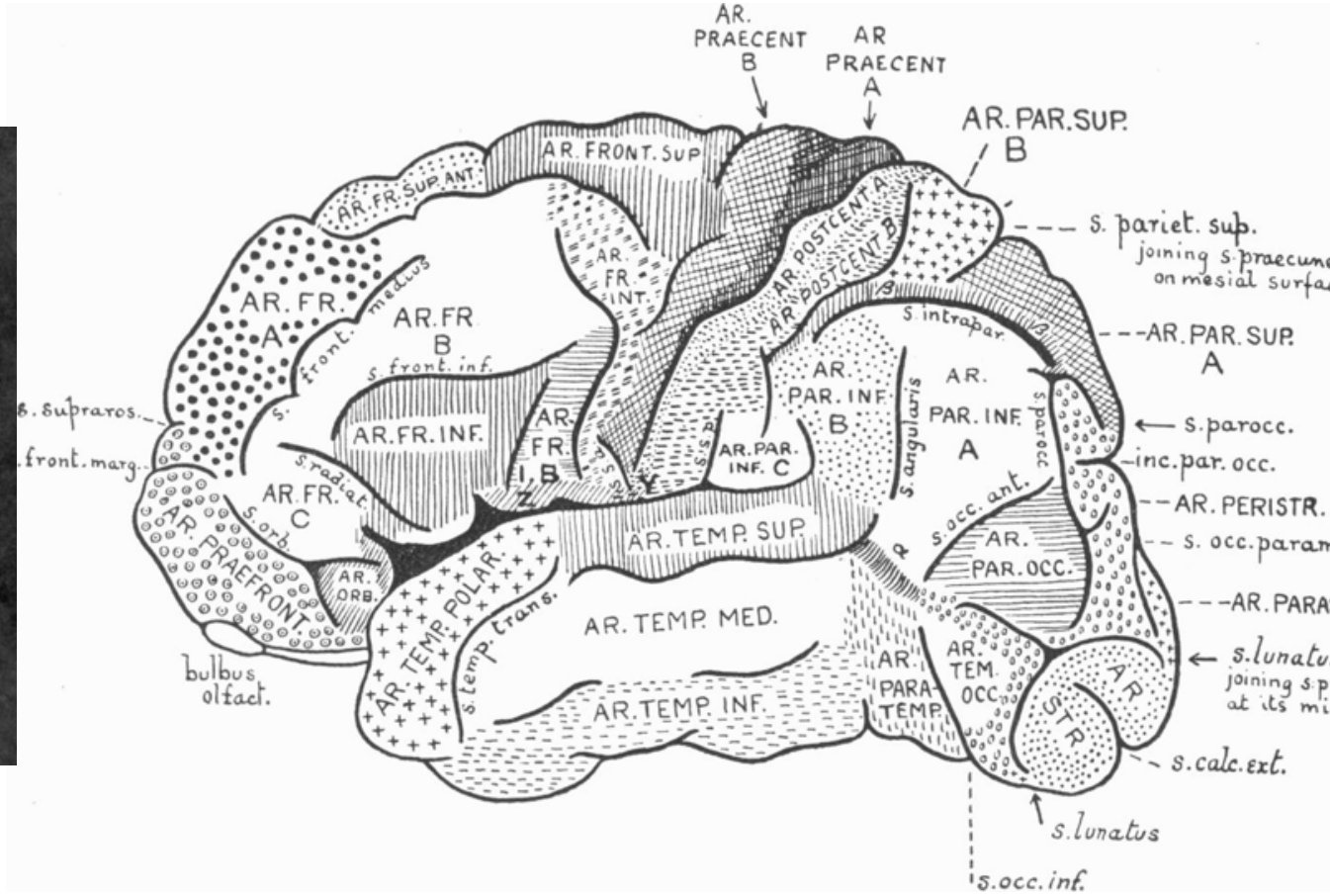


Abb. 3.

brain anatomy

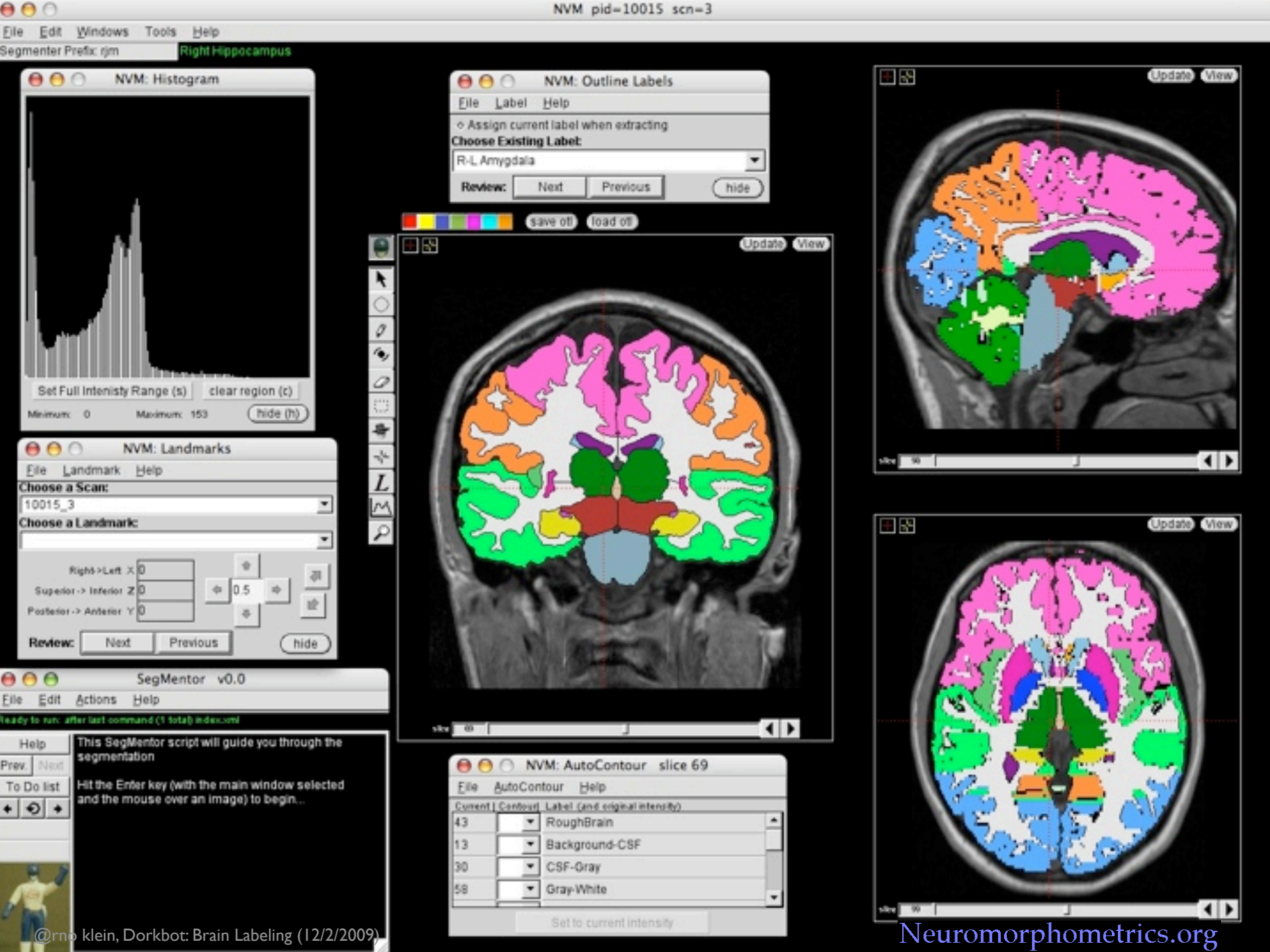
gross anatomy (macroscopic)

