



**NA-MIC**

*National Alliance for Medical Image Computing*

*<http://na-mic.org>*

# **NA-MIC MGH Core 1**

**Bruce Fischl**

**MGH ATHINOULA A. MARTINOS CENTER  
Harvard Medical School**

**MIT CSAIL/HST**



**MASSACHUSETTS  
GENERAL HOSPITAL**



# Who are we?

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Note that MGH is the lead site in the morphometry testbed of the Biomedical Informatics Research Network (BIRN) and also a site in the functional BIRN (fBIN).

## Faculty

**Bruce Fischl (BIRN/NA-MIC)**  
**Randy Gollub (BIRN/NA-MIC)**  
**Dave Kennedy (BIRN/NA-MIC)**  
Karl Helmer (mBIRN)  
Doug Greve (BIRN)

## Engineering

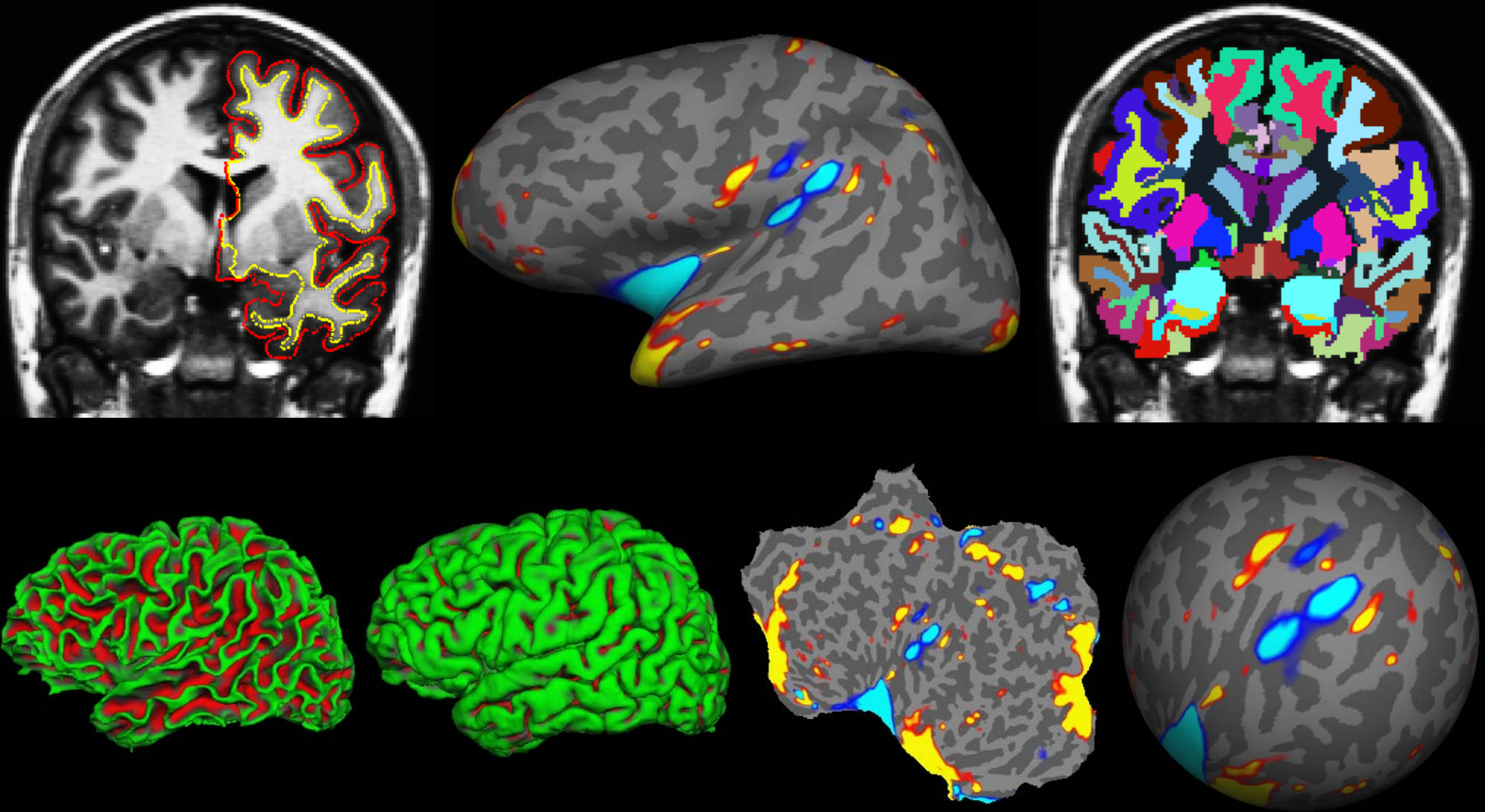
**Dennis Jen (NA-MIC)**  
Kevin Teich (BIRN)  
Nick Schmansky (BIRN)

