Functional MRI Facility

Core Facility Staff:

Peter Bandettini, Ph.D.	– Director
Sean Marrett, Ph.D.	– Staff Scientist
Jerzy Bodurka, Ph.D.	– Staff Scientist
Wen-Ming Luh, Ph.D.	– Staff Scientist
Adam Thomas	– Computer Administrator
Kay Kuhns	– Program Assistant
Karen Bove-Bettis	– Technologist
Janet Ebron	– Technologist
Alda Ottley	– Technologist
Ellen Condon	– Technologist
Sahra Omar	– Technologist

Scanners:

“3T-1”	GE 3T	(June 2000)
“3T-2”	GE 3T	(Nov 2002)
“FMRIF 1.5T”	GE 1.5T	(Sept 2004)
Currently being Cited	GE 3T	(Aug 2003)

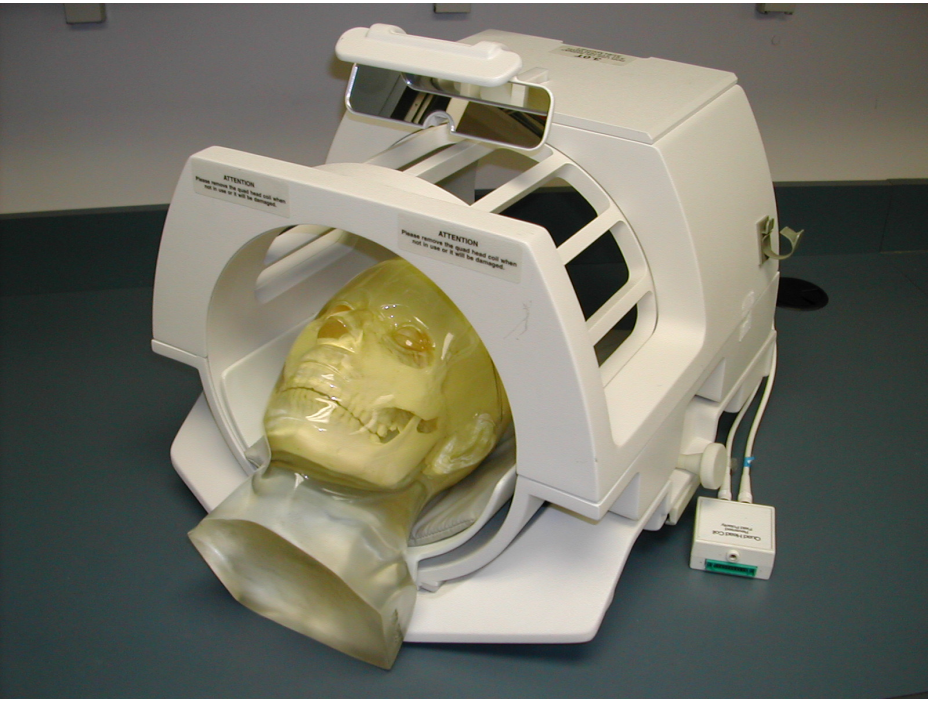
1.5T

