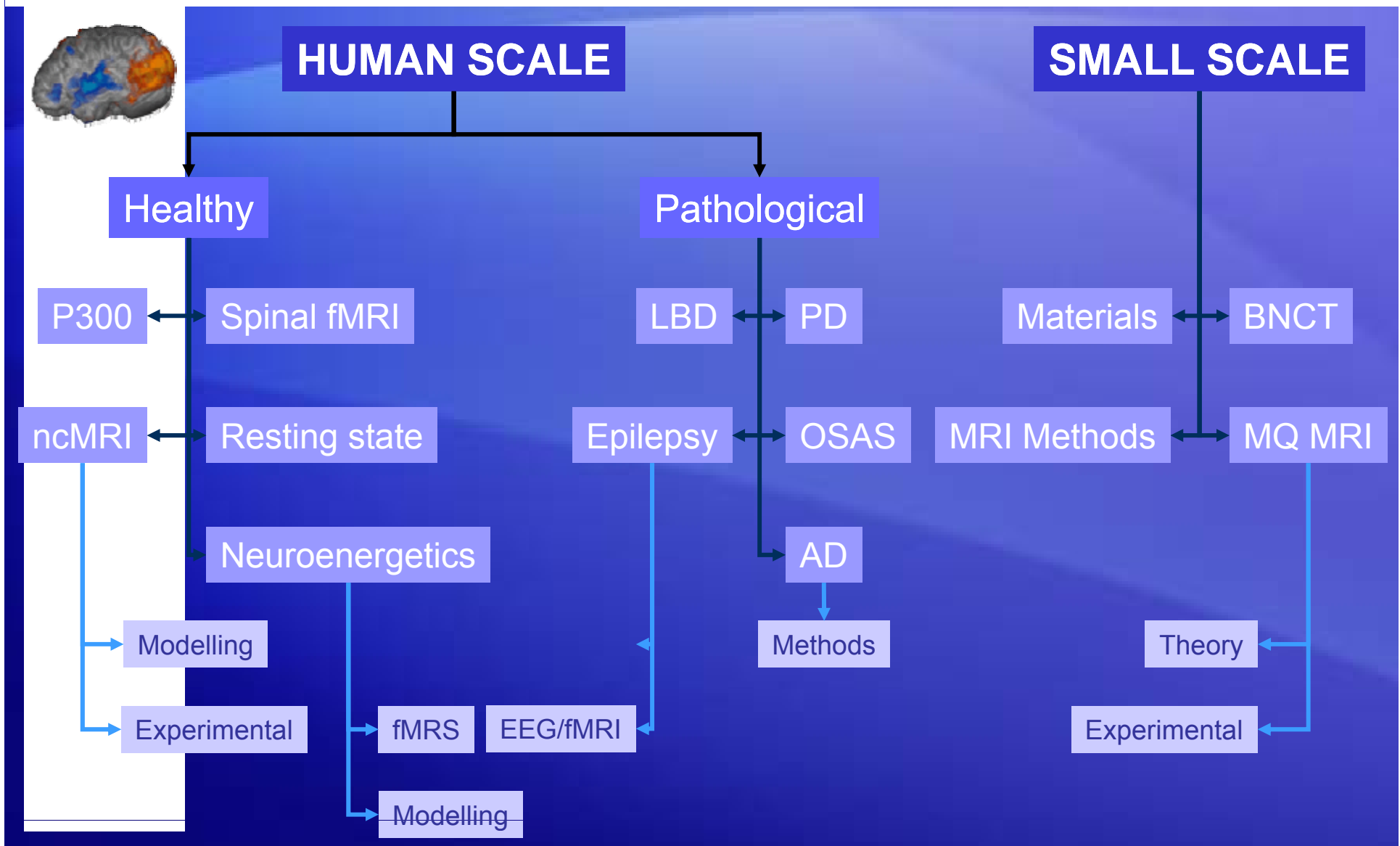


# MAGNETIC RESONANCE AND ITS APPLICATIONS TO THE STUDY OF BRAIN FUNCTION AND OTHER BIOLOGICAL TISSUES

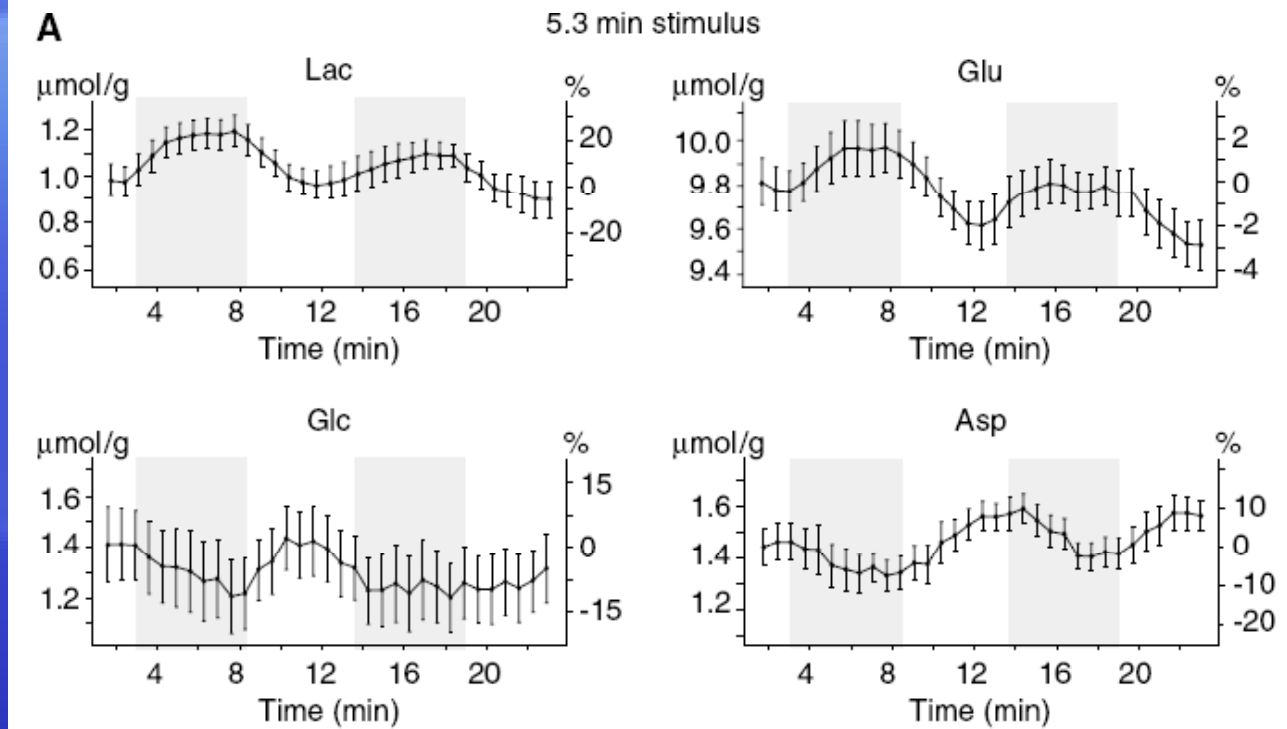
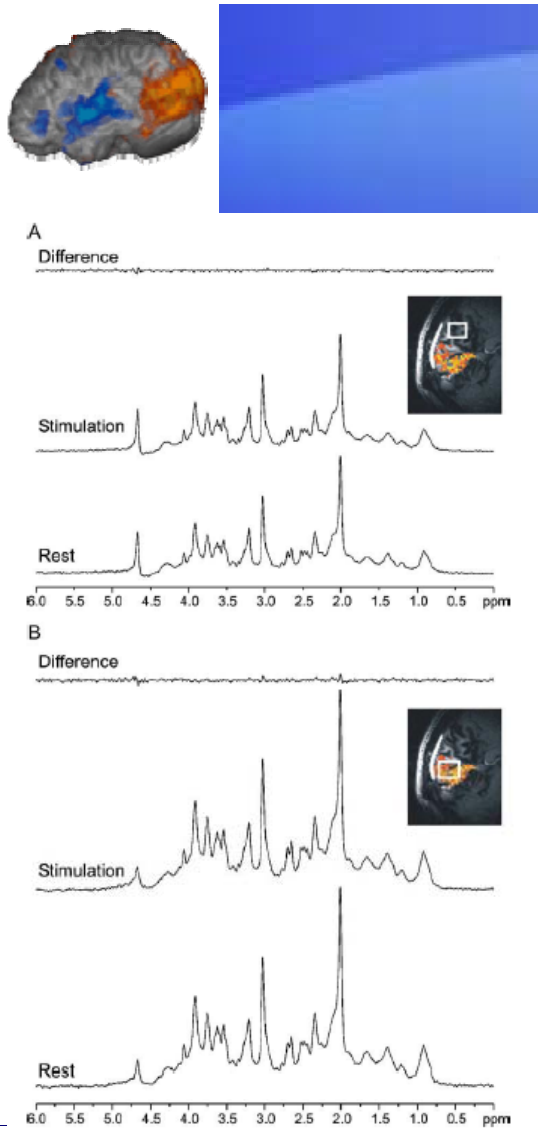
**G1 Group @ Physics Dept , Sapienza University of Rome  
Marbilab @ S. Lucia Foundation , Enrico Fermi Centre**

**Bruno Maraviglia, Silvia Capuani, Girolamo Garreffa,  
Federico Giove, Tommaso Gili,  
Antonino M. Cassarà, Marco Carnì, Giovanni Giuliatti,  
Marta Moraschi , Mauro Rebuzzi, Silvia De Santis**