Sir Grafton Elliot Smith
(1871-1937)



brain anatomy

MRI (macroscopic)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File Edit Windows Tools Help
Segmenter Prefix: rjm
Right Hippocampus
NVM: Histogram
Set Full Intenisty Range (s)
clear region (c)
Minimum: 0
Maximum: 153
hide (h)
NVM: Landmarks
File Landmark Help
Choose a Scan:
10015_3
Choose a Landmark:
Right->Left X 0
Superior -> Inferior Z 0
Posterior -> Anterior Y 0
0.5
Review:
Next
Previous
hide
SegMentor v0.0
File Edit Actions Help
Ready to run: after last command (1 total) index.xml
Help
Prev.
Next
To Do list
This SegMentor script will guide you through the segmentation
Hit the Enter key (with the main window selected and the mouse over an image) to begin...
NVM: Outline Labels
File Label Help
Assign current label when extracting
Choose Existing Label:
R-L Amygdala
Review:
Next
Previous
hide
save otl
load otl
Update
View
slice
NVM: AutoContour slice 69
File AutoContour Help
Current | Contour | Label (and original intensity)
43 RoughBrain
13 Background-CSF
30 CSF-Gray
58 Gray-White
Set to current intensity
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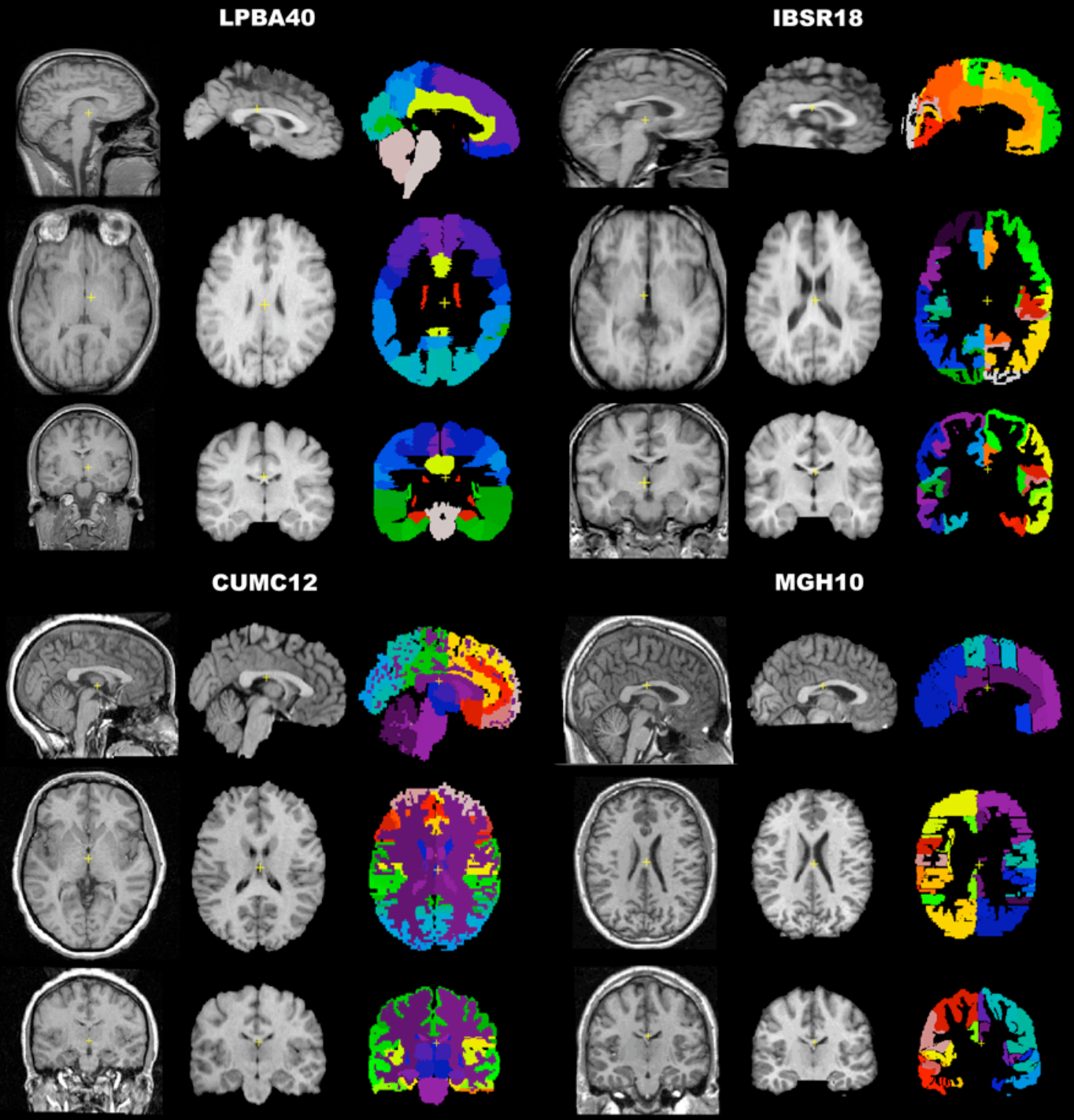
View
slice
Update
View
slice
@rno klein, Dorkbot: Brain Labeling (12/2/2009)
Neuromorphometrics.org


LPBA40
IBSR18
CUMC12
MGH10

brainCOLOR Collaborative Open Labeling Online Resource

Proposed Cortical Parcellation Protocol: SURVEY 1 SURVEY 2

Jason Tourville and Ruth Carper have developed a cortical parcellation (anatomical labeling) protocol that will be used by trained personnel to manually label an initial set of at least 800 to 1,000 T1-weighted MRI brain volumes as part of three different NIH-funded grants (find out more).

The anatomically labeled brain images will be made publicly available online as a free, downloadable resource. In order to ensure that these anatomical labels are meaningful and useful to the neuroscientific community, we urge you to take the following two surveys.

SURVEY 1, below, collects your comments regarding the protocol.
SURVEY 2 takes recommendations for additional datasets you wish to have us manually label.

Instructions
For each survey, please fill in your name and email address, fill in the survey and click the Submit button at the bottom of the survey.

While filling out the first survey, please refer to the figures and tables. To enlarge a figure or table, click on it or on the following links:

Fig. 2: Lateral, medial views
Fig. 3: Dorsal, ventral views
Fig. 4: Lateral sulcus
Table 1: Sulci
Table 2: Regions
Table 3: Planes

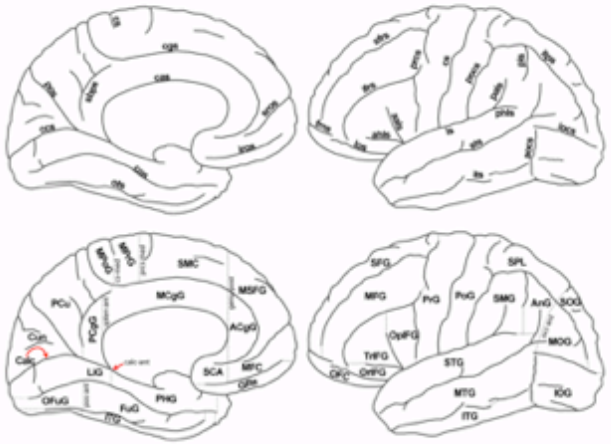


Figure 2. Region-delimiting sulci (top) and proposed regions of interest (bottom) of the medial (left) and lateral (right) cortical surfaces are schematized (see lists above for abbreviation definitions). All regions, including optional regions are shown with the exception of entorhinal cortex. Boundaries not formed by sulci are indicated by dotted lines. Dividing planes are labeled (all lower case; dotted lines that are not labeled represent simple extensions of sulci). The curved arrow from the Calcarine Cortex ROI (Calc) to the calcarine sulcus indicates that the ROI lies within the sulcus.