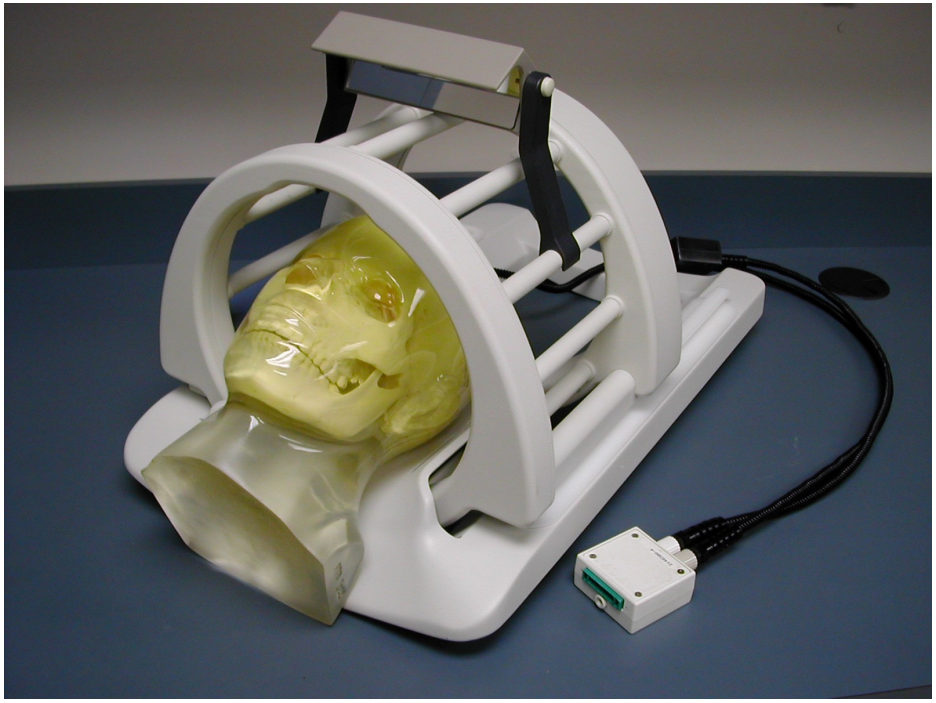
3T-1

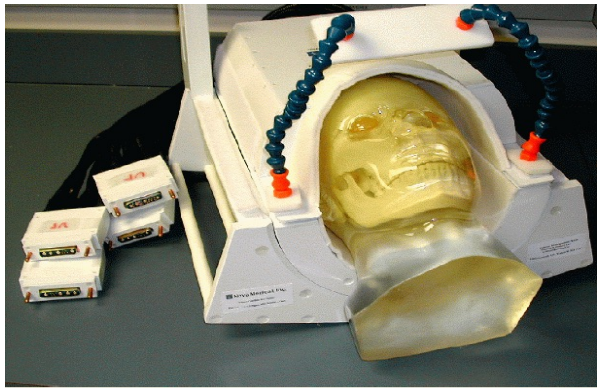
3T-2

Radiofrequency Coils

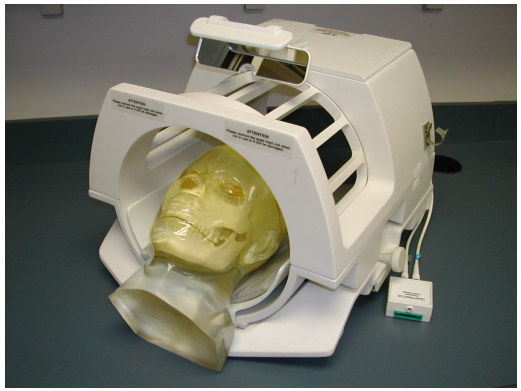
Head "Bird-cage" coils







A



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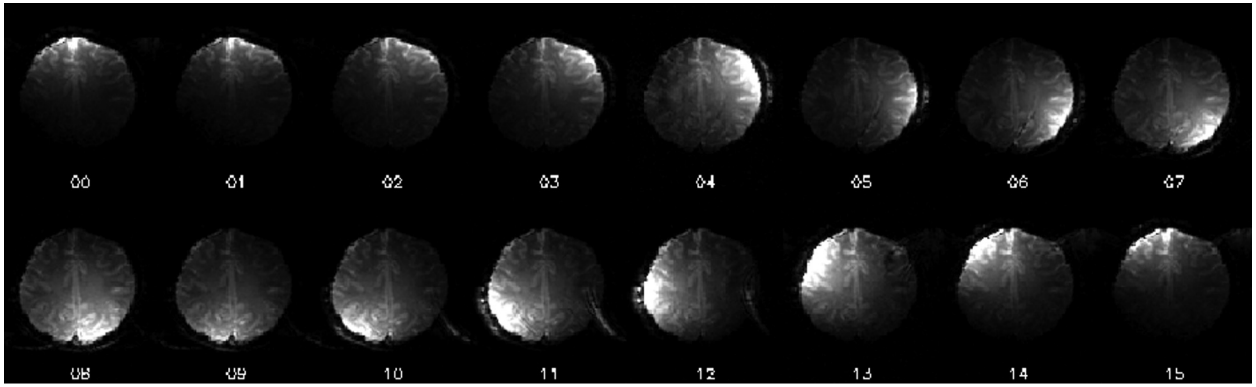
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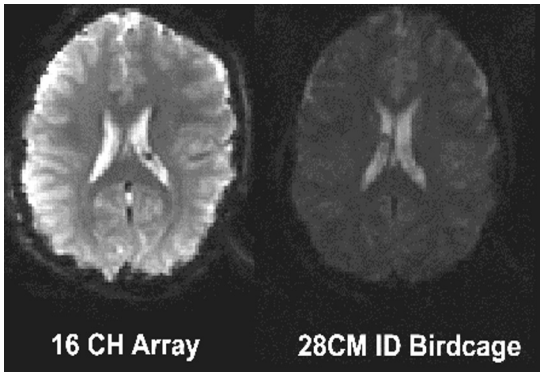
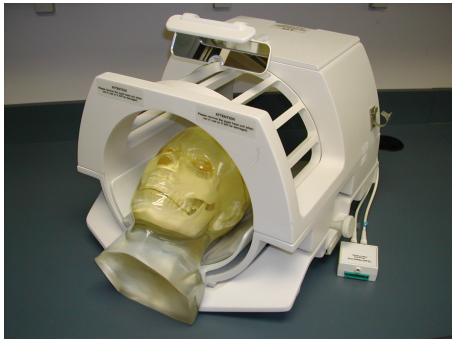
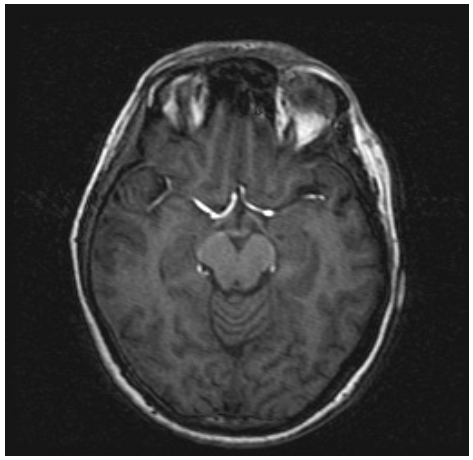

16 CH Array
28CM ID Birdcage

D

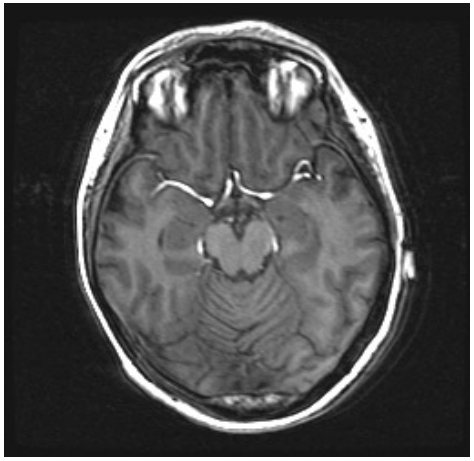
Radiofrequency Coils

8-channel acquisition:

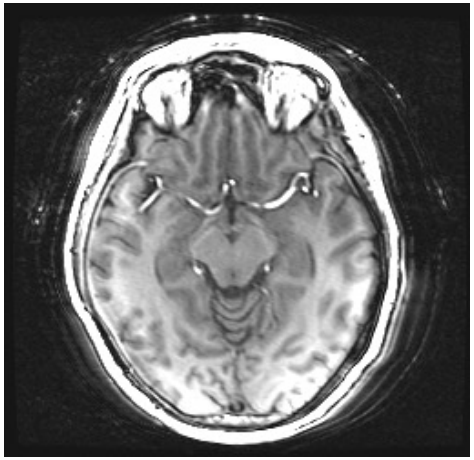




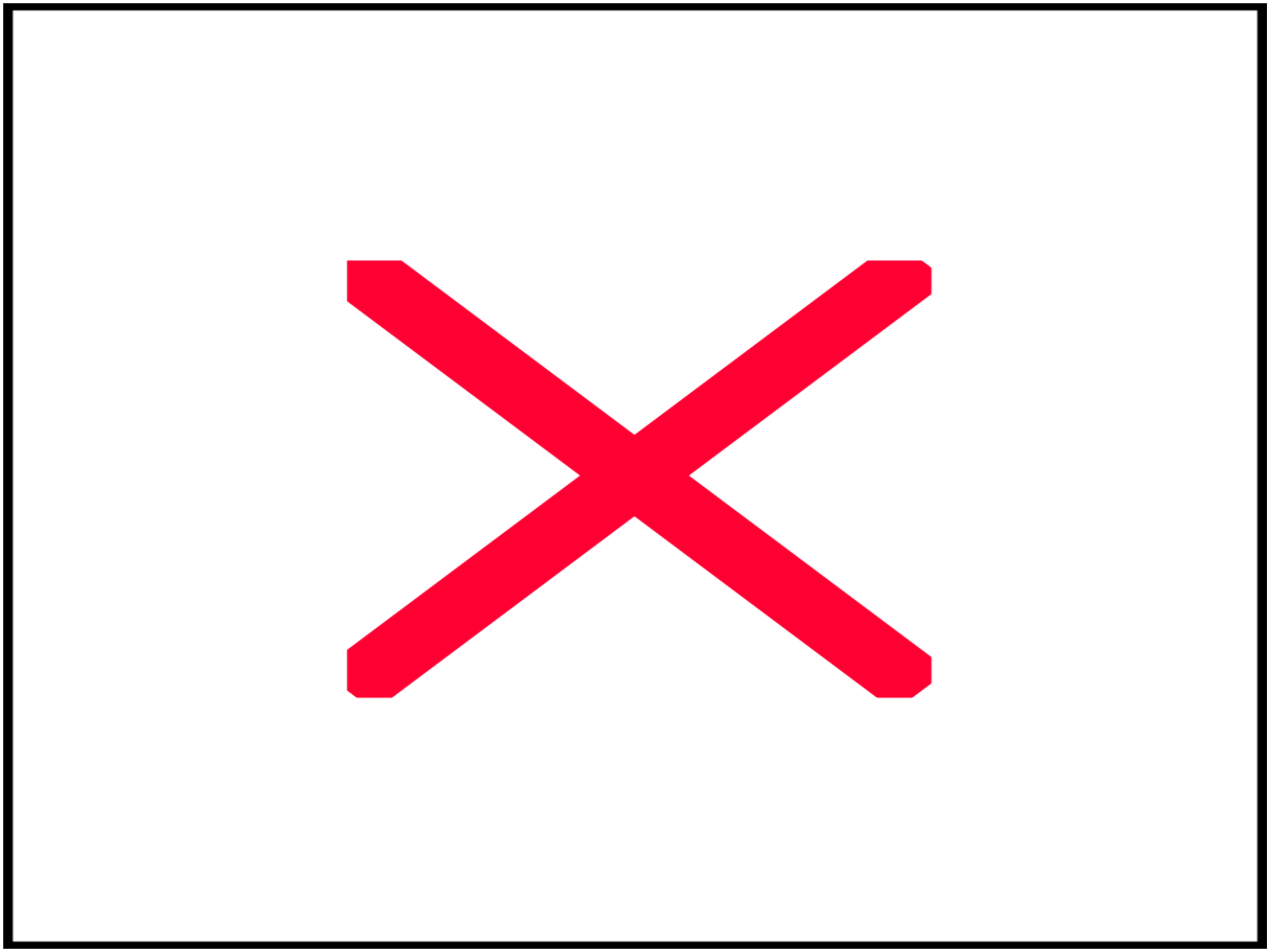
GE birdcage



GE 8 channel coil



Nova 8 channel coil



Stimulus presentation equipment

- Back projection screen 48X36in (DaLite Polacoat 100) mounted on an aluminum stand.
- Sharp LCD projectors with Buhl lens
- Avotec Silent Vision fiber-optic glasses for visual stimulus with integrated eye-tracking system
- SMI iView system with long-range lens for video-camera based eye-tracking
- Avotec Silent Scan earphones
- Phone-Or Dual Channel Noise-canceling Microphone

Software and response devices

- Presentation software
- e-prime (biological)
- Psychophysics Toolbox
- SuperLab
- Custom designed button response units and physiological interfaces RSB

New Devices (acquired in the last year)

- EEG
- Custom DLP projection (higher temporal resolution)
- DLP Backprojection
- Fiber-optic response systems
- MRI compatible power-injector
- Drug infusion pump

Pulse Sequences

BOLD imaging:

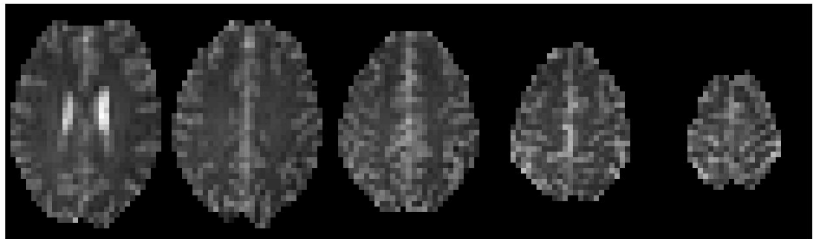
•***EPI-RT :*** General purpose BOLD imaging with real time display