# RESEARCH



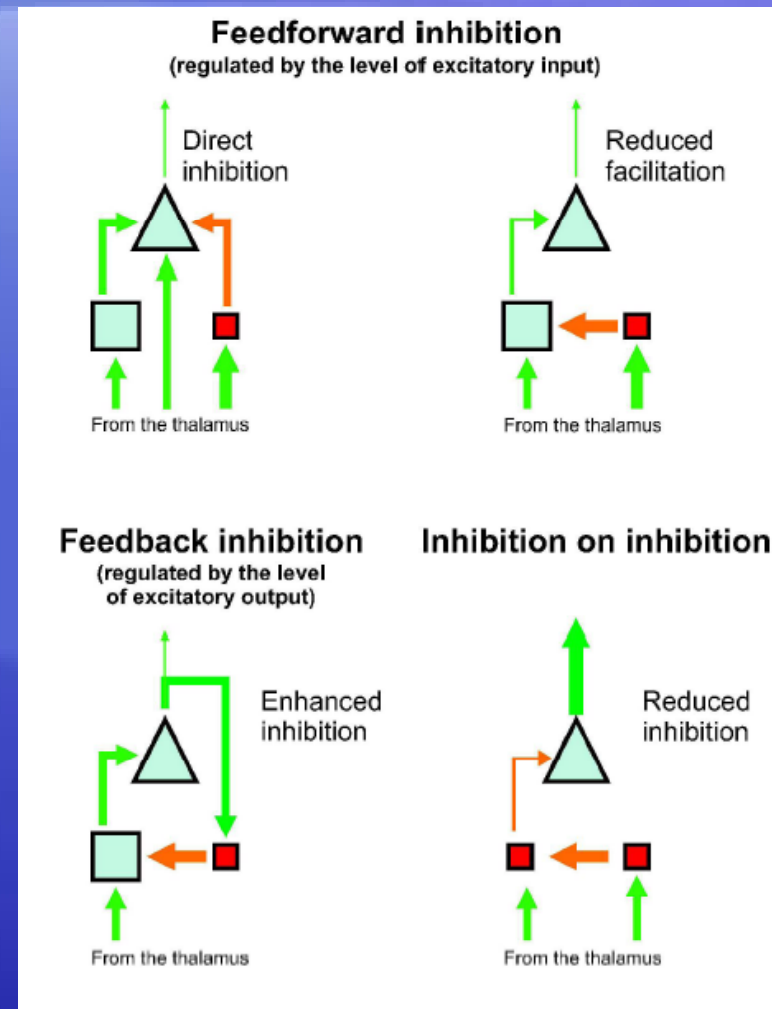
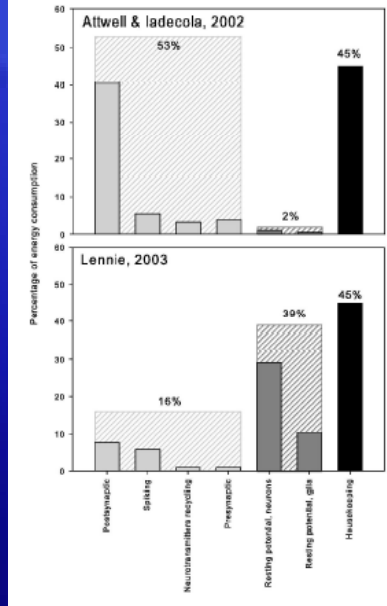
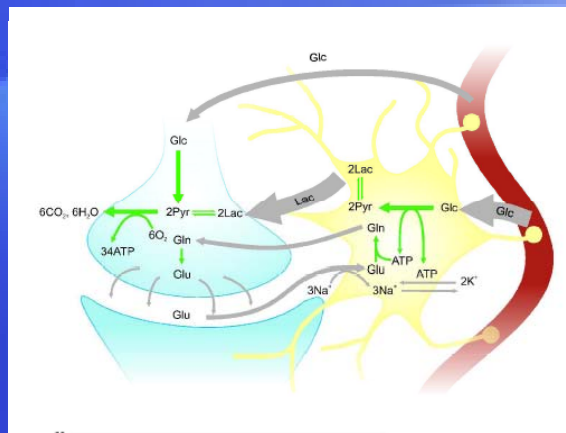
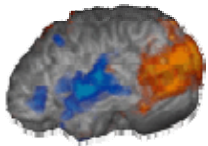
# Neuroenergetics: experimental



Journal Cereb Blood Flow Metab 27:1055-1063 (2007)

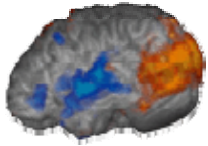
Magn Reson Imaging 24:343-348 (2006)

# Neuroenergetics: modelling

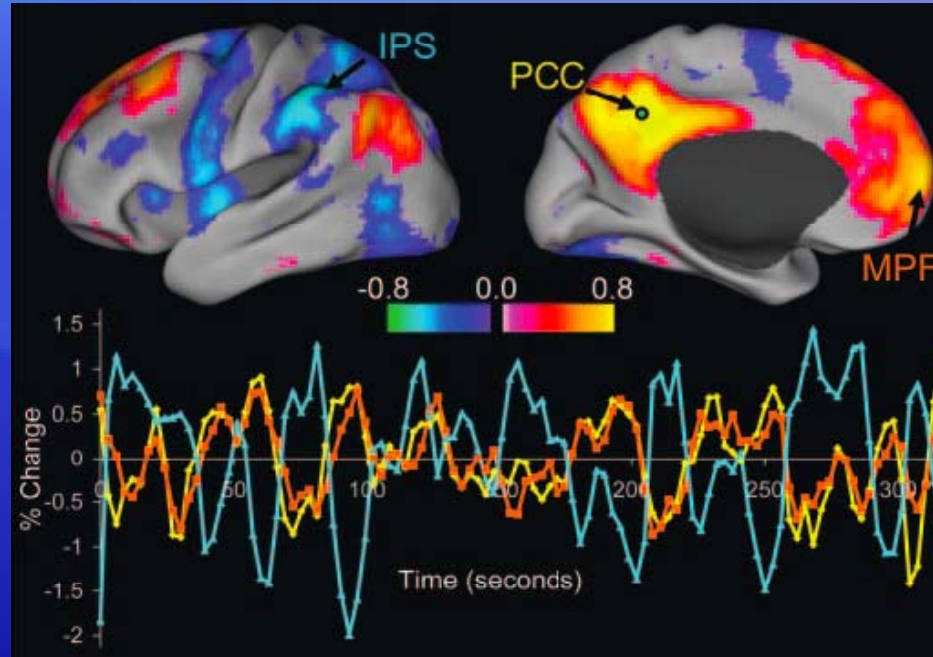


Journal Cereb Blood Flow Metab, *under revision*

# Resting state



Low frequency intrinsic correlations during rest  
the default network(s)