Figure 3. Sulci and ROIs are shown on the dorsal (left group) and ventral (right group) surfaces. Boundaries not formed by sulci are indicated by dotted lines. Dividing planes are labeled (all lower case; dotted lines that are not labeled represent simple extensions of sulci).

brainCOLOR Collaborative Open Labeling Online Resource

Proposed Cortical Parcellation Protocol: SURVEY 1 SURVEY 2

Jason Tourville and Ruth Carpe
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more).

The anatomically labeled brain
made publicly available online
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datasets you wish to have us m

Instructions
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Fig. 3: Dorsal, ventral views
Fig. 4: Lateral sulcus
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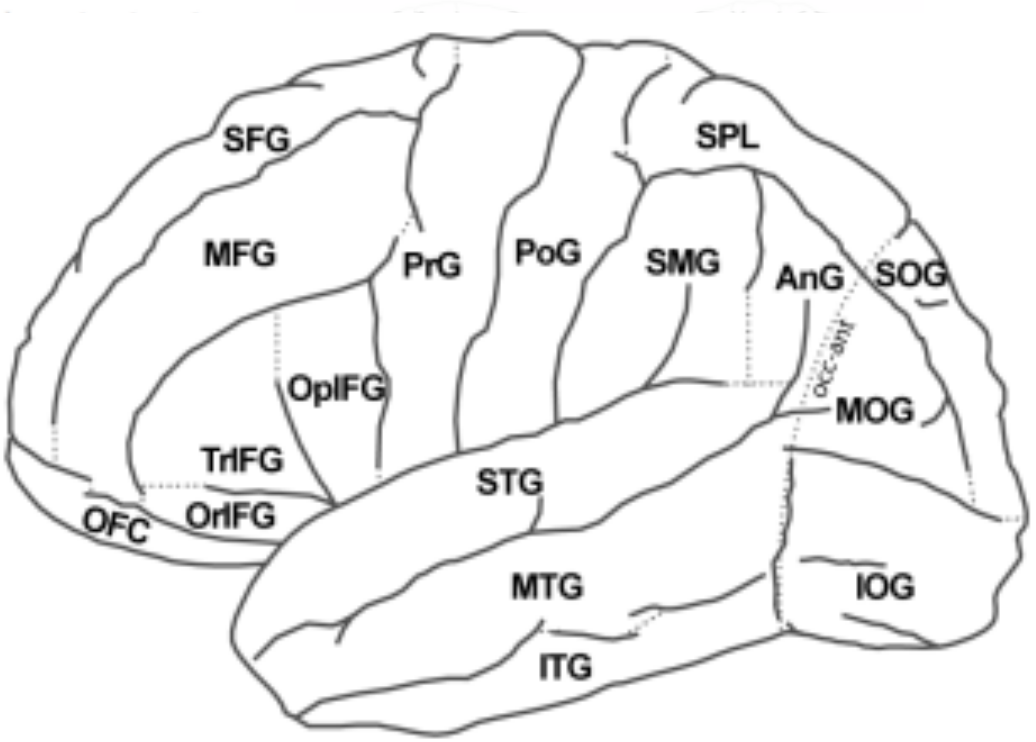
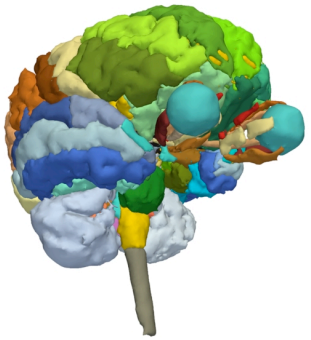


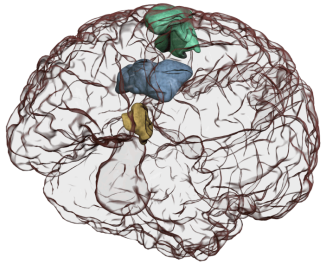
Figure 3. Sulci and ROIs are shown on the dorsal (left group) and ventral (right group) surfaces. Boundaries not formed by sulci are indicated by dotted lines. Dividing planes are labeled (all lower case; dotted lines that are not labeled represent simple extensions of sulci).

why label brains?

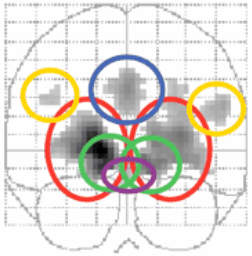
(1) labels serve as a teaching tool or visual guide



(2) labels break up data within a brain



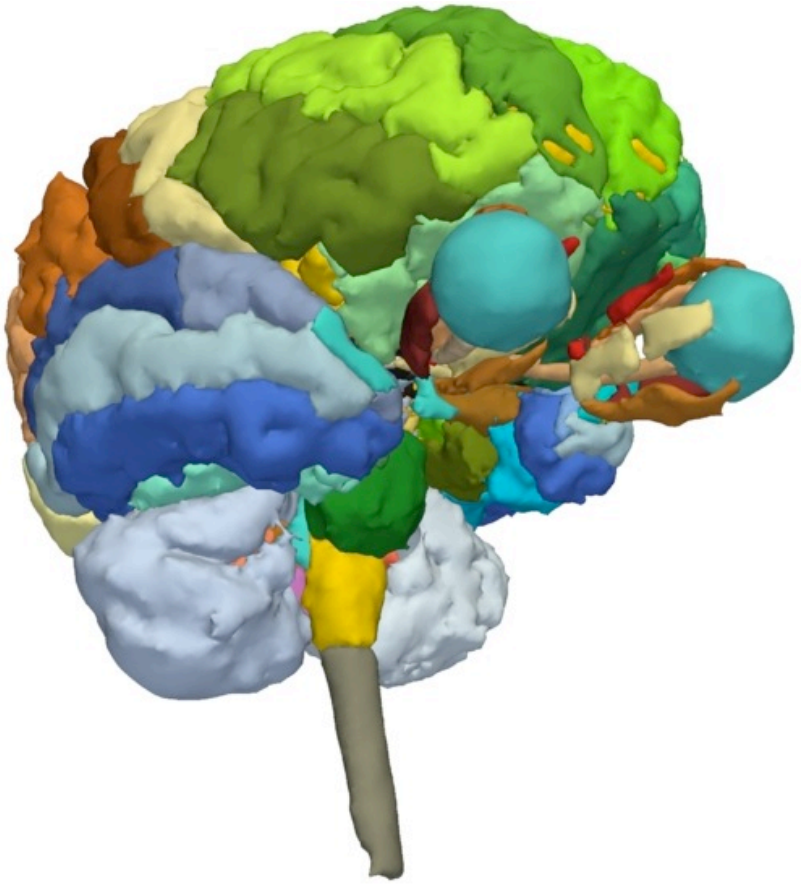
(3) labels establish correspondences across brains



why label brains?