•***epi3, epi4*** **:** NIH EPI sequences, epi4 for use with 16 channel system

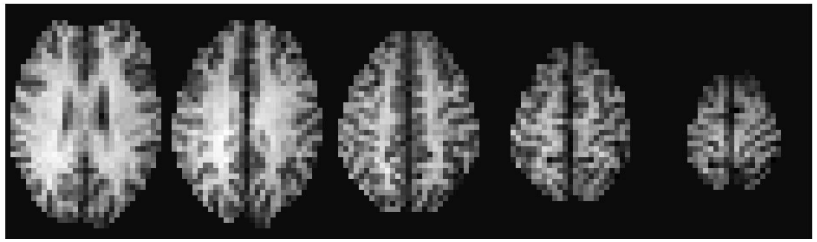
•***SPEP:*** Simultaneous perfusion and BOLD -spiral/EPI sequence with perfusion and diffusion modules and multi-echo and combined SE and GE capability

•***Clustered volume EPI-RT:*** (for auditory studies)

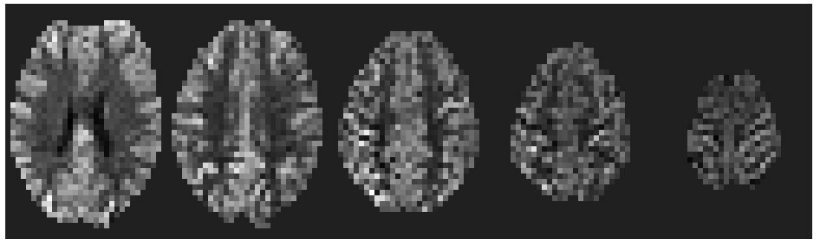
•***NIH-EPI*** (for use with 16 channel receiver system)



EPI



IR-EPI

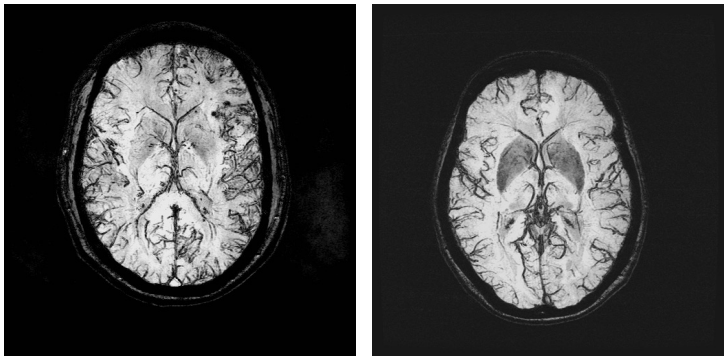


Pulsed ASL (QUIPSS II)

Anatomical Imaging:

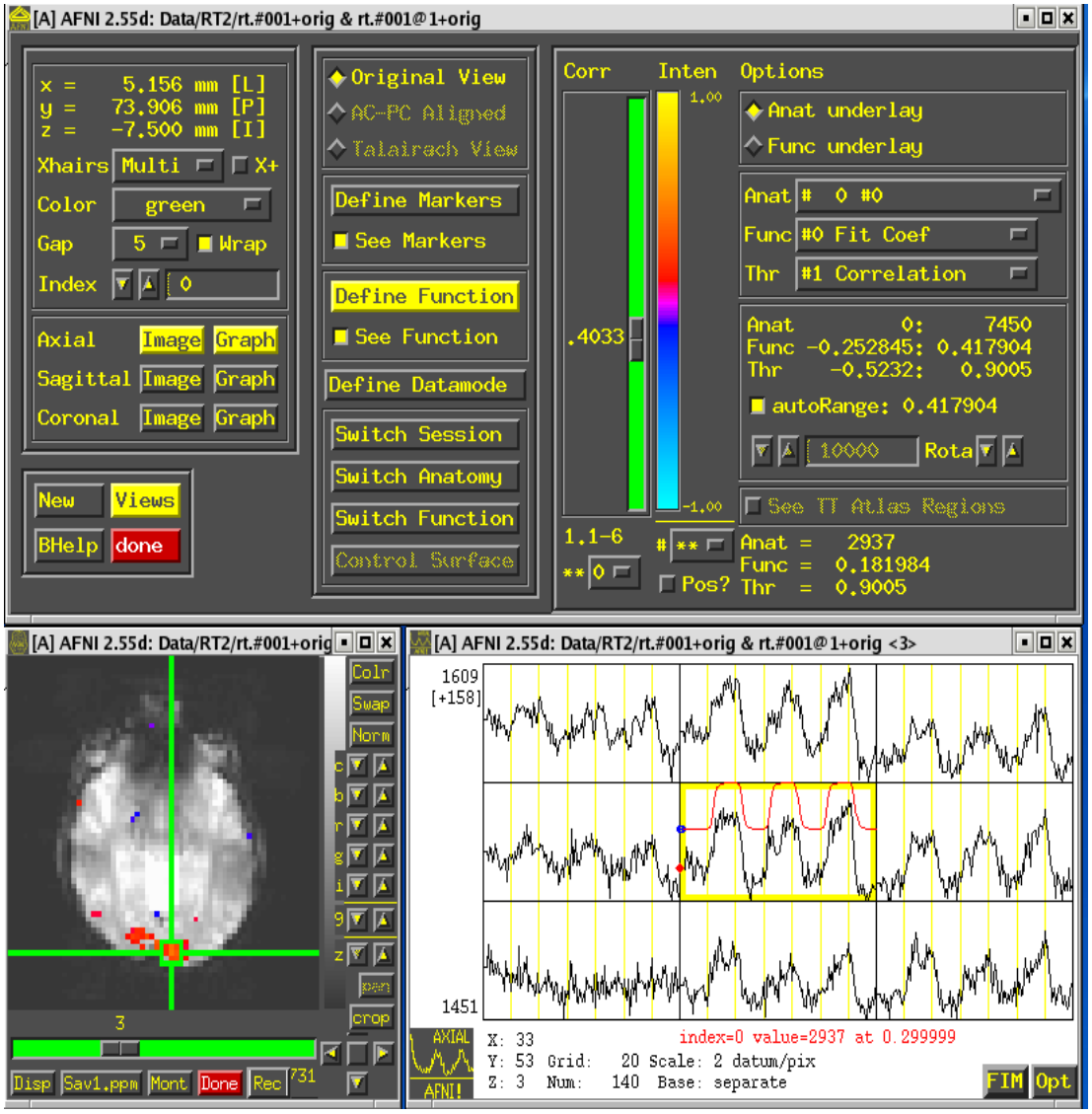
• **MP-RAGE:** T1 weighted sequence with excellent Gray/White matter contrast