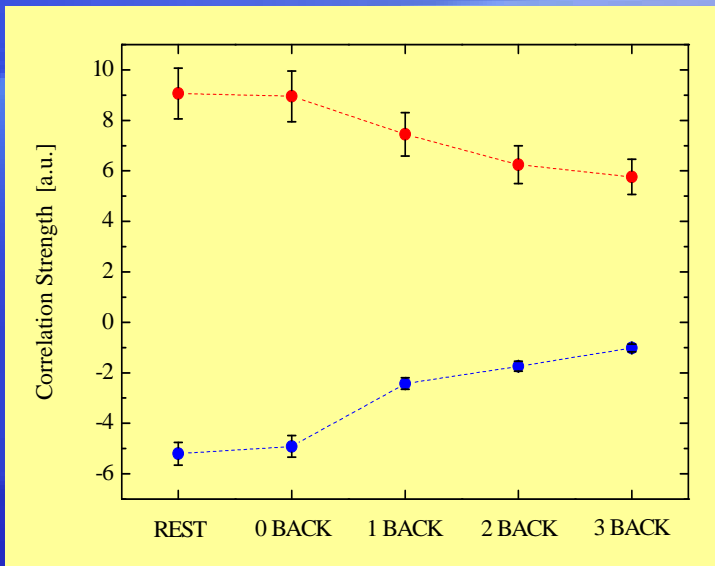
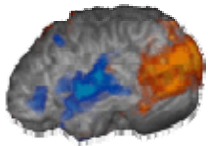
$0.01 \text{ Hz} < f < 0.08 \text{ Hz}$

Greicius M et al PNAS **100**:253-258 (2003)

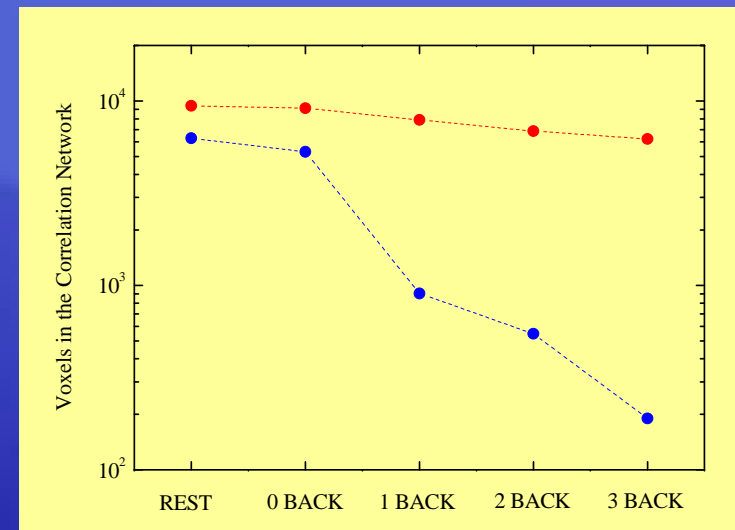
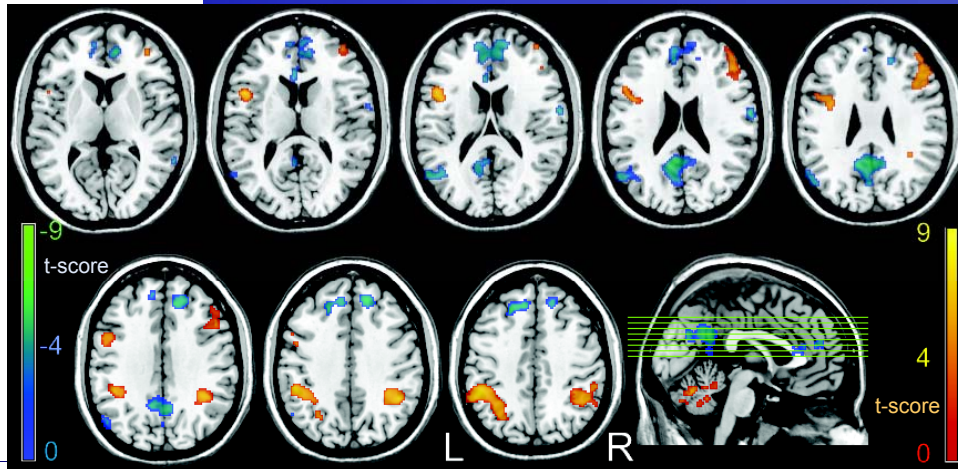
Fox MD et al PNAS **102**:9673-9678 (2005)

Damoiseaux JS et al **103**:13848-13853 (2005)

