



Functional MRI (fMRI)

Spatial Specificity



Spatial Resolution

Limits to spatial resolution in fMRI

- Technology
- SNR
 - As voxels get smaller, SNR decreases
- Spatial scale of blood flow changes



Spatial Resolution – technological limitation

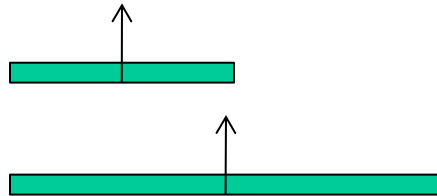
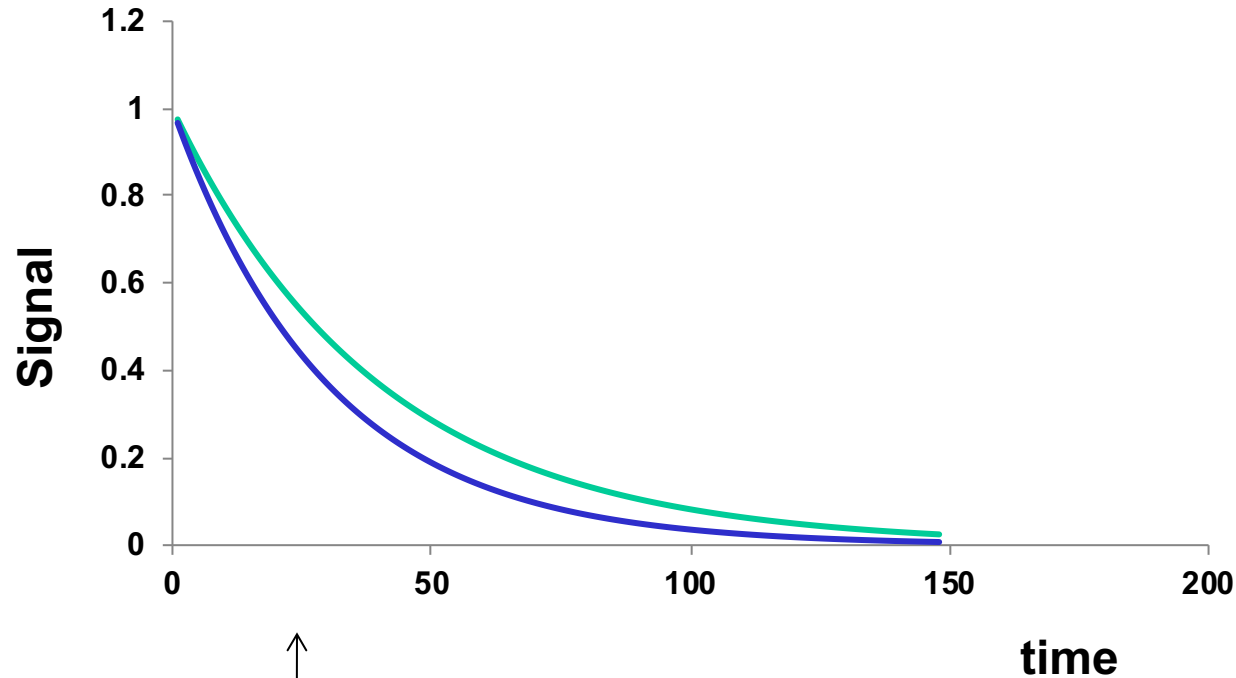