## Postdocs

Lilla Zollei  
Gheorghe Postelnicu  
Anastasia Yendiki



# FreeSurfer



# Huntington's Disease



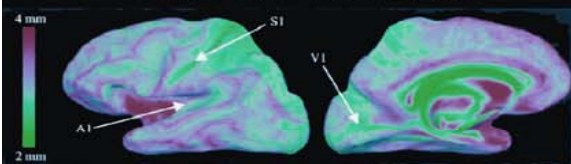
Rosas et al., 2002

# Multiple Sclerosis

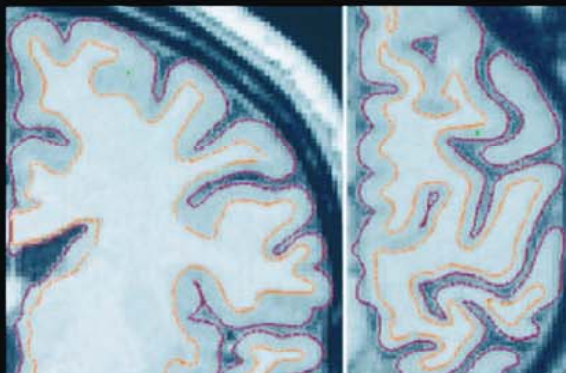


Sailer et al., 2003

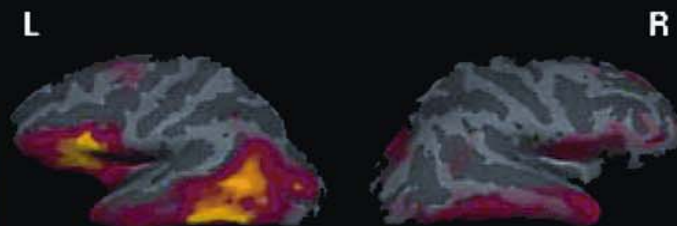
# Normal Variation



Fischl et al., 2000

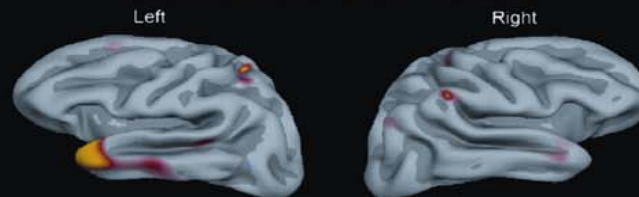


# Schizophrenia



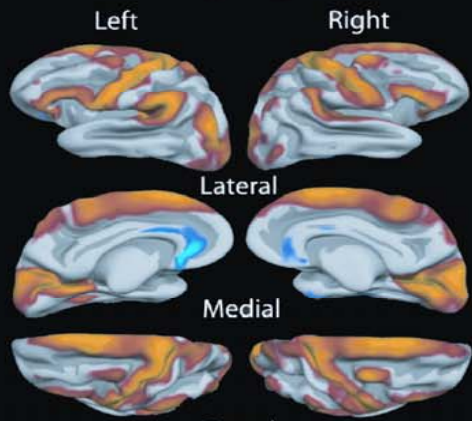
Kuperberg et al., 2003

# Semantic Dementia

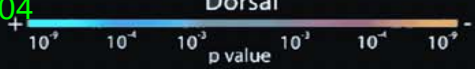


Gold et al., 2005

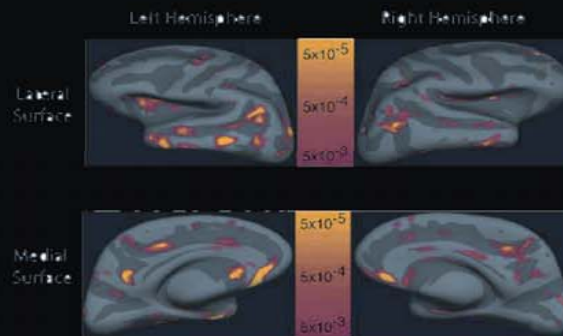
# Aging



Salat et al., 2004



# Animal Phobia



Rauch et al., 2004



# What NA-MIC gets from MGH

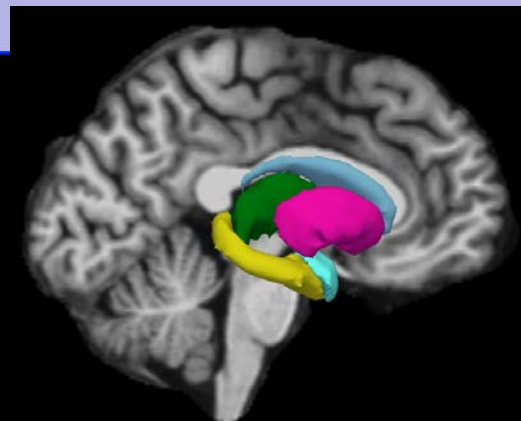
