Is the understanding of neural correlates essential for a theory of thinking?

- Human thinking, yes.
  - *Intrinsic physical and evolved limitations*
  - *Testable models*

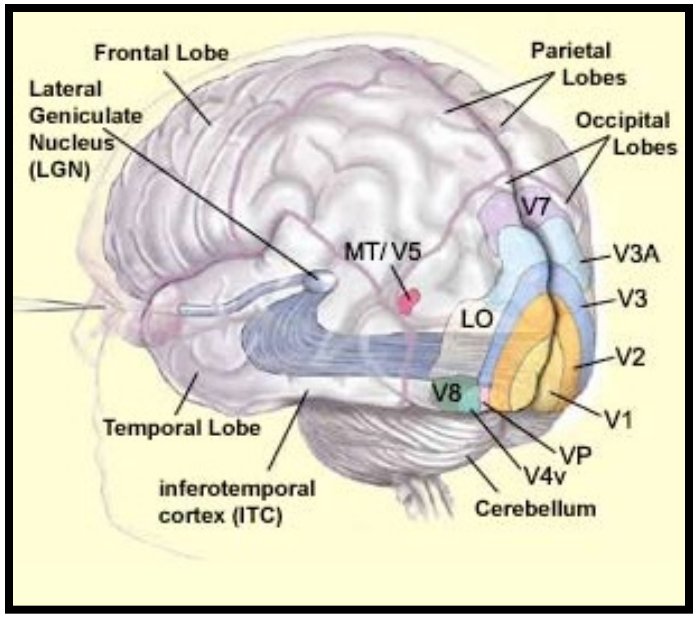
- Theory of "thinking," no.

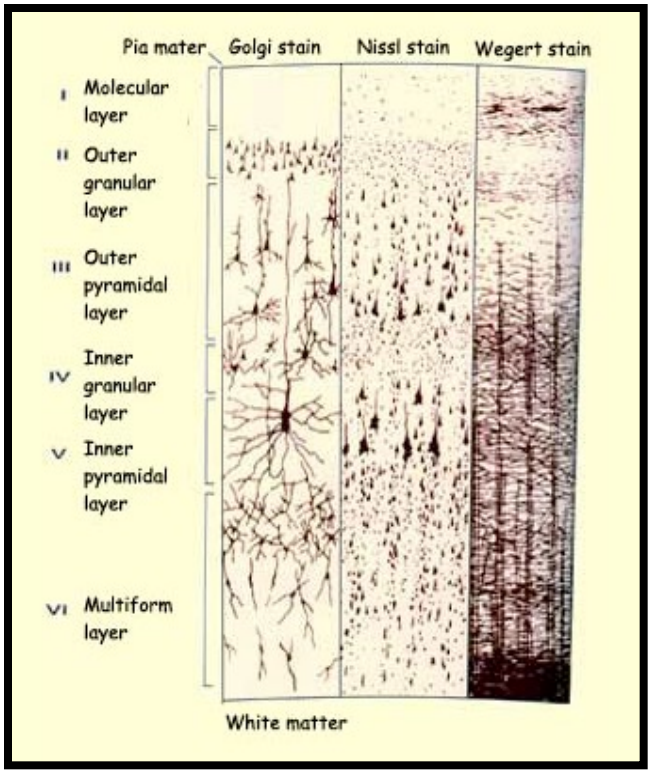
What do we know today about the neuronal implementation of complex thinking?

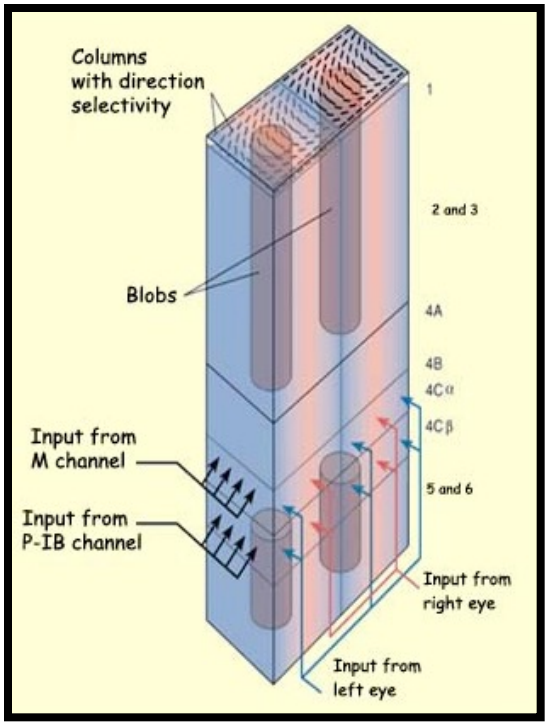
- What is "complex thinking?" (chess vs. visual extraction vs. walking on a trail)

Is the "meso-level really the one were we understand the least and what can Speculatively be said about it today?