Image acquisition



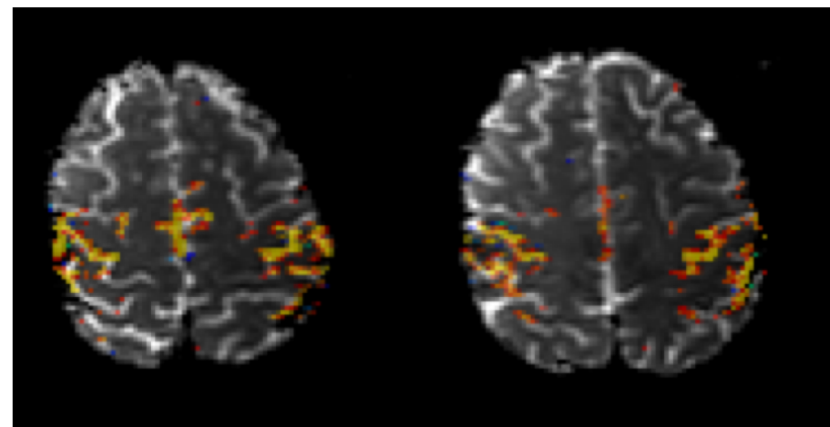
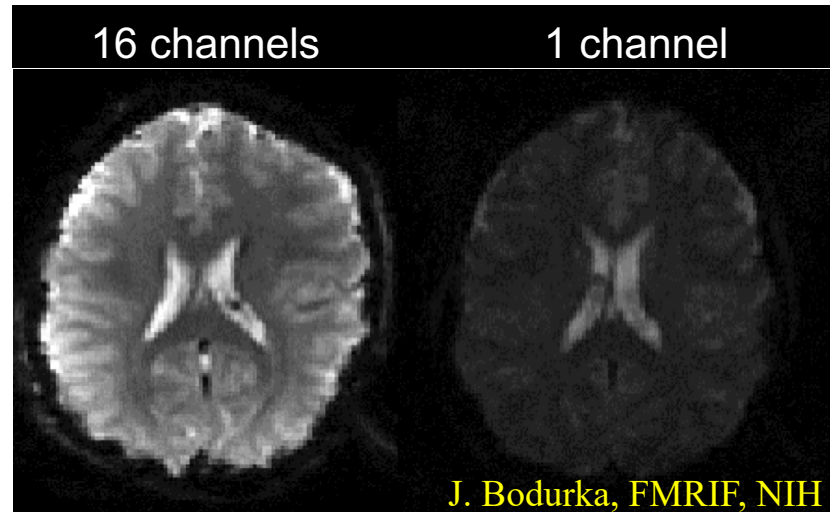
Parallel Imaging (multiple radio-frequency coils)