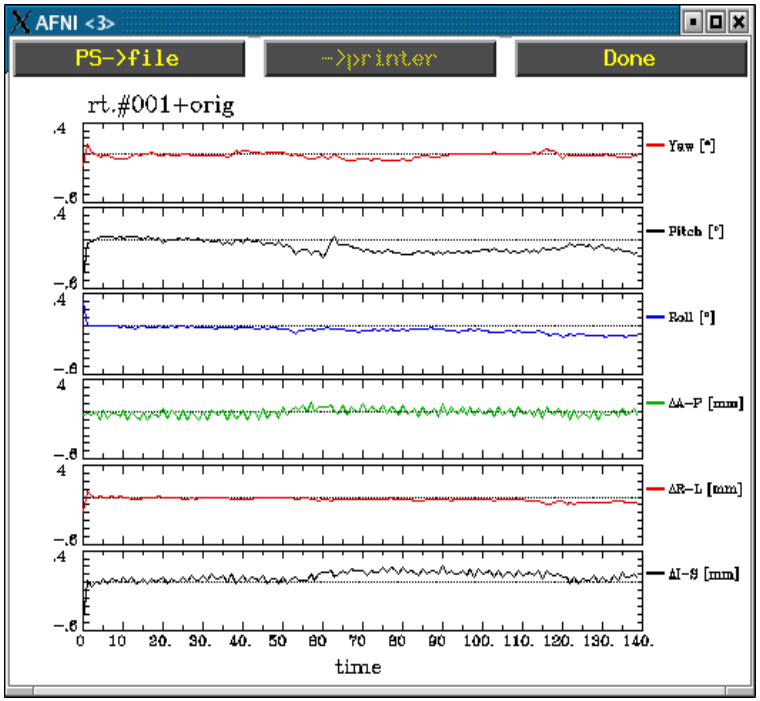
• standard product multi-shot sequences like: SPGR, SE, FSE etc.



High-resolution venogram

“Real – Time” fMRI

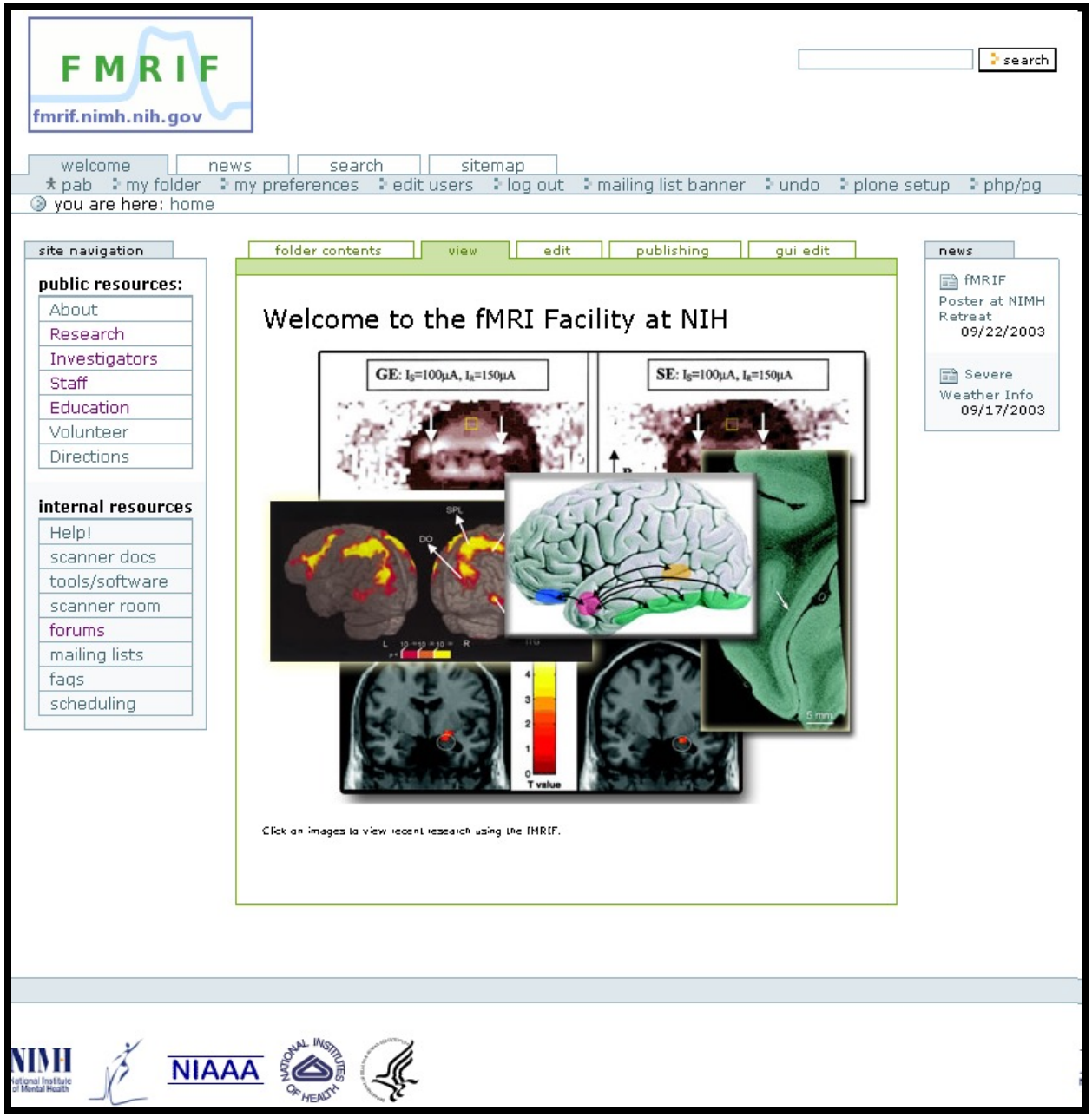




motion tracking

Website:

FMRIF.NIMH.NIH.GOV



3T-1

	Wednesday 03/09/05	Thursday 03/10/05	Friday 03/11/05	Saturday 03/12/05	Sunday 03/13/05	Monday 03/14/05	Tuesday 03/15/05
8am	CBDB (smarenco)	CBDB (Berman)	LBC (sfriedman-hill)	NMRF	CBDB (Berman)	training	CBDB (vmattay)
9am	CBDB (jcallicott)	CBDB (Berman)	LBC (sfriedman-hill)	NMRF	CBDB (Berman)	training	CBDB (vmattay)
10am	CBDB (jcallicott)	CBDB (Berman)	LBC (sfriedman-hill)	NMRF	CBDB (Berman)	CBDB (vmattay)	CBDB (smarenco)
11am	CBDB (jcallicott)	CBDB (vmattay)	LBC (sfriedman-hill)	NMRF	LBC	CBDB (vmattay)	NINDS
Noon	NMRF	CBDB (vmattay)	LBC (sfriedman-hill)	NINDS	LBC	CBDB (vmattay)	NINDS
1pm	NMRF	CBDB (jcallicott)	LBC (sfriedman-hill)	NINDS	LBC	CBDB (vmattay)	NINDS
2pm	NMRF	CBDB (jcallicott)	CBDB (Berman)	NINDS	LBC	NINDS	NINDS
3pm	NMRF	FIM (dknight)	CBDB (Berman)	NINDS	LBC	NINDS	NINDS
4pm	NIAA	FIM (dknight)	CBDB	NINDS	LBC	NINDS	NINDS
5pm	NIAA	FIM (dknight)	CBDB (smarenco)	NINDS	LBC	NINDS	NINDS
6pm	NIAA	FIM (dknight)	CBDB (vmattay)	NINDS	LBC	NINDS	NINDS
7pm	NIAA	FIM (rbirn)	CBDB (vmattay)	NINDS	LBC	NINDS	NINDS
8pm	DEV	FIM (rbirn)	CBDB (vmattay)	NINDS	LBC	GE	DEV
9pm	DEV	FIM (rbirn)	CBDB (vmattay)	NINDS	LBC	GE	DEV
10pm	DEV	FIM (rbirn)	CBDB (vmattay)	NINDS	LBC	GE	DEV

	Weekday		Weekend	
Department	Day	Eve	Day	Eve
Geriatric Psychiatric Branch				
training				
NIAA - National Inst. of Alcohol and Alcoholism				
DEV - Scanner Development				
FIM - Functional Imaging Methods				
GE Maintenance Time				
MAP - Mood and Anxieties Program				
NINDS - Neurological Disorders and Stroke				
CBDB - Clinical Brain Disorders Branch				
LBC - Laboratory of Brain and Cognition				
NMRF - NIH Magnetic Resonance Facility				
David Rubinow				
Posted				

3T-2

	Wednesday 03/09/05	Thursday 03/10/05	Friday 03/11/05	Saturday 03/12/05	Sunday 03/13/05	Monday 03/14/05	Tuesday 03/15/05
8am	MAP	NINDS	NINDS	MAP	DR	DR	DR
9am	MAP	NINDS	NINDS	MAP	LBC	training	CBDB
10am	MAP	NINDS	NINDS	MAP	LBC	training	CBDB
11am	MAP	NINDS	NINDS	MAP	LBC	MAP	CBDB
Noon	MAP	NINDS	NINDS	MAP	LBC	MAP	GPB
1pm	MAP	NINDS	NINDS	MAP	FIM	LBC (imukai)	GPB
2pm	MAP	NMRF	NINDS	MAP	FIM	LBC (imukai)	GPB
3pm	MAP	NMRF	NINDS	MAP	NINDS	LBC (imukai)	GPB
4pm	MAP	NMRF	NINDS	MAP	NINDS	LBC (imukai)	MAP
5pm	MAP	NMRF	NINDS	MAP	NINDS	LBC (imukai)	MAP
6pm	MAP	NMRF	NINDS	MAP	NINDS	LBC (imukai)	MAP
7pm	MAP	NMRF	NINDS	MAP	NINDS	NMRF	MAP
8pm	DEV	DEV	NINDS	GPB	NINDS	NMRF	GE
9pm	DEV	DEV	NINDS	GPB	NINDS	NMRF	GE
10pm	DEV	DEV	NINDS	GPB	NINDS	NMRF	GE

	Weekday		Weekend	
Department	Day	Eve	Day	Eve
Geriatric Psychiatric Branch				
training				
NIAA - National Inst. of Alcohol and Alcoholism				
DEV - Scanner Development				
FIM - Functional Imaging Methods				
GE Maintenance Time				
MAP - Mood and Anxieties Program				
NINDS - Neurological Disorders and Stroke				
CBDB - Clinical Brain Disorders Branch				
LBC - Laboratory of Brain and Cognition				
NMRF - NIH Magnetic Resonance Facility				
David Rubinow				
Posted				

Education / Support:

- Weekly fMRI discussions (Fridays, 1pm, 10/4N230)
- Bi-Monthly user meetings (First Monday every other month, 3pm, 10/4N230)
- Bi-Monthly steering committee meetings (First Monday every other month, 3pm, 10/4N230)
- Meetings with each PI to address needs and concerns & guide purchases
- Training in scanner operation and use of subject interface devices
- Consulting on paradigm design

PI Research:

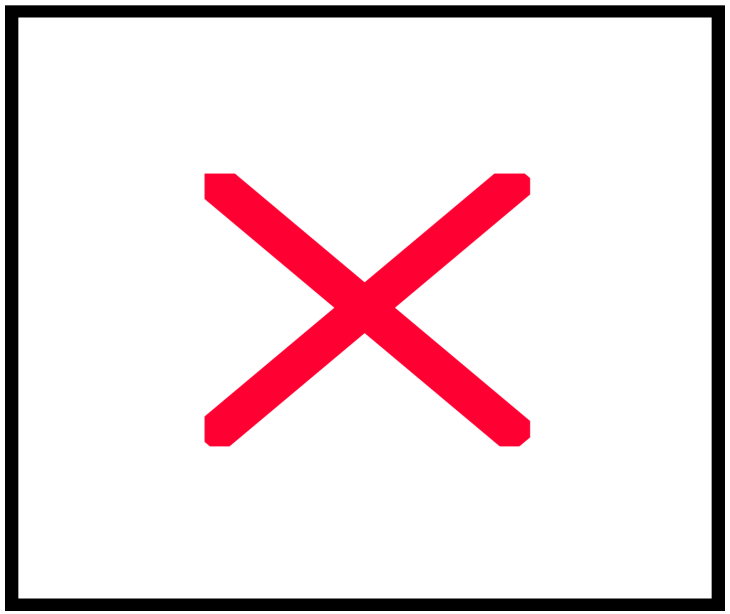
NIMH:
Peter Bandettini, Ph.D.
Karen Berman, M.D.
James Blair, Ph.D.
Robert Cohen, M.D., Ph.D.
Christian Grillon, Ph.D.
Wayne Drevets, M.D.
Ellen Liebenluft, M.D.
Daniel Pine, M.D.
Jun Shen, Ph.D.
Leslie Ungerleider, Ph.D.
Daniel Weinberger, M.D.

NINDS:
Leonardo Cohen, M.D.
Jeff Duyn, Ph.D.
Jordan Grafman, Ph.D.
Mark Hallett, Ph.D.
Alan Koretsky, Ph.D.
Chrsity Ludlow, Ph.D.

NIAAA:
Daniel Hommer, M.D.

NICHD:
Peter Basser, Ph.D.
Allen Braun, M.D.

Research Protocols on FMRIF Scanners



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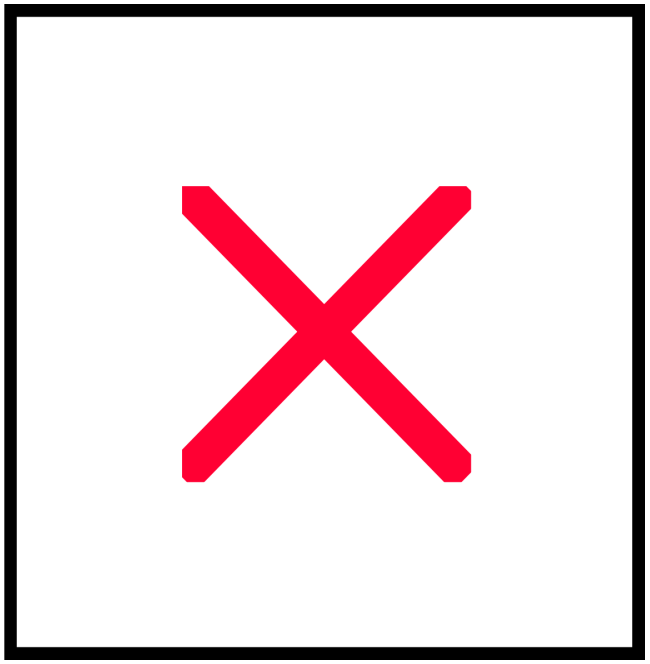

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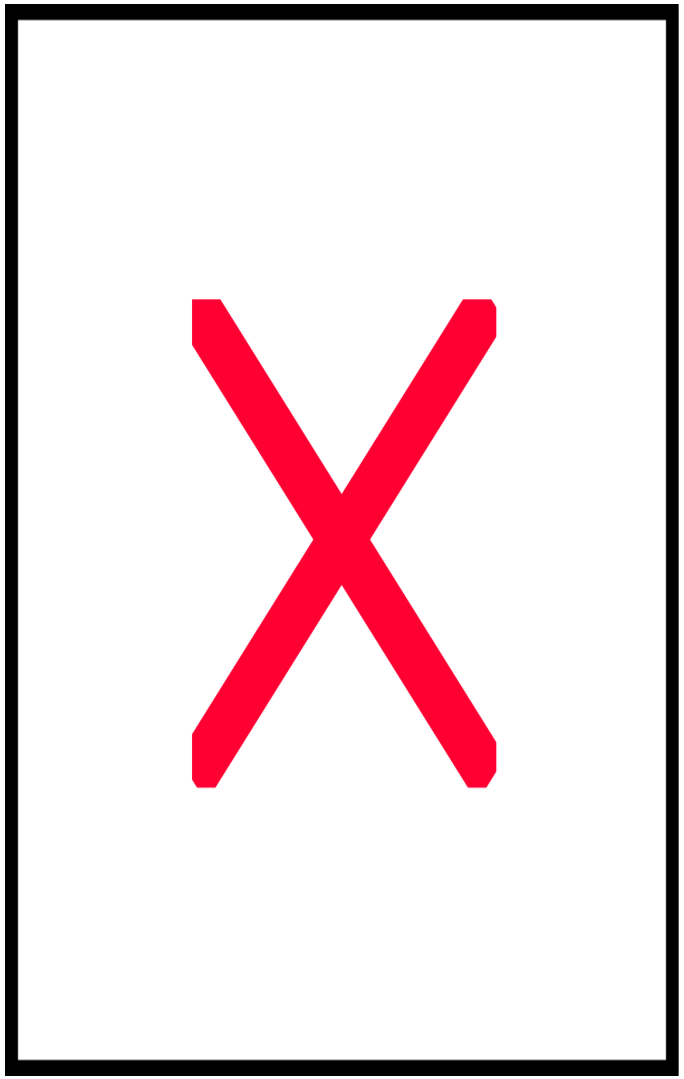