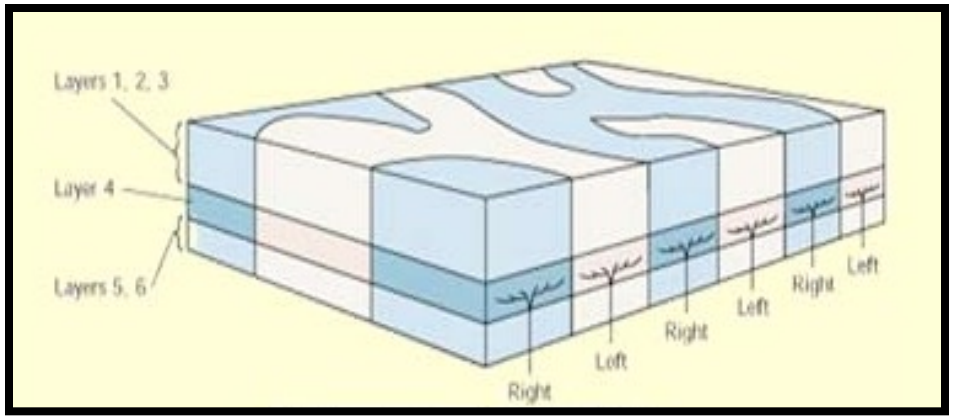
Visual Cortex Organization

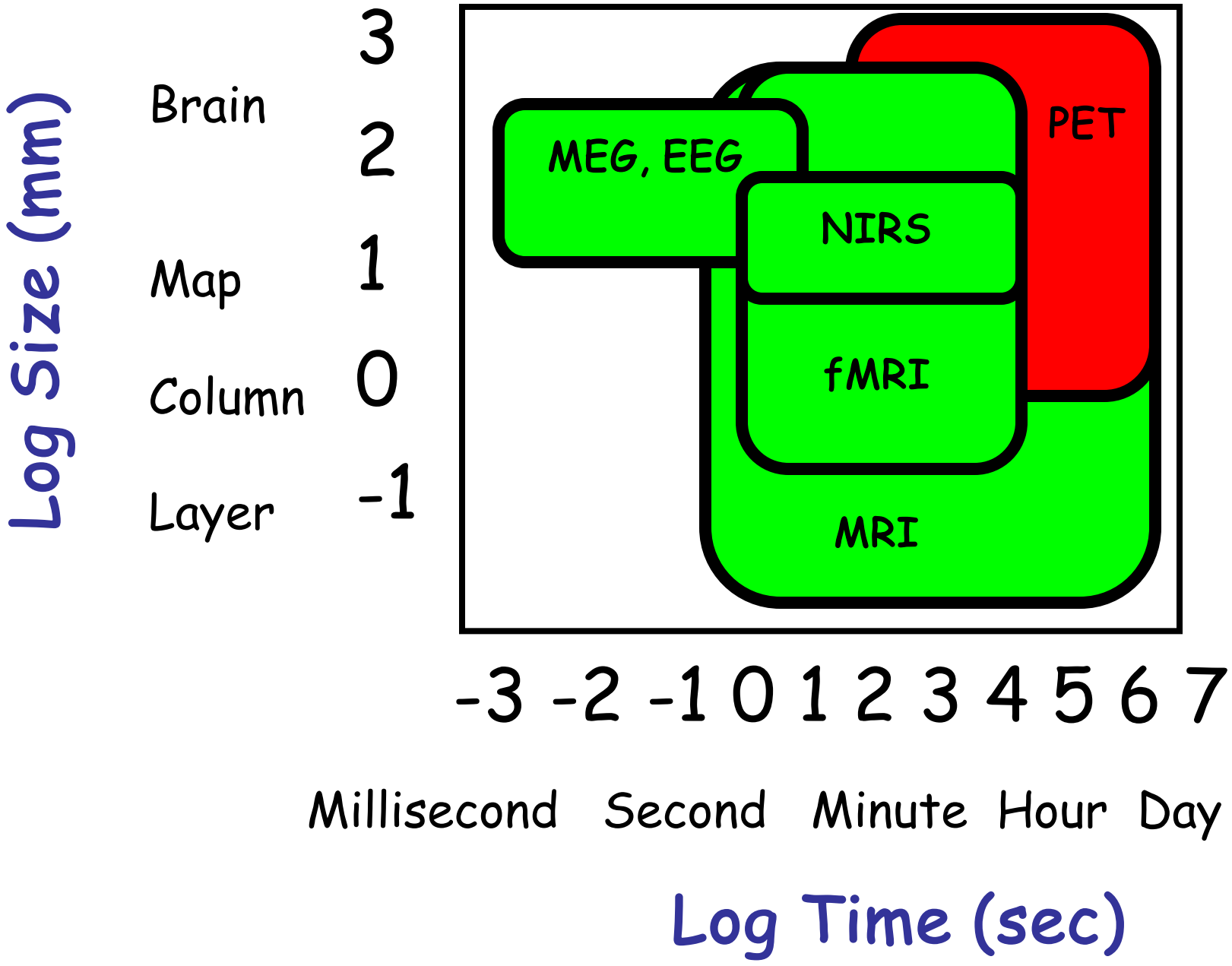






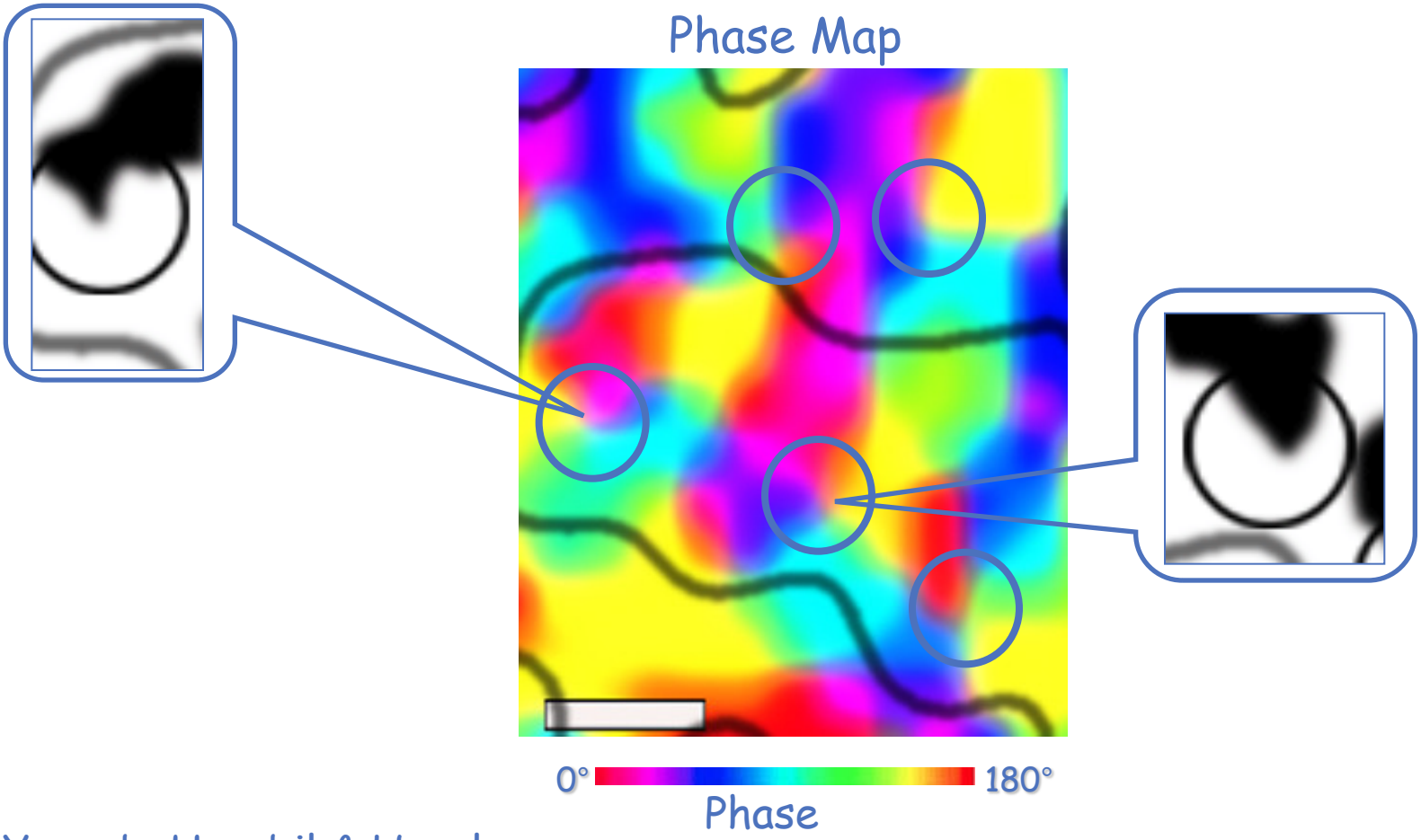
http://www.thebrain.mcgill.ca




Log Size (mm)
Brain
Map
Column
Layer
3
2
1
0
-1
MEG, EEG
PET
NIRS
fMRI
MRI
-3 -2 -1 0 1 2 3 4 5 6 7
Millisecond
Second
Minute
Hour
Day
Log Time (sec)