# Resting state

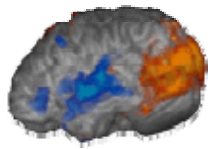


Cognitive modulation of the Default Mode Network

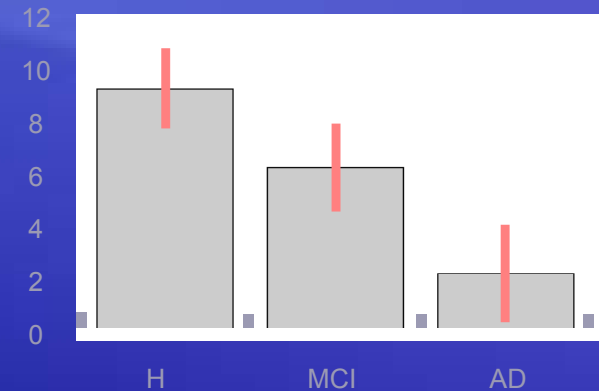
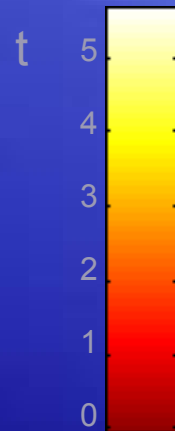
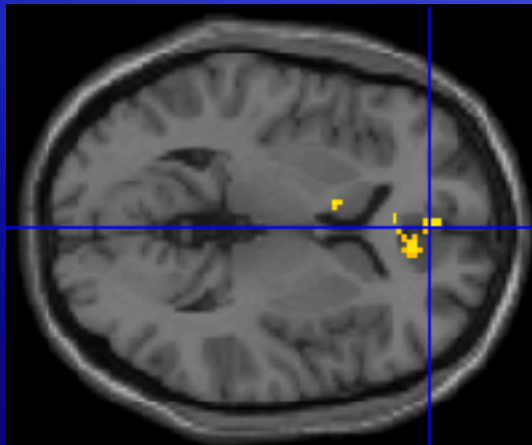
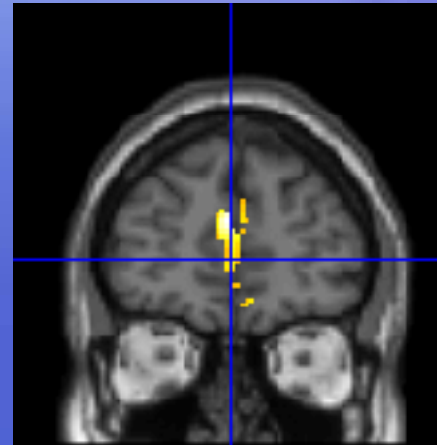
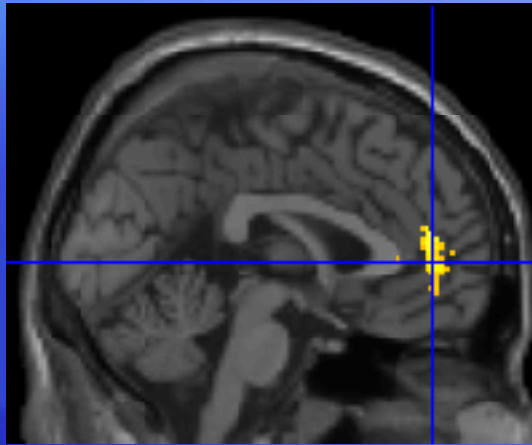


Cereb Cortex, *submitted*

# Resting state

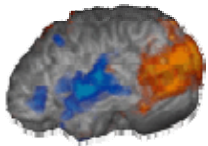


Healthy controls vs AD & MCI patients

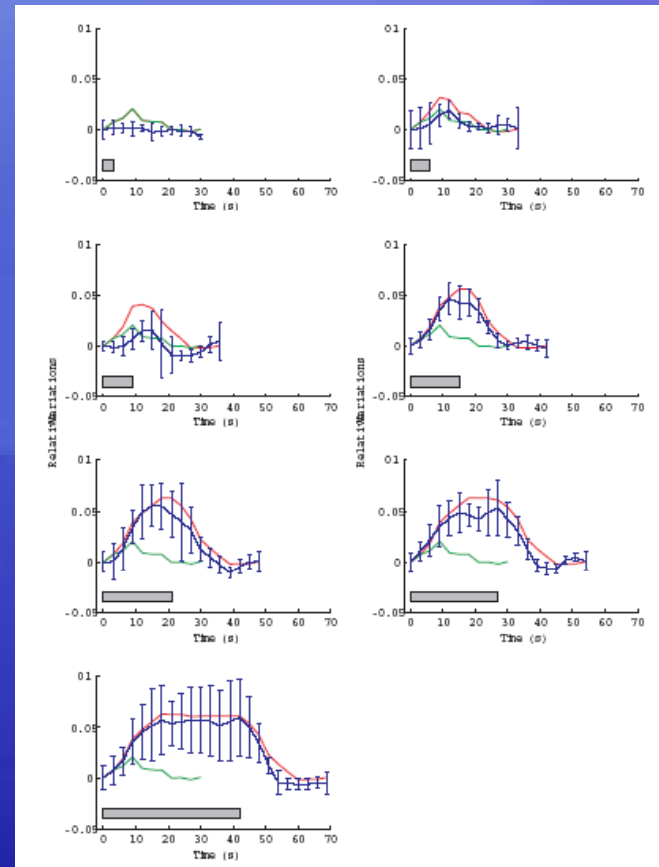
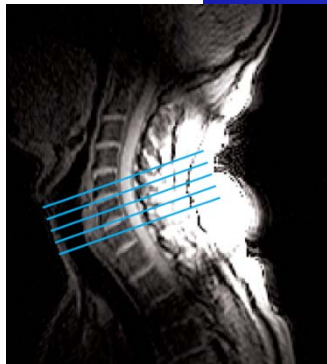
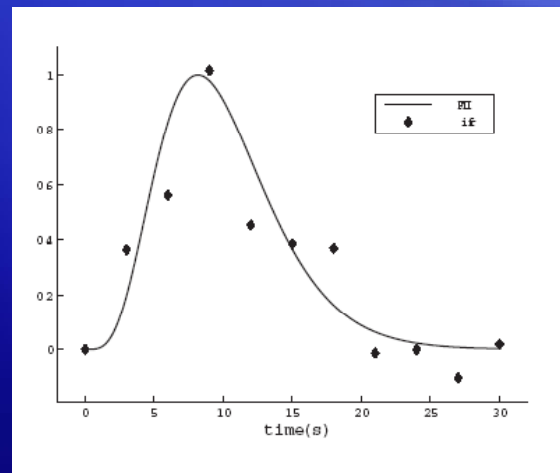
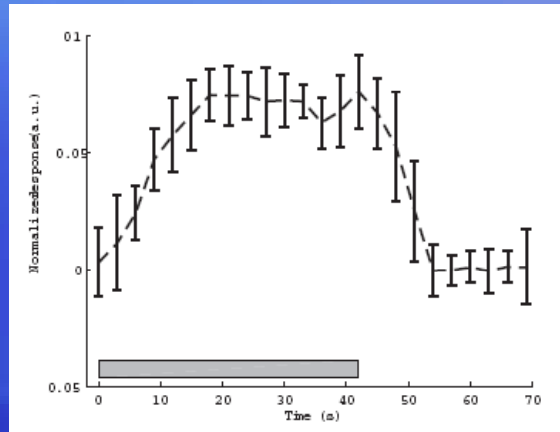