(1) labels serve as a teaching tool or visual guide:

- teach brain anatomy



http://www.spl.harvard.edu/publications/item/view/1265,
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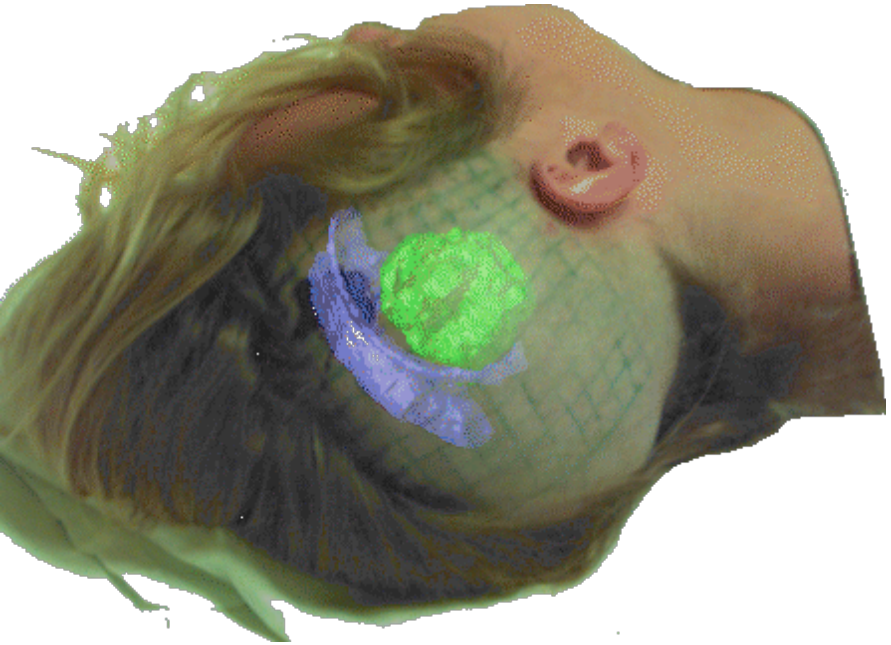
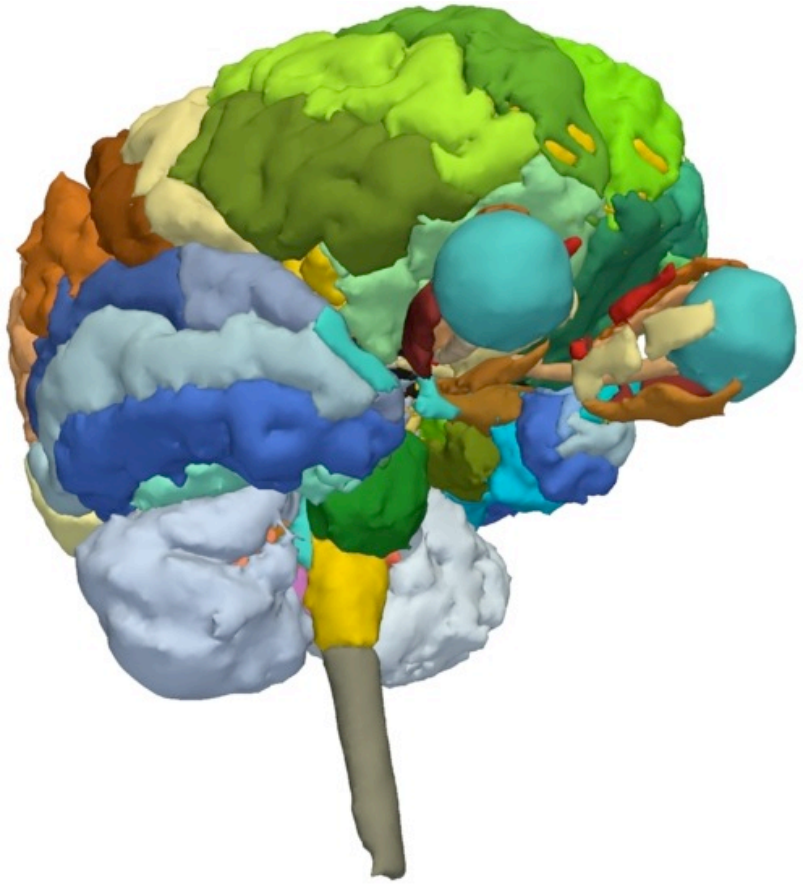
why label brains?

(1) labels serve as a teaching tool or visual guide:

- teach brain anatomy
- guide neurosurgery





http://www.spl.harvard.edu/publications/item/view/1265,
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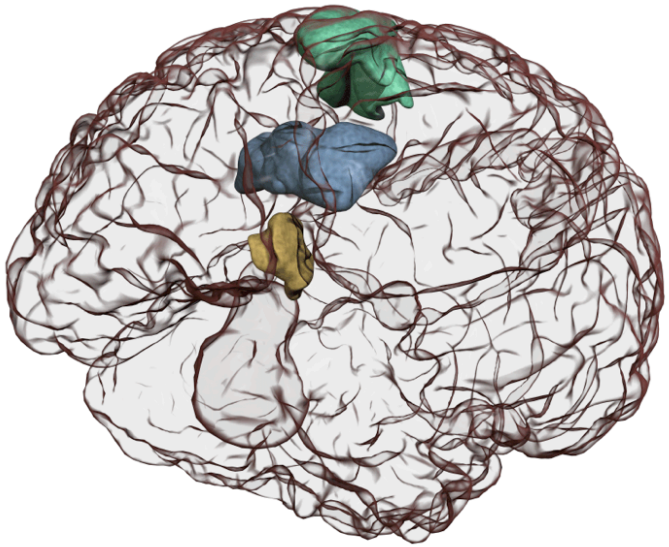
why label brains?

(2) labels break up data within a brain:

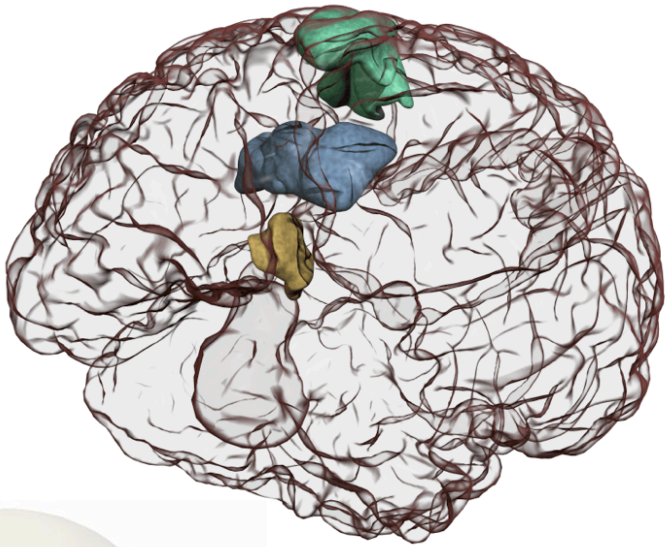
- quantify data by brain region

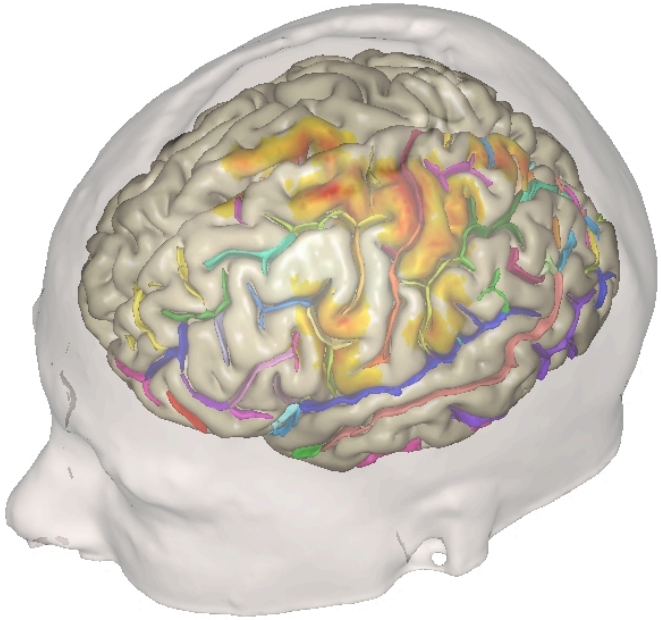


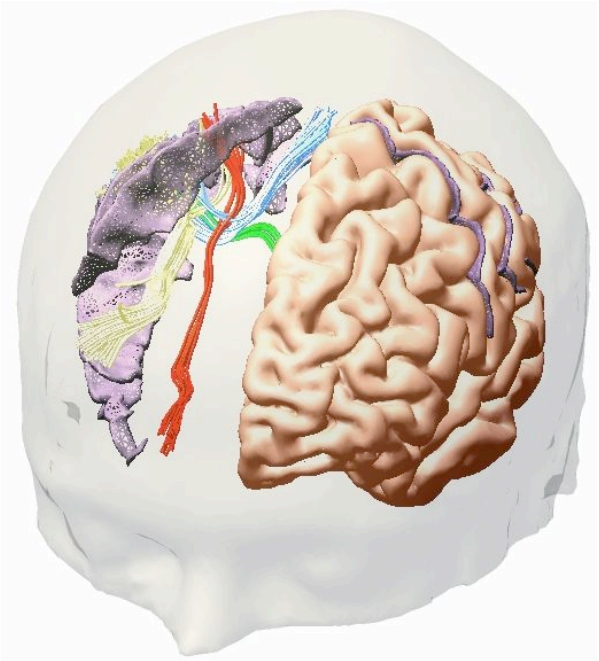
why label brains?

(2) labels break up data within a brain:

- quantify data by brain region
- assign results to brain regions



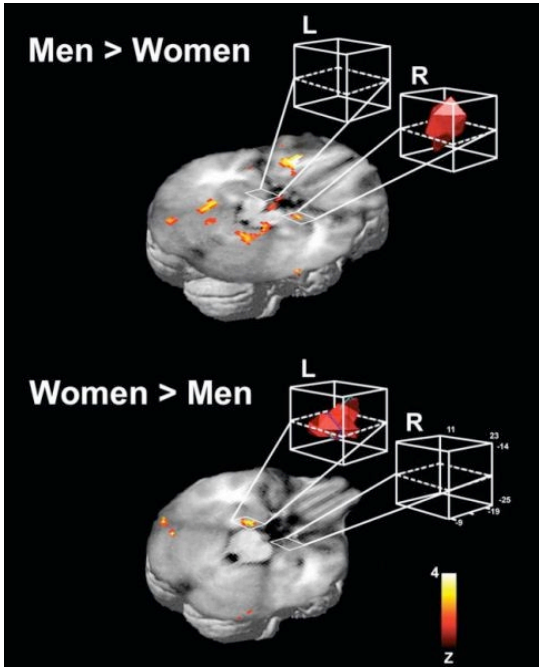




why label brains?

(3) labels establish correspondences across brains:

- compare individuals within a study

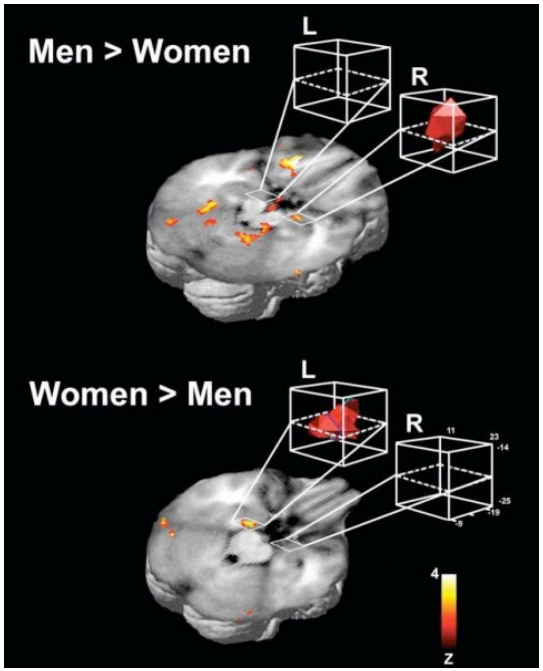


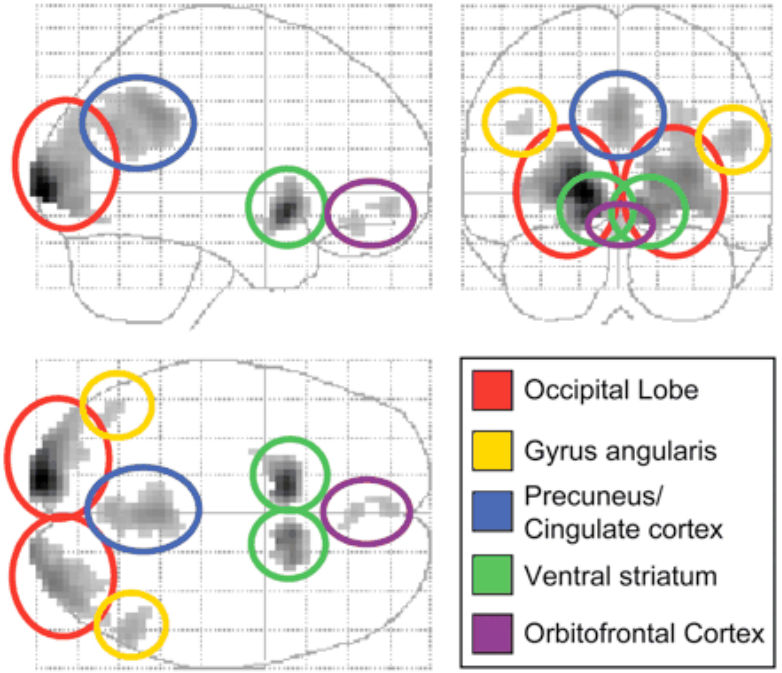
http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=frplas&part=ch15

why label brains?

(3) labels establish correspondences across brains:

- compare individuals within a study
- communicate results using a common language





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why label brains?

(3) labels establish correspondences across brains:

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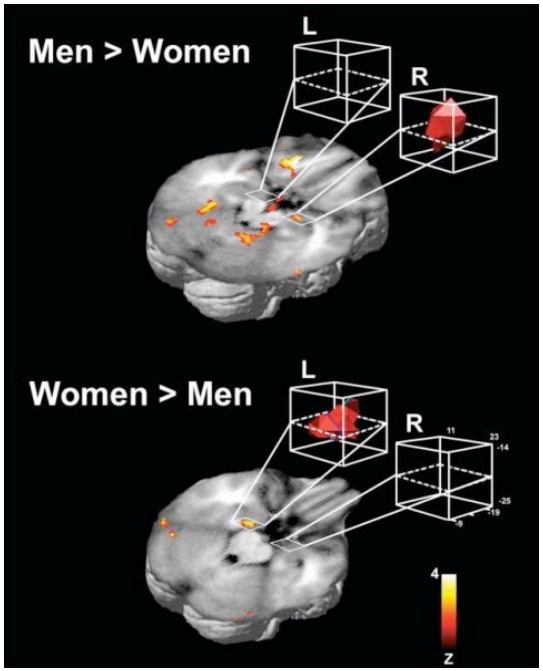
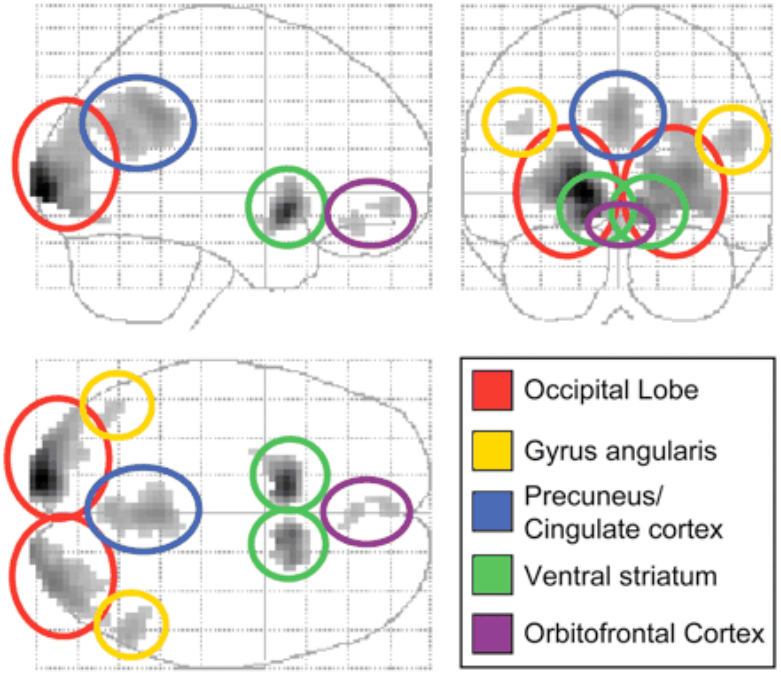
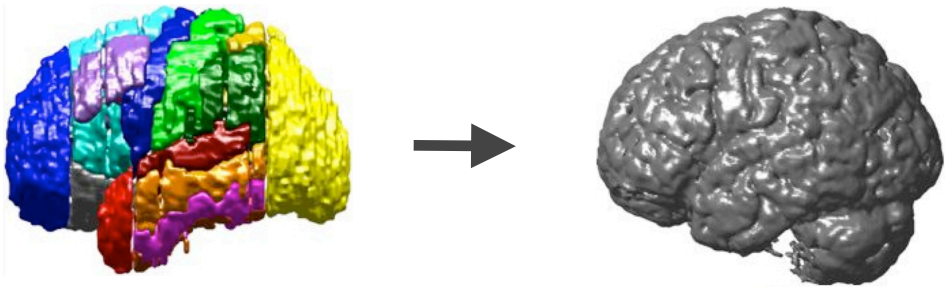