Methodology

Orientation Columns in Human V1 as Revealed by fMRI at 7T

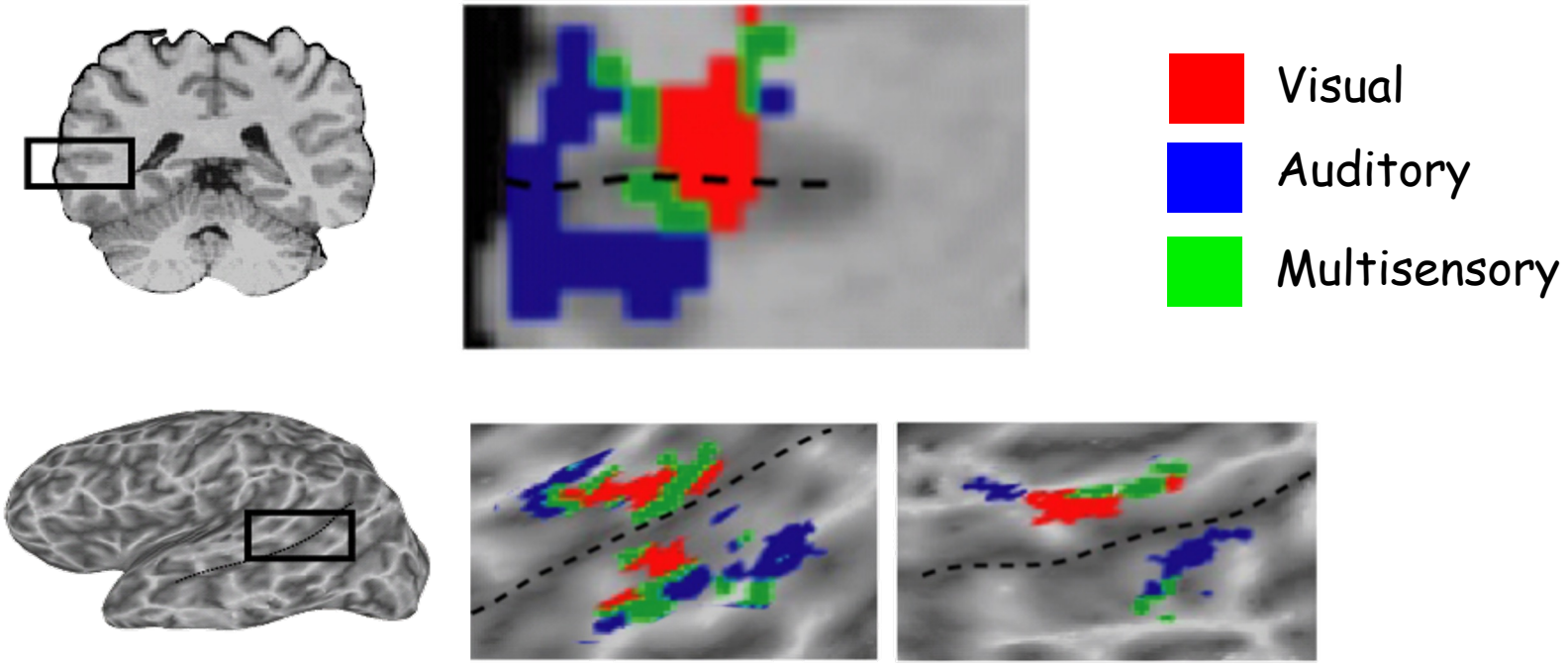


Yacoub, Ugurbil & Harel
University of Minnesota / CMRR
HBM 2006: Thursday, June 15, 2006 at 9:30

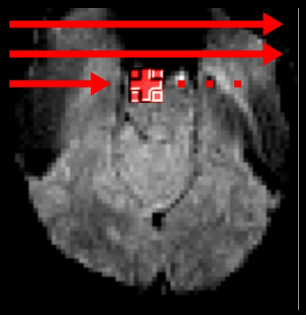
Scalebar = 0.5 mm

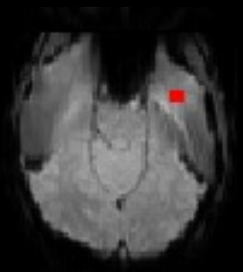
Multi-sensory integration

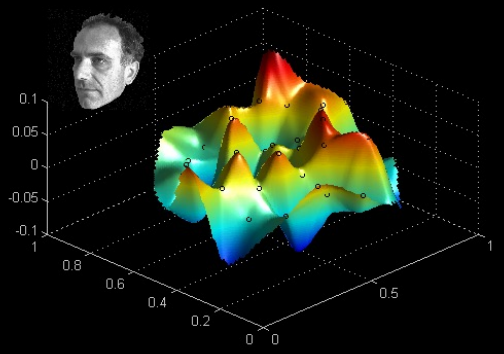
M.S. Beauchamp et al.,

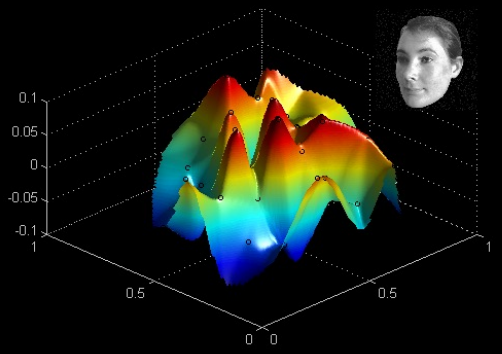


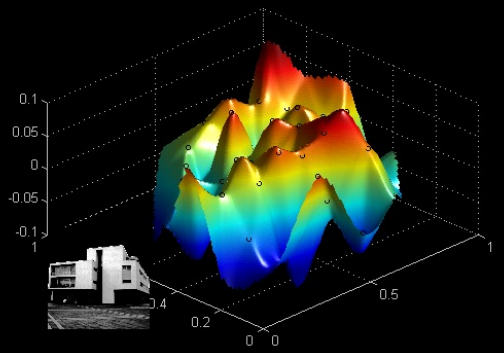
Multivariate Analysis:
looking for differences in pattern