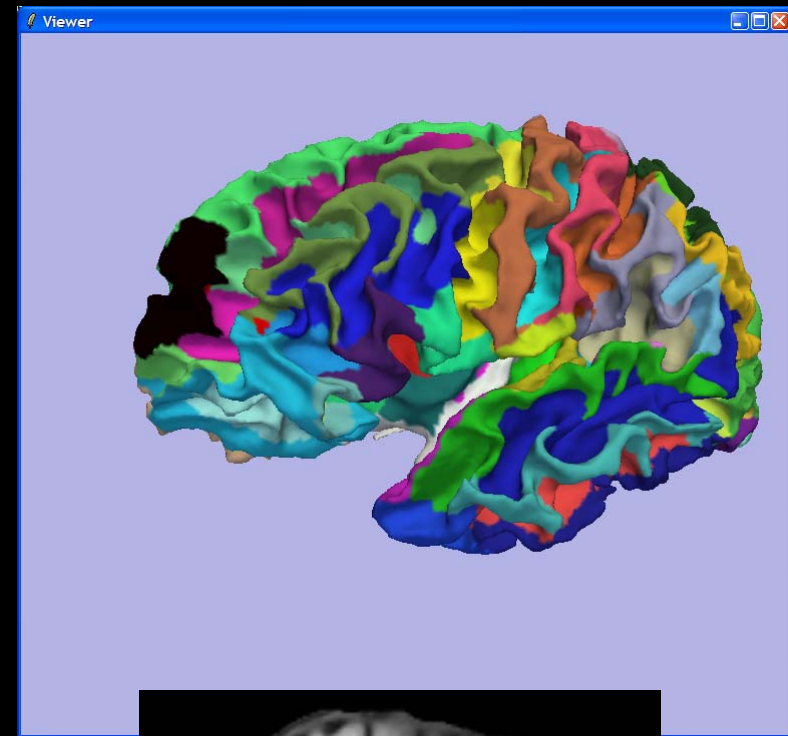
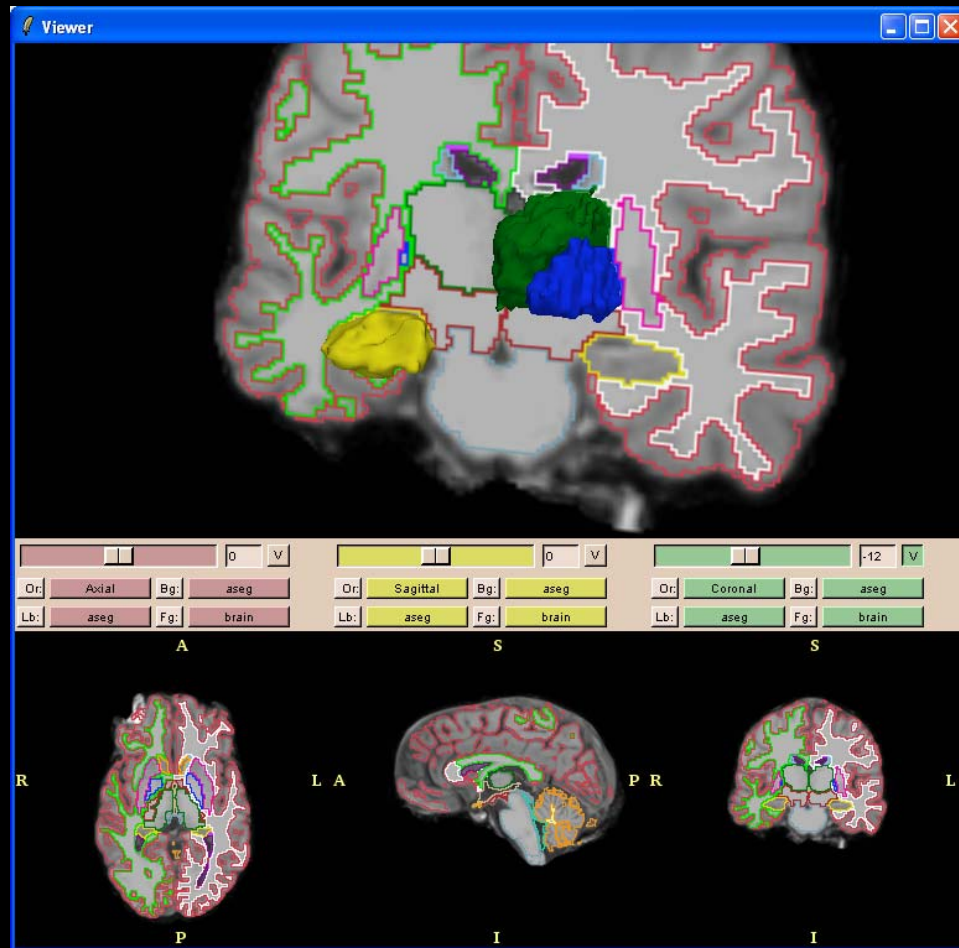
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- 1. Integration of FreeSurfer and Slicer.**  
ability to render any of the models/measures generated in FreeSurfer (>2500 licenses distributed)
- 2. Training courses.**  
4 courses run (22, 21, 24 and 50 attendees) in collaboration with Randy Gollub, Steve Pieper, Sonia Pujol, Katie Hayes, Jenni Pacheco and Doug Greve.
- 3. POIstats tool for constrained tractography.**  
An MCMC algorithm with replica exchange for computing the most probable path between two ROIs.
- 4. Tools for aligning histological images with MRI ones.**
- 5. Development and training for the fBIRN DBP.**