Neurology, *submitted*

# Spinal cord fMRI

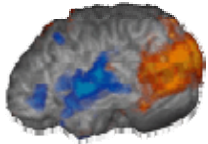


Neuroimage, 42:626-634 (2008)

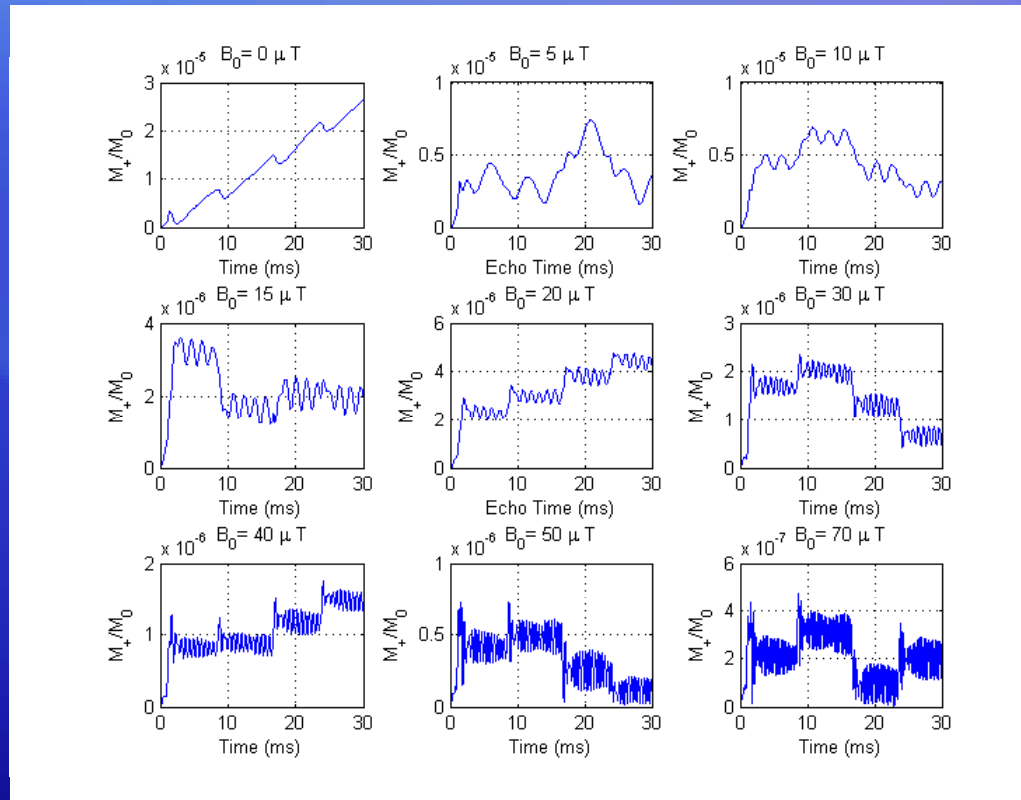




# Neuronal current MRI

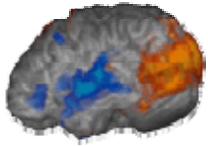


## Ultra Low Field NMR



Neuroimage, 41:1228-1241 (2008)

# Advanced MRI of biological tissues



## Trabecular Bone

J Magn Reson Imaging, **submitted**

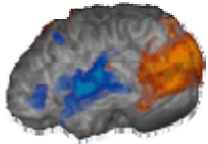
## Cartilage

Biophys J, **in preparation**

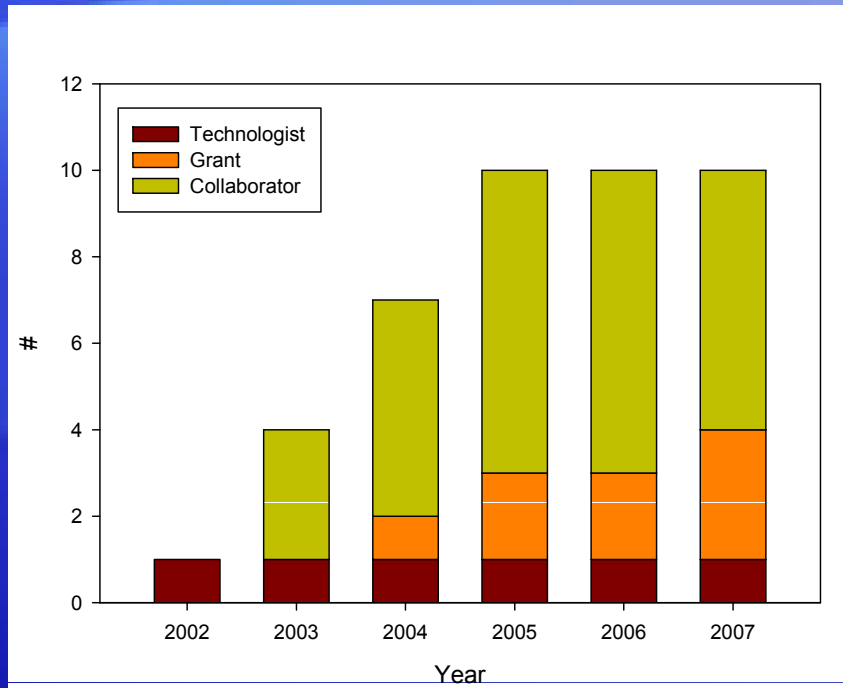
## Boron Neutron Capture Therapy

Int J Radiat Oncol Biol Phys, **562-567** (2008).