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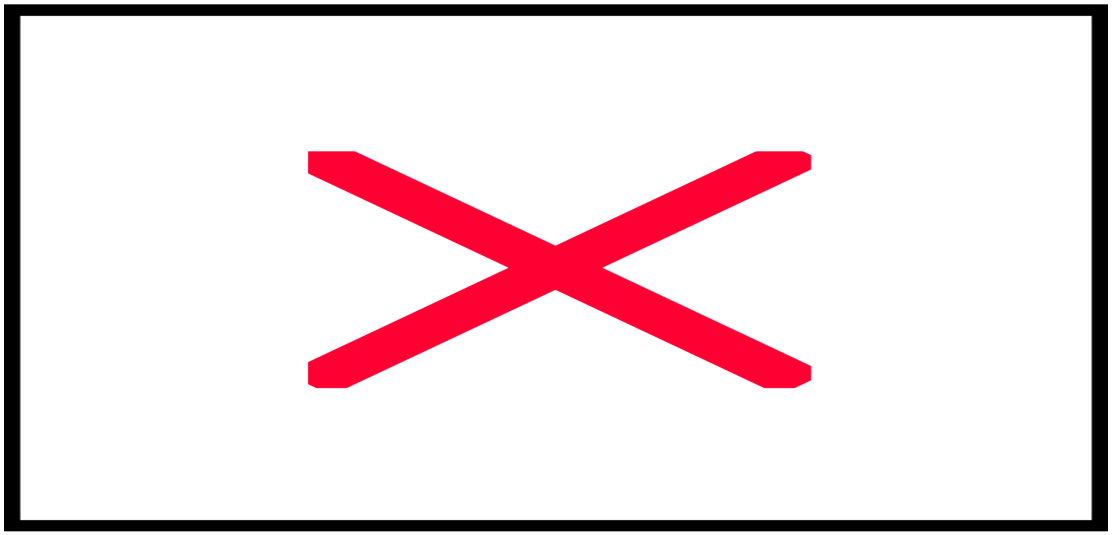

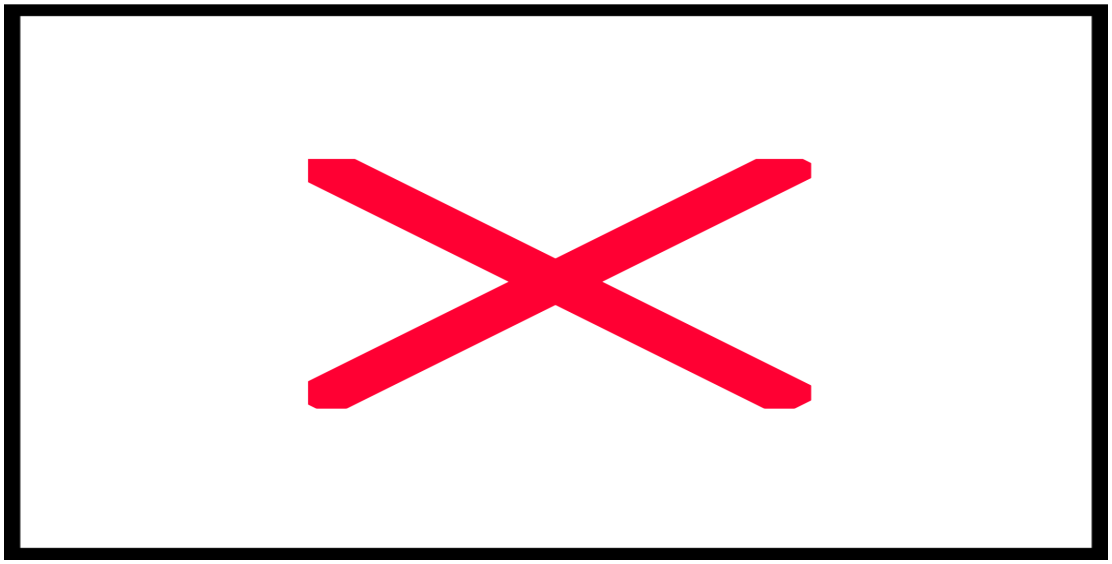

2003:

Up days:
3T-1: 303
3T-2: 280

Total budget (including salaries):
$1,746 000.00

Cost per usage hour (only counting up days x 10 hrs day): $309

Cost per Gigabyte: $2.35

Functional MRI
Papers Published at the NIH:

2000: **20**
2001: **11**
2002: **24**
2003: **26**
2004: **31**
2005: **5**

Ongoing Projects and Directions

- More routine access to advanced subject interface devices (eye tracking, skin conductance).
- Better dissemination of methods information to and across groups.
- Simultaneous EEG/fMRI.
- Higher resolution single shot fMRI (1.5 mm^3).
- More routine access to perfusion imaging methods and processing.
- Better shimming techniques (to image base of brain more effectively).

Schedule so far

Feb 17: Peter Bandettini: Introduction, overview
March 3: (3:00 PM) Steven Schiff from the Krasnow Institute
March 10: Joelle Sarlls from the University of Arizona. "Radial Data Acquisitions in Diffusion-weighted MRI"
March 17: Danny Pine, Mood and Affective Disorders Program
March 24: Niko Kriegeskorte (discussion: multivariate analysis and pattern classification)
March 31:
April 14: David Leopold
April 21: Adam Thomas (discussion: slice orientation tradeoffs)
April 28: Rasmus Birn
May 19: Sean Marrett (discussion: fMRI of processes associated with perceptual decision making)
May 26: Kyle Simmons, Laboratory of Brain and Cognition (discussion: voxel-wise uniqueness and variability of activation patterns)
June 23:
June 30
July 7
July 21
July 28

Potential topics/issues…

Signal dropout
Multivariate analysis
Pooling across scanners
Slice orientation
DTI and fMRI integration
Connectivity assessment methods
High field strength issues
Simultaneous measures (EEG, SCR, eye tracking, physiology)
FMR-Adaptation
Behavior prediction
Neuronal-hemodynamic coupling
Voxel based morphometry
High resolution issues
Perfusion imaging
…?