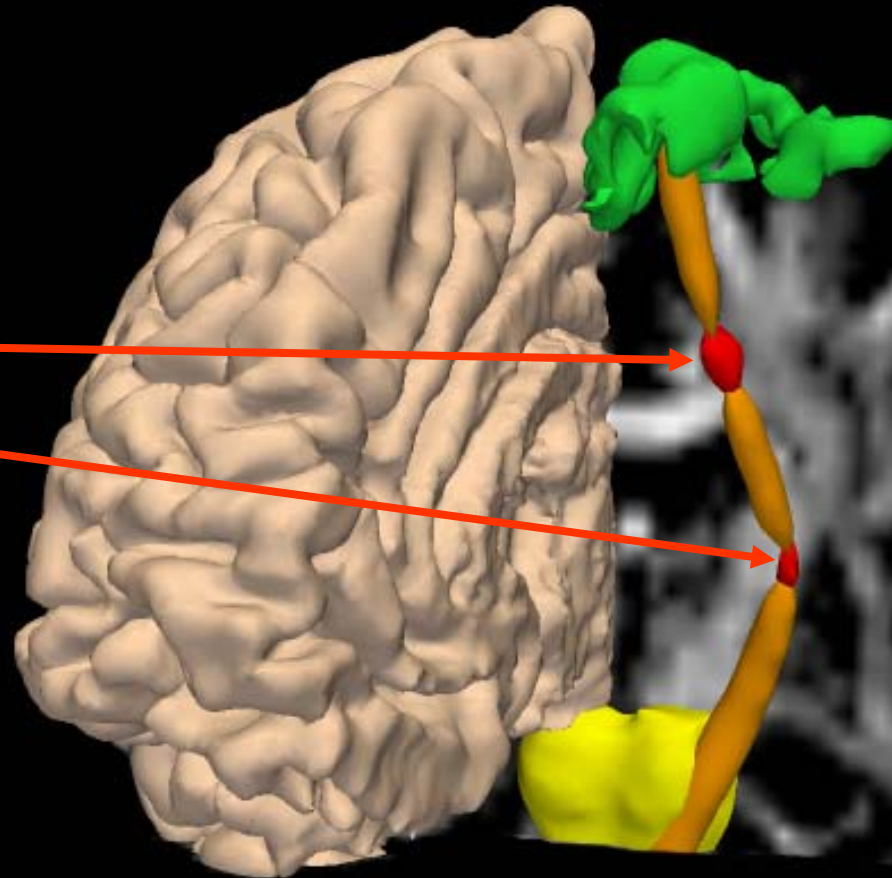
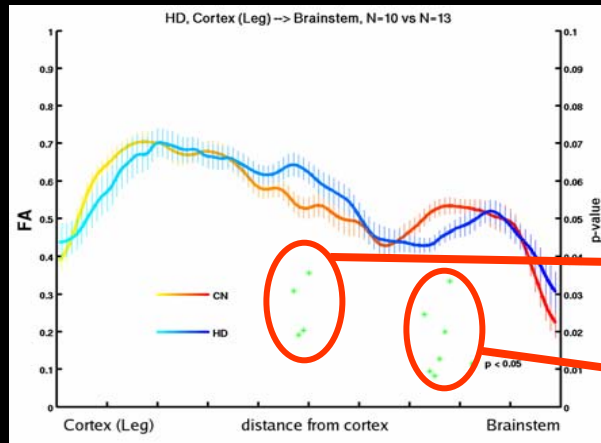
# FreeSurfer/Slicer Integration