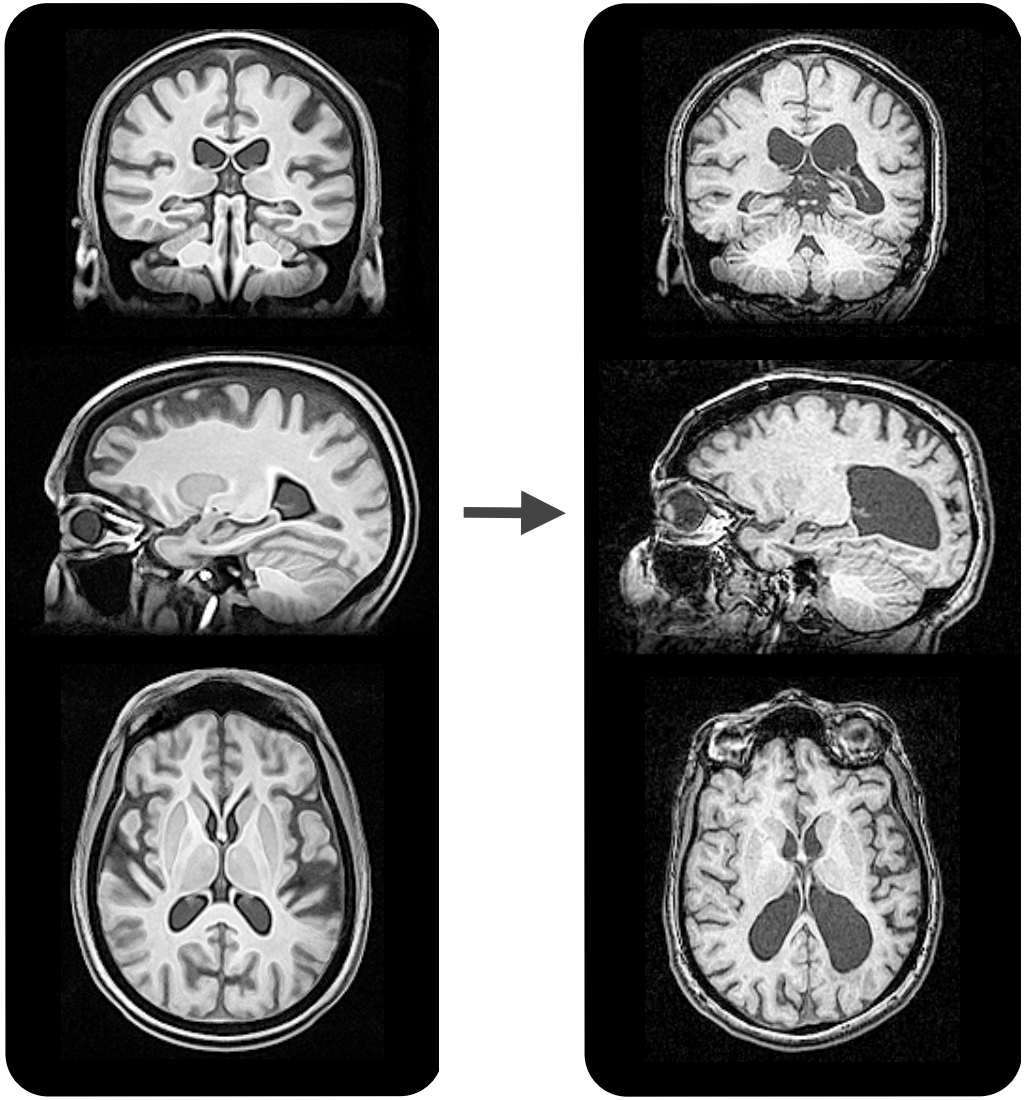
http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=frplas&part=ch15
DOI: 10.1126/science.1145876

how to automate labels?

conventional approach:
atlas-based registration



how to automate labels?