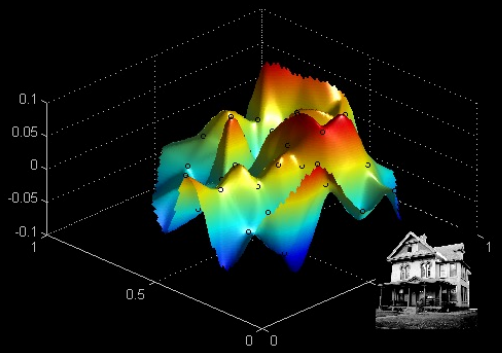








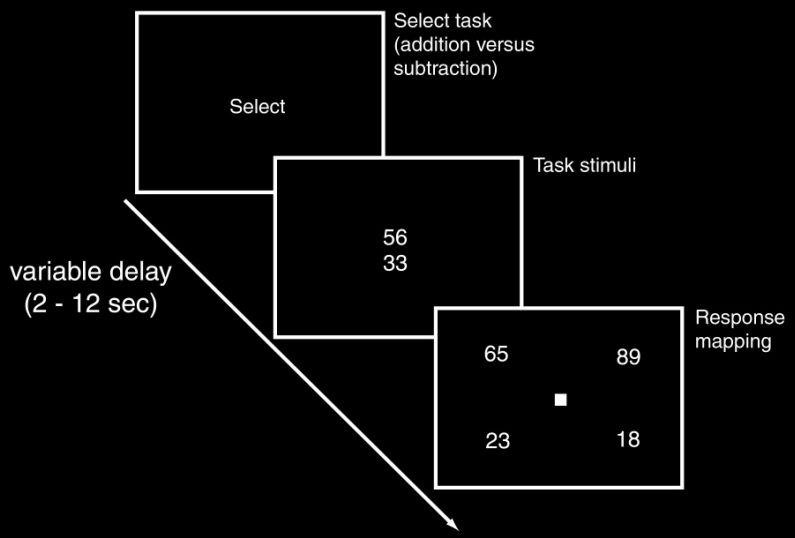


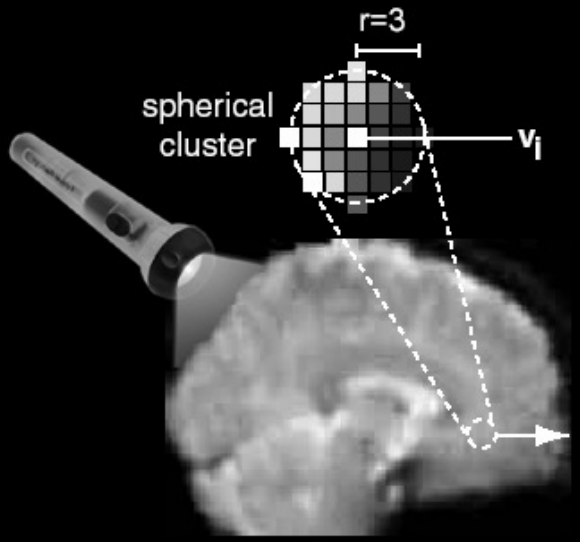


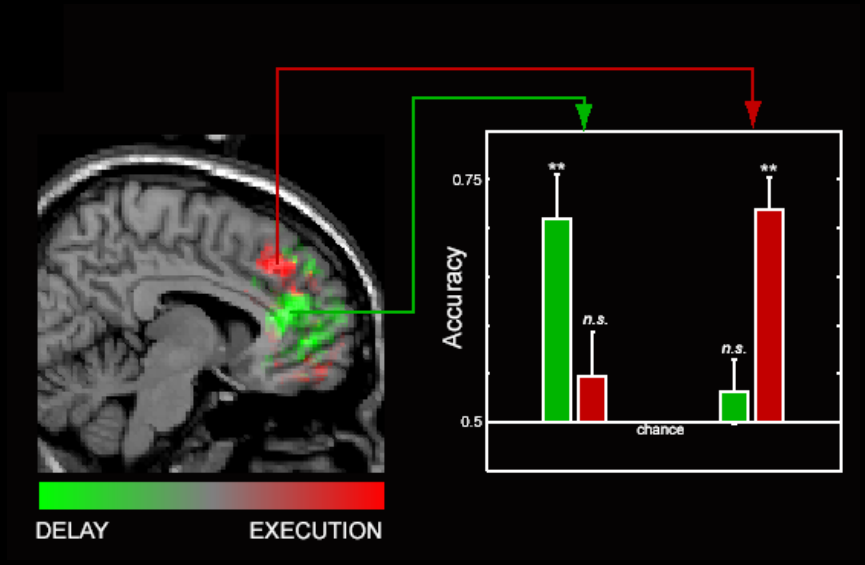
Niko Kriegeskorte, NIH

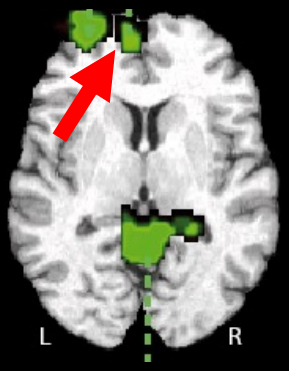
Reading hidden intentions in the human brain

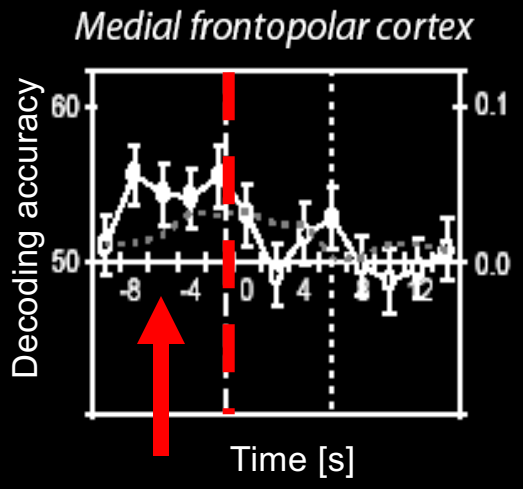
Thu 9.45: Cognition – Representation and Processes





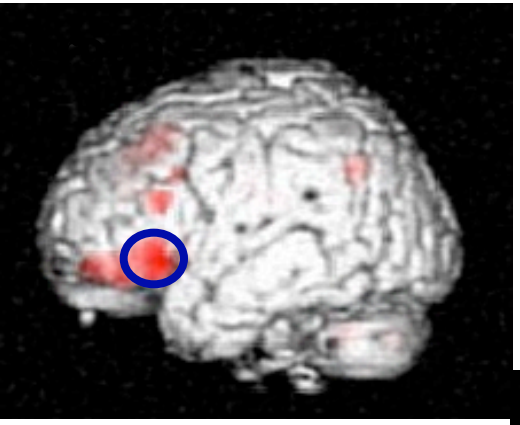






Haynes, Sakai, Rees, Gilbert, Frith & Passingham (Current Biology,2007)