# RESOURCES



## PEOPLE:



## MAIN COLLABORATIONS:

CMRR, University of Minnesota, Minneapolis, USA

Brigham & Women's Hospital, Boston, USA

University of California, Berkeley, USA

Dipartimento di Scienze Neurologiche, Università "Sapienza", Roma, Italy

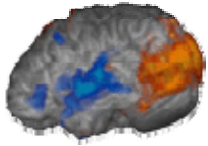
Istituto Neurologico Mediterraneo, Isernia, Italy

## RESEARCH AGREEMENTS:

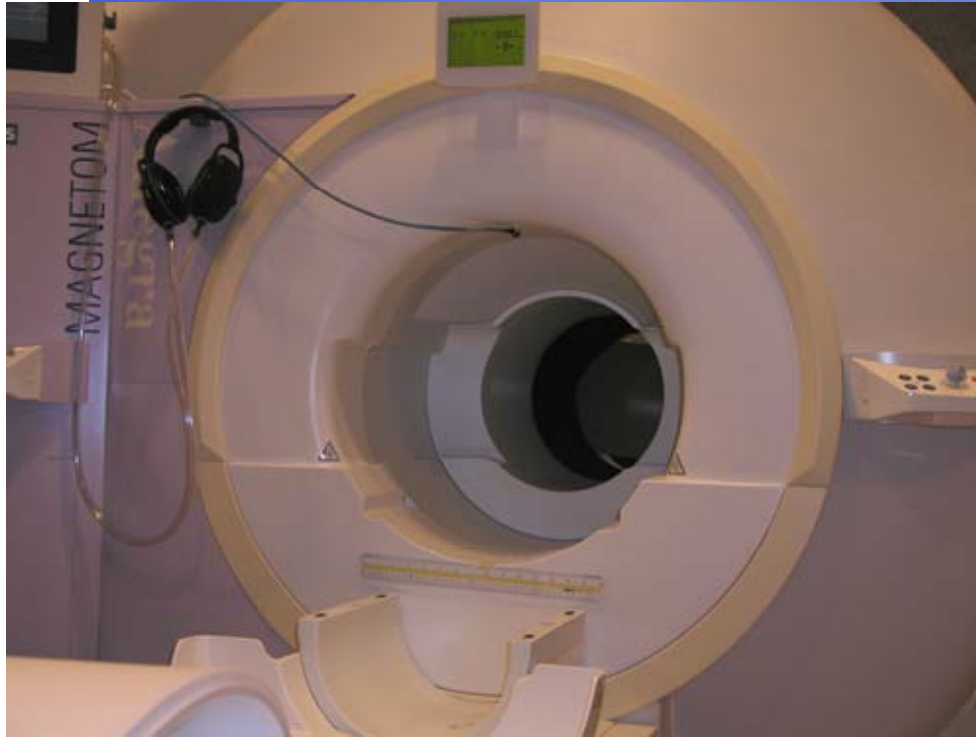
Dipartimento di Fisica, Università  
"Sapienza", Roma, Italy  
(2 professors, 1 researcher,  
3 research fellows, 2 PhD student,  
1 technician)

Fondazione Santa Lucia, Roma, Italy  
(1 researcher, 1 research fellow, MDs)

# NMR Systems



## 3T HEAD SYSTEM (HUMAN)



Siemens Allegra

Magnetic field: 3T

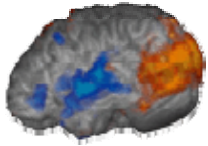
Imaging Gradients: 40 mT/m

Bore diameter: 63 cm

RFPA: 4kW ( $^1\text{H}$ )

System granted by:  
Fondazione Santa Lucia

# NMR Systems



## 9.4T VERTICAL BORE SYSTEM



Bruker Avance 400

Magnetic field: 9.4T

Diffusion gradients: 40 mT/m

$\mu$ -Imaging gradients: 400mT/m

High resolution Multinuclear  
Broad Band Observe

Insert: 5 mm

$\mu$ -Imaging probe

Insert: 5 mm ( $^1\text{H}$ )

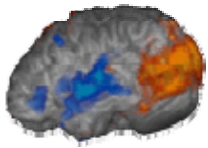
Insert: 8 mm ( $^1\text{H}$ ,  $^{13}\text{C}$ ,  $^{23}\text{Na}$ )

Insert: 8 mm ( $^1\text{H}$ ,  $^{13}\text{C}$ )

Site granted by:

Dipartimento di Fisica, Università di Roma "Sapienza"

# NMR Systems



## 7T HORIZONTAL BORE SYSTEM

Bruker Biospec

Magnetic field: 7T

Imaging gradients: 25 mT/m

$\mu$  –Imaging gradients:  
40mT/m

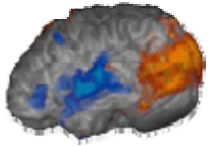
Bore diameter: 15 cm

RFPA : 1kW



System site granted by:  
Dipartimento di Fisica, Università di Roma “Sapienza”