In collaboration with Randy Gollub, Kevin Teich, Wendy Plesniak, Nicole Aucoin and Steve Pieper



# POIstats\*



\*Manuscript in preparation – will be contributed to iTK in first quarter '07. Joint work with Dave Tuch, Karl Helmer, David Salat, Vasanth Pappu, H. Diana Rosas and Dennis Jen



# What MGH gets from NA-MIC

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1. Integration of FreeSurfer and Slicer!
2. Open sourcing of FreeSurfer.
3. Industrial strength engineering expertise.
  - 407 unit tests
  - 64 system tests
  - nightly builds/tests on an array of platforms
  - integration of the Doxygen documentation system.
4. ITK support.





# Publications

Salat DH, Smith EE, Tuch DS, Benner T, Pappu V, Schwab KM, Gurol ME, Rosas HD, Rosand J, Greenberg SM. White matter alterations in cerebral amyloid angiopathy measured by diffusion tensor imaging. *Stroke*. 2006 Jul;37(7):1759-64.

Blood AJ, Tuch DS, Makris N, Makhlof ML, Sudarsky LR, Sharma N. White matter abnormalities in dystonia normalize after botulinum toxin treatment. *NeuroReport* 2006; 17(12): 1251-5.

Granziera C, DaSilva AF, Snyder J, Tuch DS, Hadjikhani N. Anatomical alterations of the visual motion processing network in migraine with and without aura. *PLoS Med*. 2006 Oct;3(10):e402.

Tuch DS, Salat DH, Wisco JJ, Zaleta AK, Hevelone ND, Rosas HD. Choice reaction time performance correlates with diffusion anisotropy in white matter pathways supporting visuospatial attention. *Proc Natl Acad Sci U S A*. 2005 Aug 23;102(34):12212-7.

Peng Yu, P. Ellen Grant, Yuan Qi, Xiao Han, Florent Segonne, Rudolph Pienaar, Evelina Busa, Jenni Pacheco, Nikos Makris, Randy L. Buckner, Polina Golland, Bruce Fischl, Cortical Surface Shape Analysis Based on Spherical Wavelets, *IEEE Transaction on Medical Imaging* (to be published in the special issue on computational neuroanatomy).

Florent Segonne, Jenni Pacheco, Bruce Fischl, Geometrically Accurate Topology Correction of Cortical Surfaces using Non-Separating Loops, *IEEE Transaction on Medical Imaging* (to be published in the special issue on computational neuroanatomy).

Khachaturian M, Wisco JJ, Tuch DS. Boosting the sampling efficiency of q-ball imaging using multiple wavevector fusion. *Magn Reson Med*. 2007 (in press)



# Publications (submitted)

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**Manoach DS, Ketwaroo AG, Polli FE, Thakkar KN, Barton JJS, Goff DC, Tuch DS. Reduced integrity of the anterior cingulum bundle is associated with saccadic latency in schizophrenia. 2007 (under revision)**

**Hinds, O., Polimeni, J., Rajendran, N., Balasubramanian, M., Wald, L., Rosas, D., Frosch, M., Augustinack, J., Wiggins, G., Potthast, A., Fischl, B., and Schwartz, E. 2007. Intersubject regularity in the intrinsic shape of human V1. Journal of Neuroscience. Submitted.**

**Xiao Han, Bruce Fischl, Intensity Renormalization for Improved Brain MR Image Segmentation across Scanner Platforms , IEEE Transaction on Medical Imaging (submitted).**

**Whitcher B, Wisco JJ, Hadjikhani N, Tuch DS. Statistical group comparison of diffusion tensors via multivariate hypothesis testing. 2007 (under revision)**

**Whitcher B, Tuch DS, Wisco JJ, Sorensen AG, Wang L. Using the wild bootstrap to quantify the uncertainty in DTI. 2007 (under revision)**