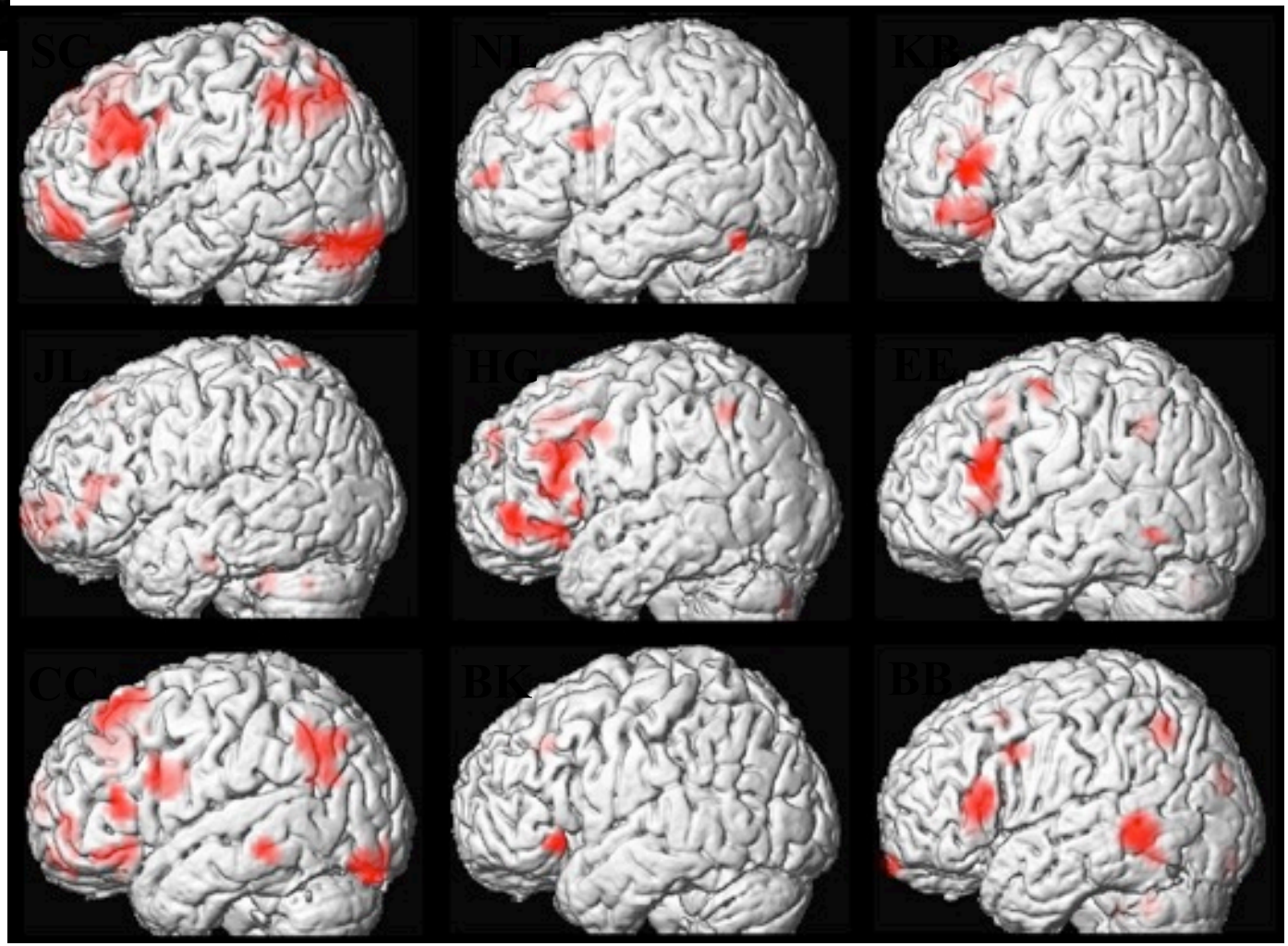
Soon, Brass, Heinze & Haynes (in preparation)