# NMR Systems



## EEG DEVICE



EBNeuro Mizar 40

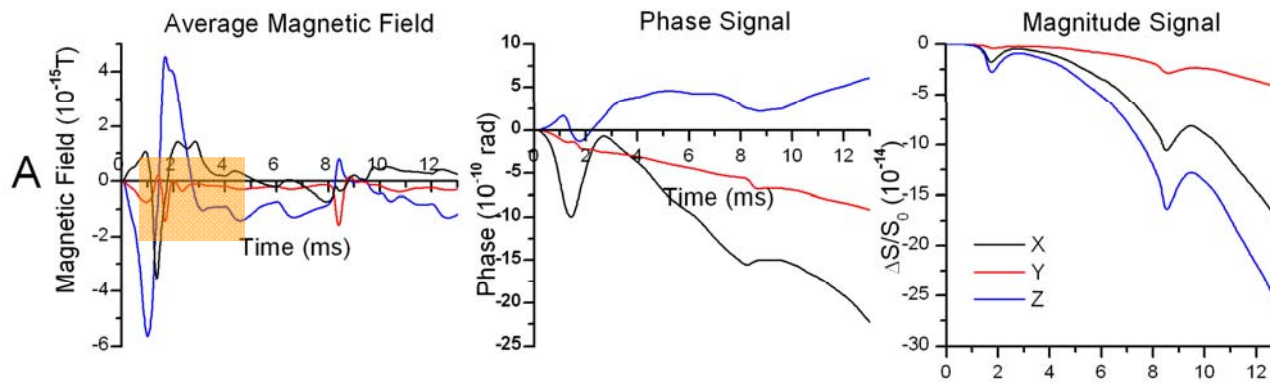
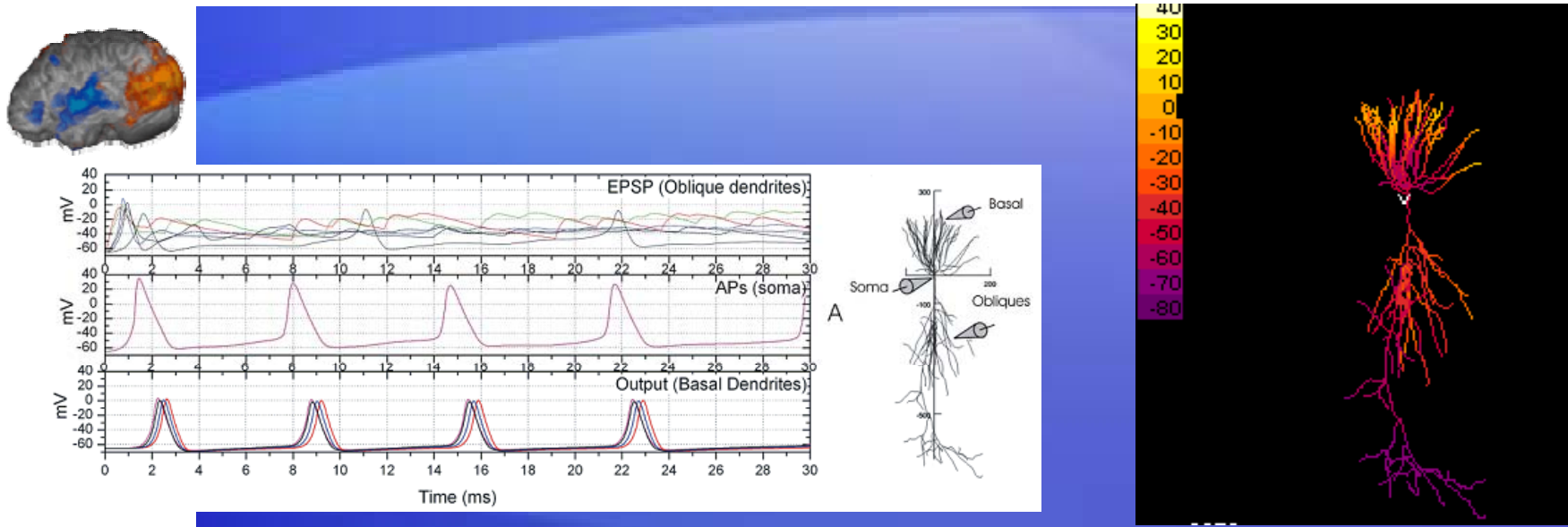
32/64 channels

Sampling frequency: up to 16 kHz

Dynamic range:  $\pm 65.5$  mV

MRI compatibile

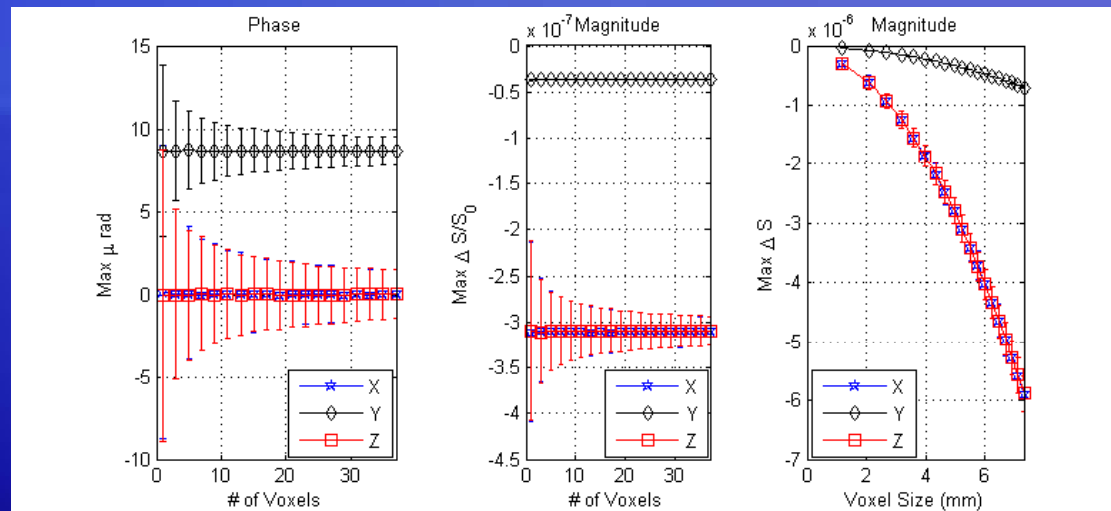
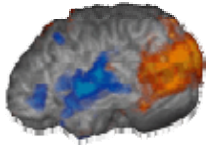
# Neuronal current MRI



Neuroimage 39:87-106 (2008)



# Neuronal current MRI



Neuroimage, cited