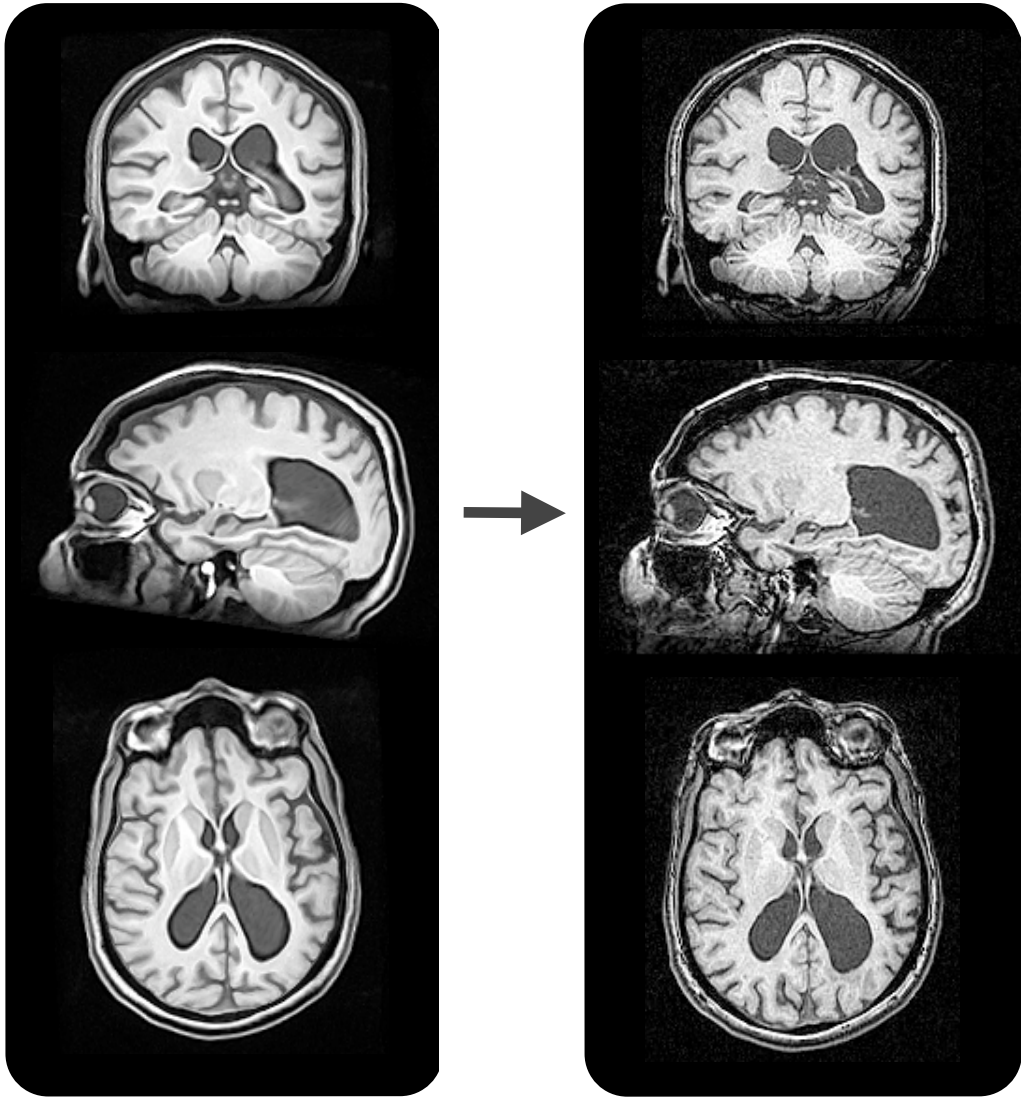


Atlas

Target

after Avants, et al. 2008

how to automate labels?