Extensive Individual Differences in Brain Activations During Episodic Retrieval

Miller et al., 2002

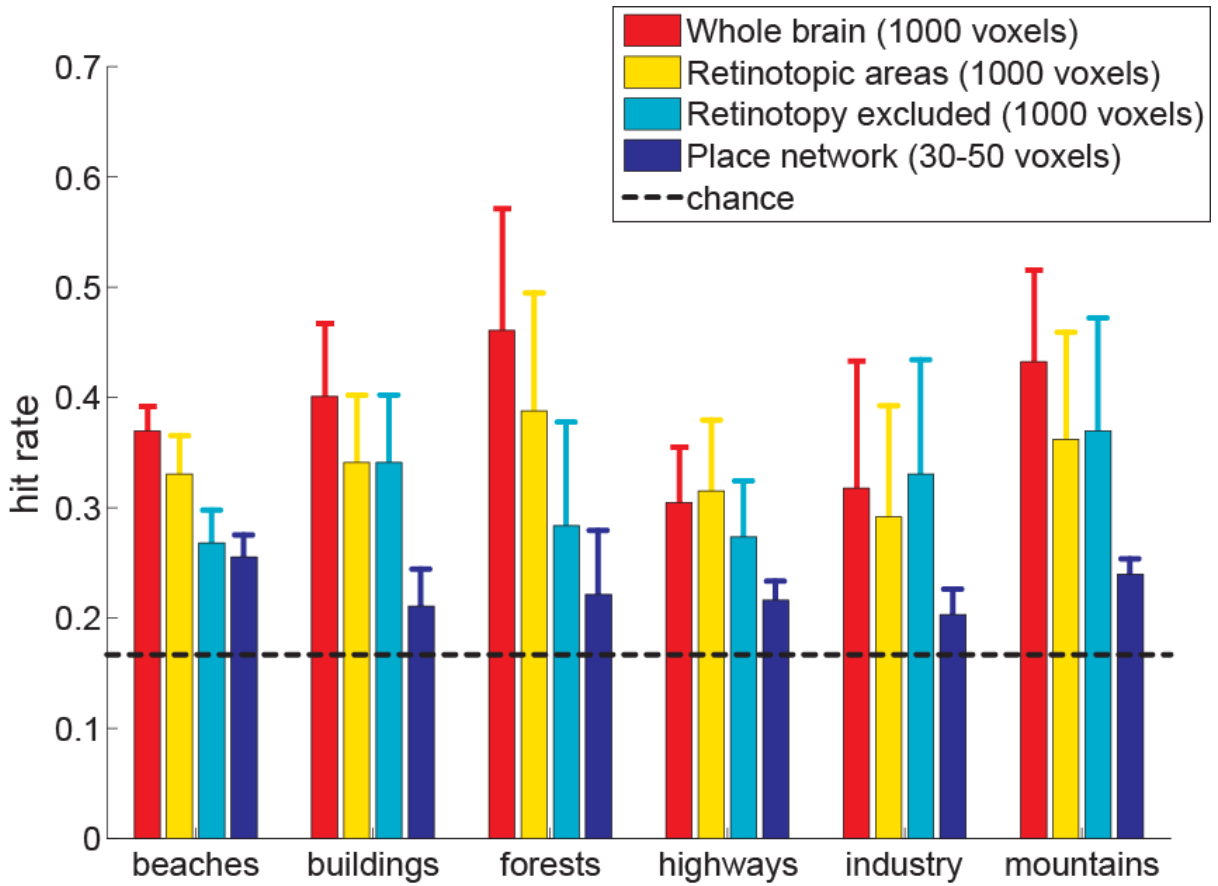
Individual activations from the left hemisphere of the 9 subjects



Courtesy, Mike Miler, UC Santa Barbara and Jack Van Horn, fMRI Data Center, Dartmouth University

Predicting perceived natural scene categories from distributed patterns of fMRI activity

Dirk B. Walther, Eamon Caddigan,
Justas Birgiolas, Li Fei-Fei, Diane Beck

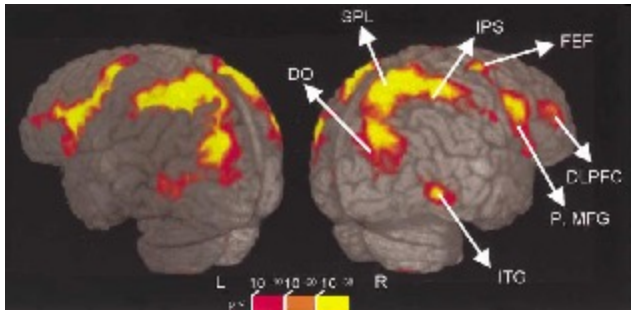


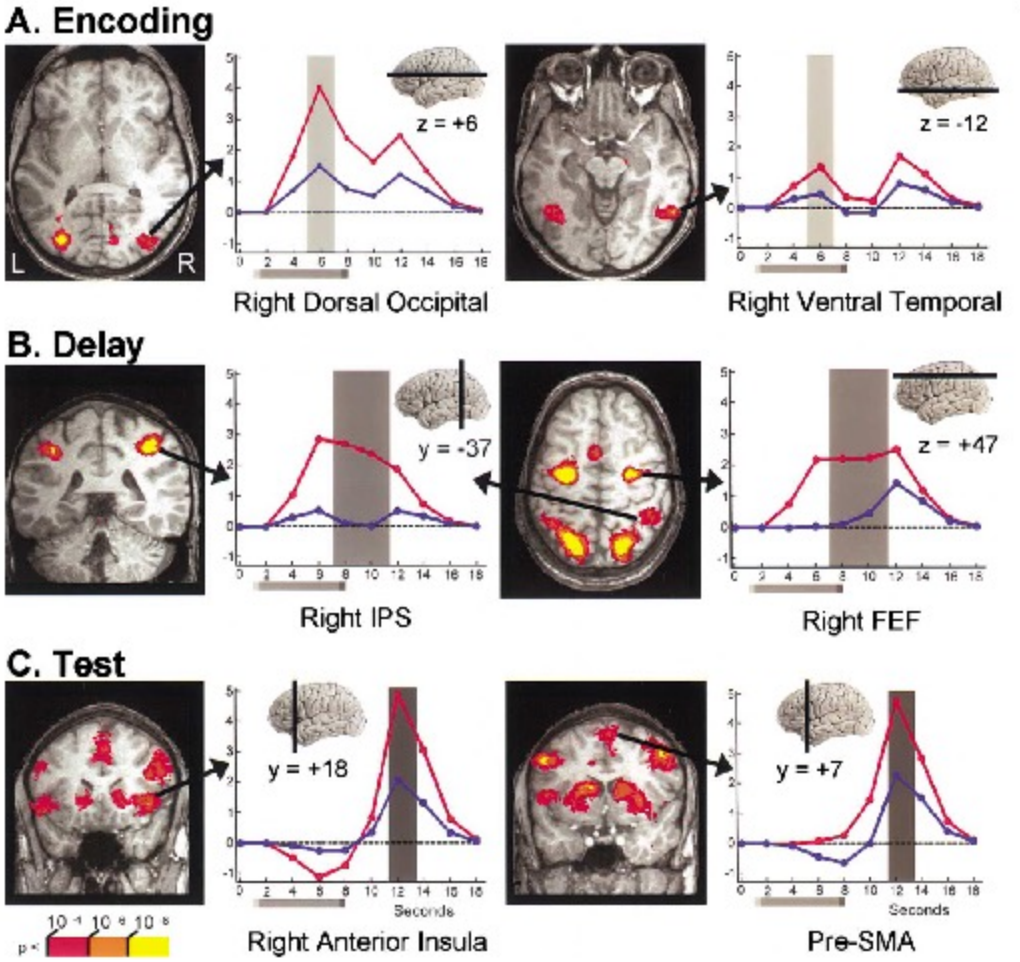
Methodology

Neuron, Vol. 35, 975–987, August 29, 2002, Copyright ©2002 by Cell Press

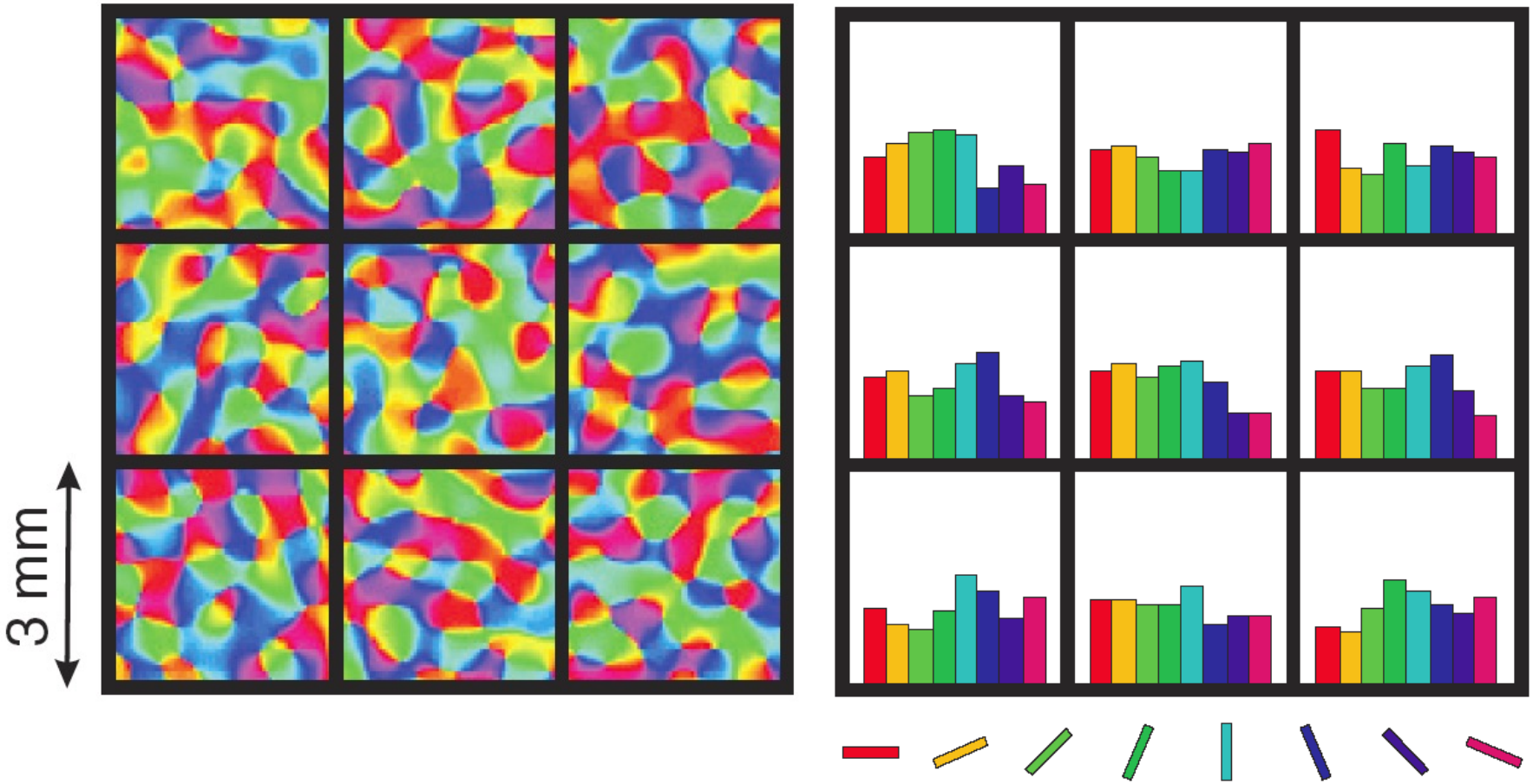
Neural Correlates of Visual Working Memory: fMRI Amplitude Predicts Task Performance

Luiz Pessoa,[1] Eva Gutierrez, Peter A. Bandettini, and Leslie G. Ungerleider
Laboratory of Brain and Cognition
National Institute of Mental Health
National Institutes of Health
Bethesda, Maryland 20892





Methodology



Boynton (2005), News & Views on Kamitani & Tong (2005) and Haynes & Rees (2005)