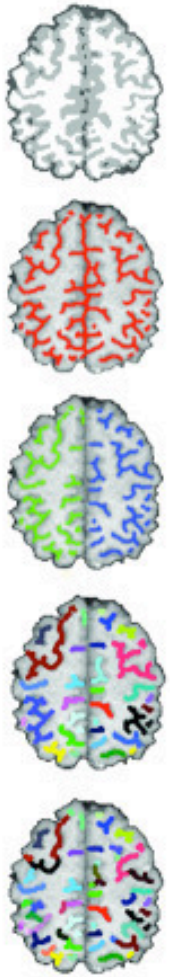
Atlas to Target

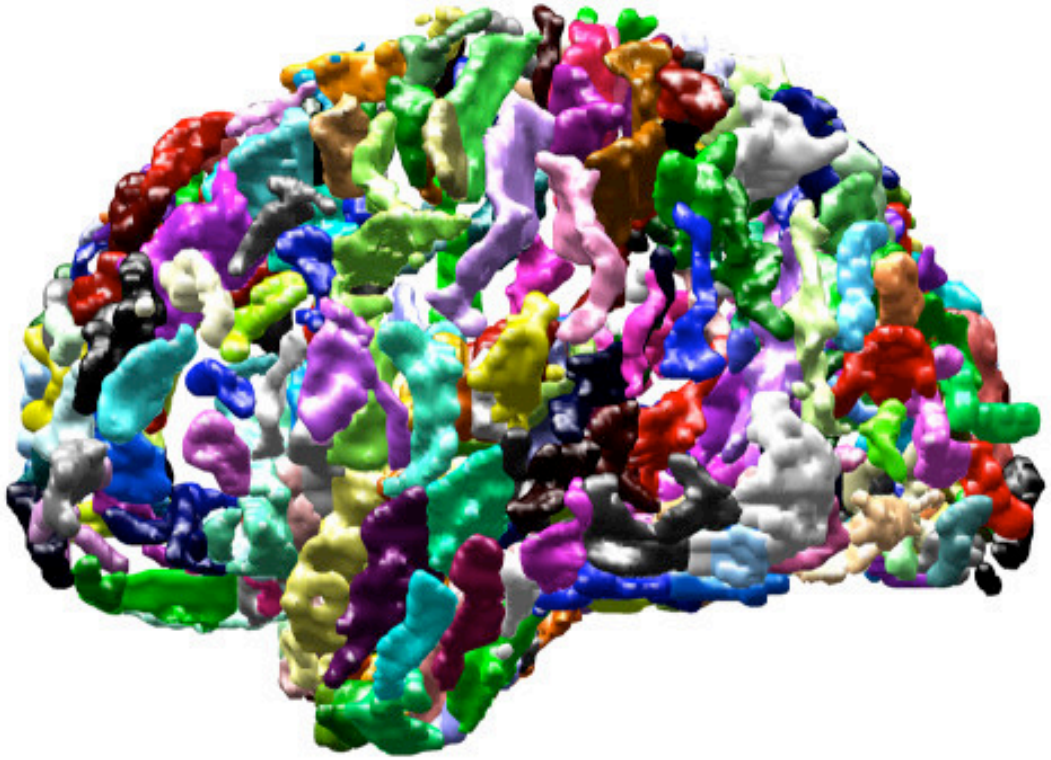
Target

after Avants, et al. 2008

Mindboggle

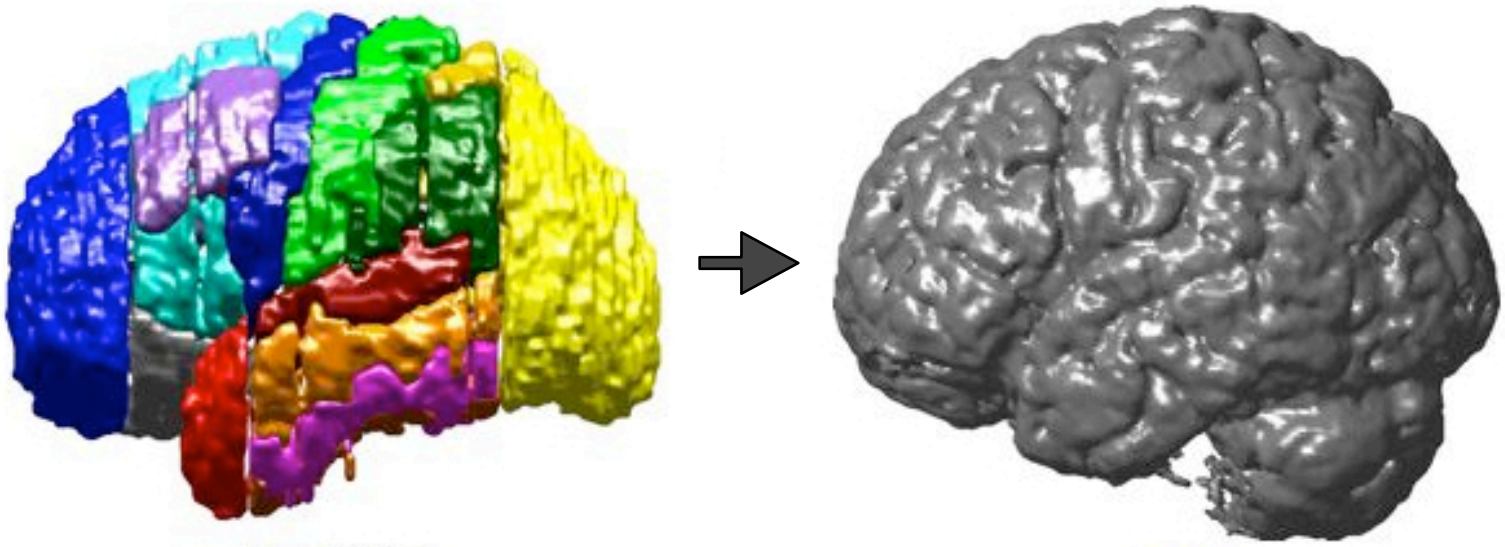
feature extraction





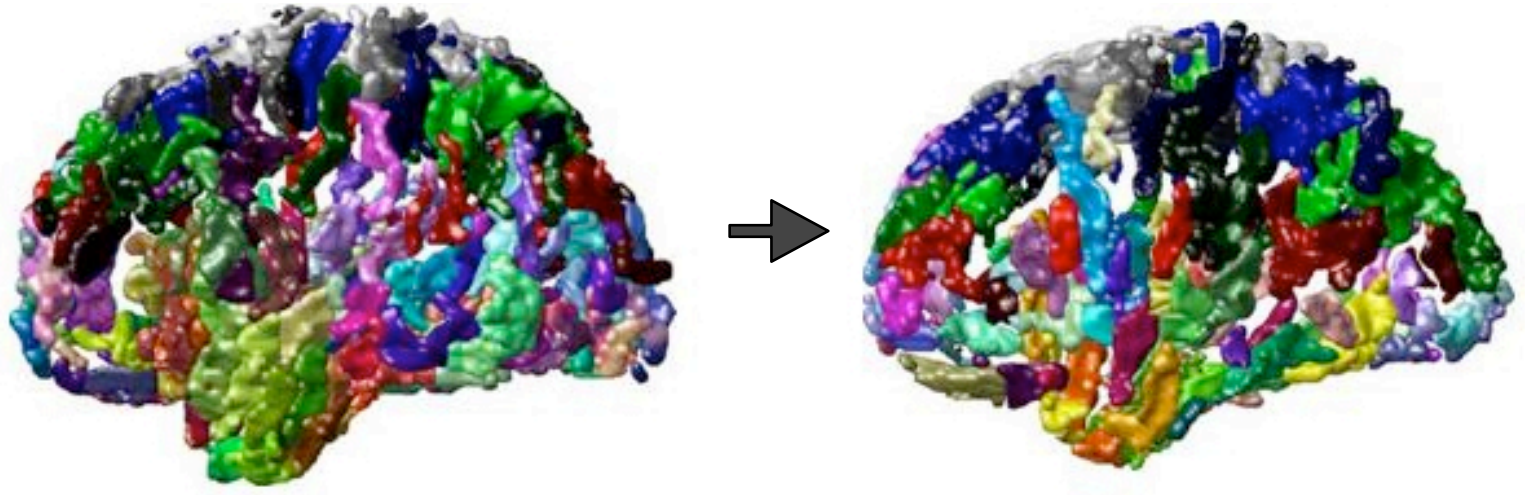
Mindboggle

registration replaced by...



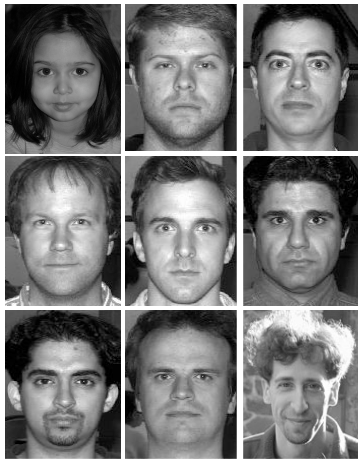
Mindboggle

registration replaced by:
combinatoric matching



Mindboggle 2

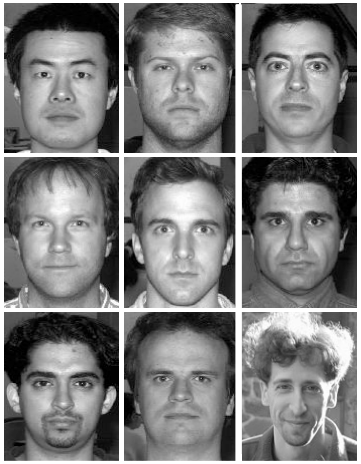
face matching strategy for
brain feature matching

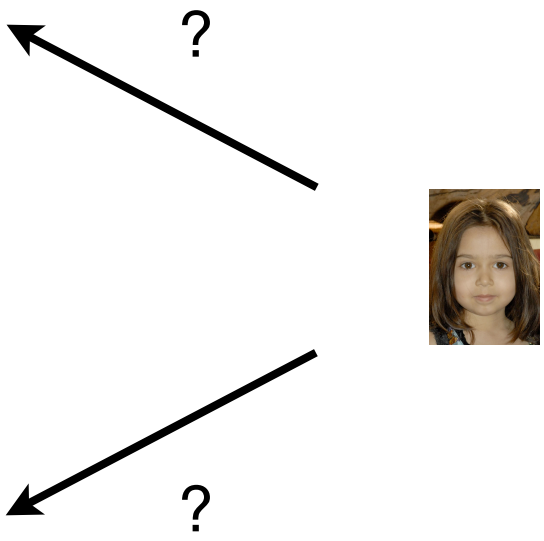


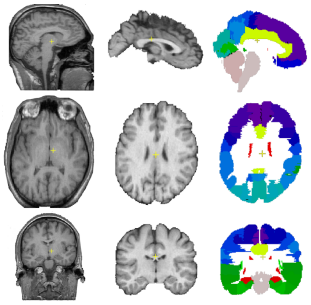
?

Mindboggle 2

different face class vs.
same face class







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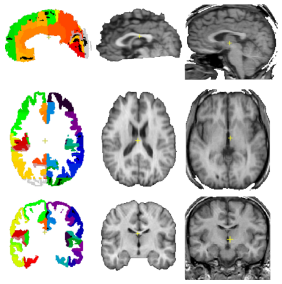

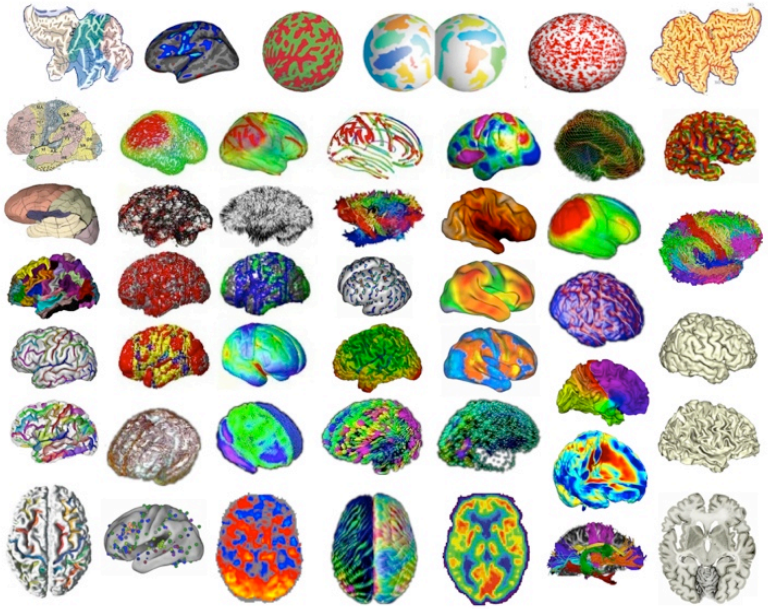

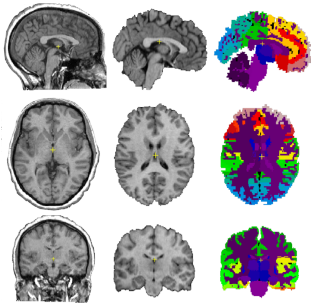
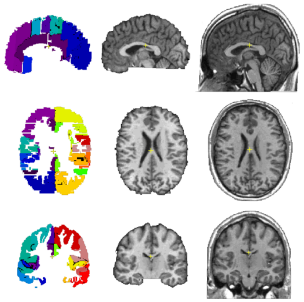
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