L. Wald et al., MGH



de Zwart et al., NIH

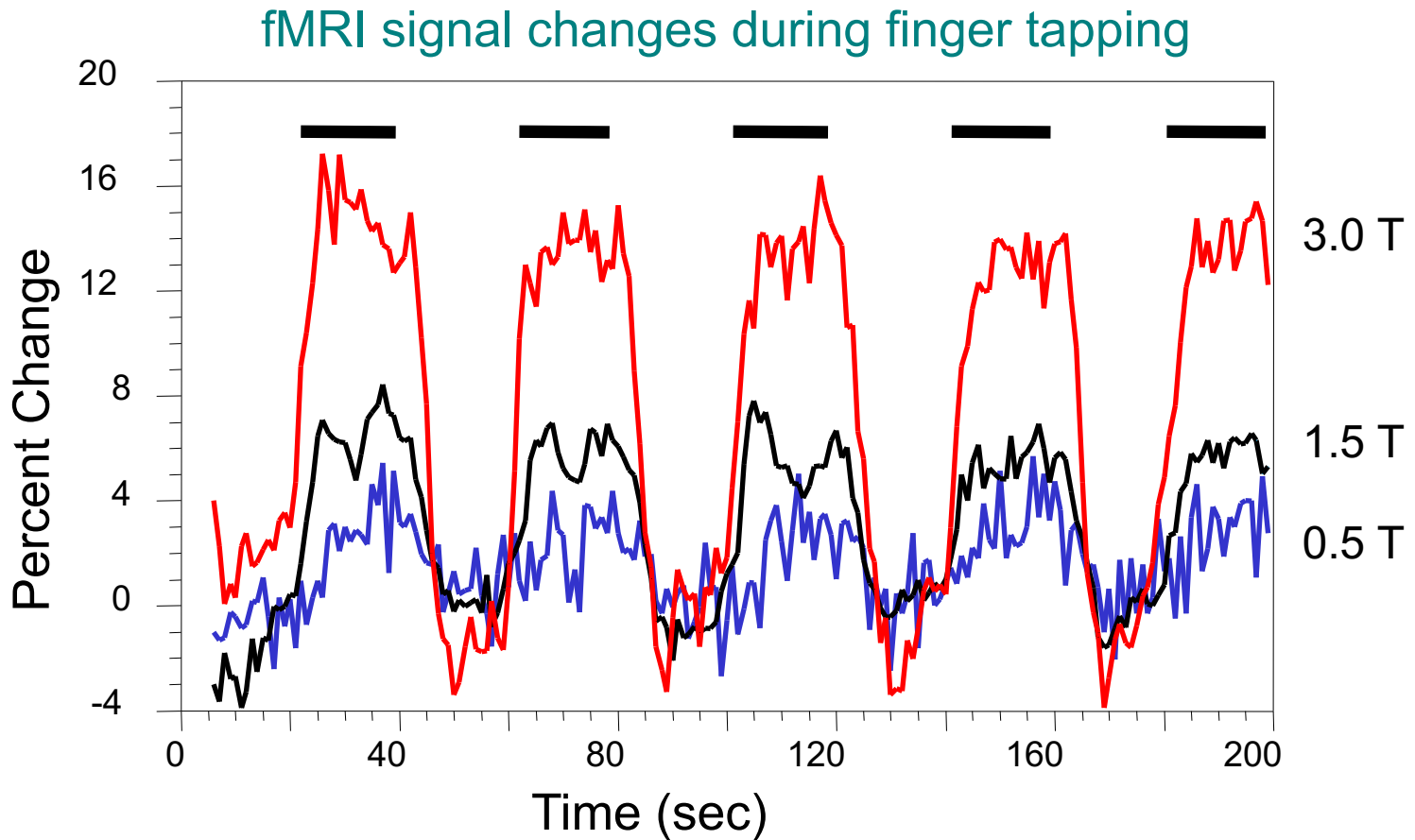


1.2 mm x 2.3 mm x 4 mm

J. Duyn, J. Bodurka, NIH

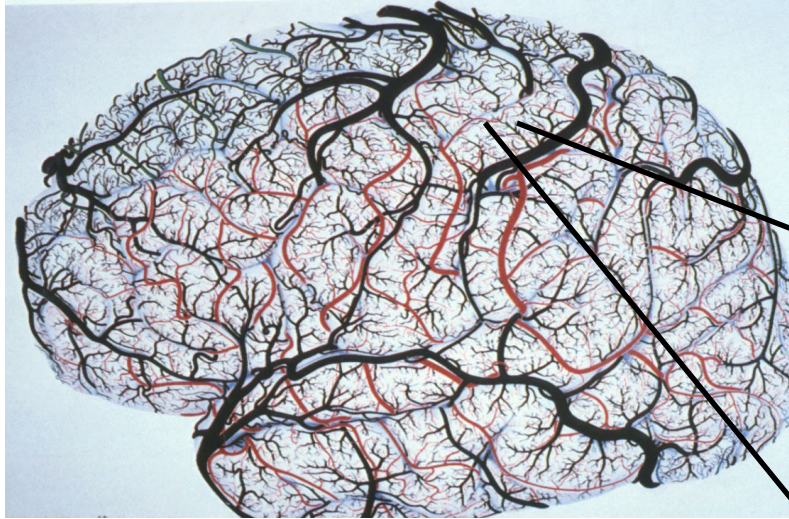


The effect of field strength



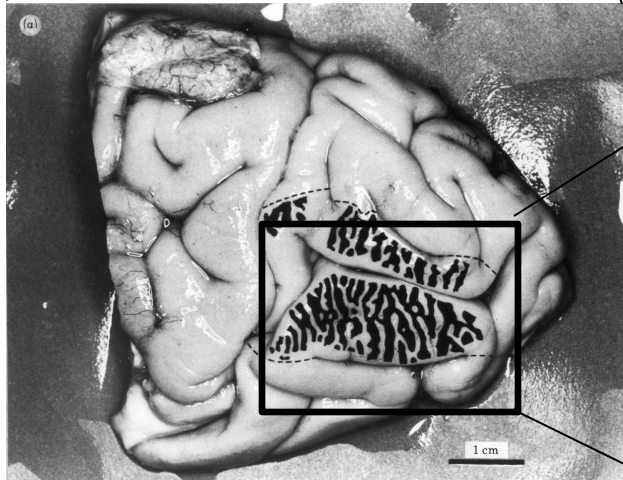
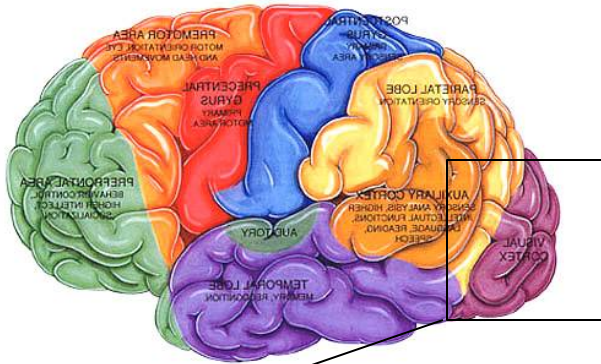


Limits to resolution in fMRI

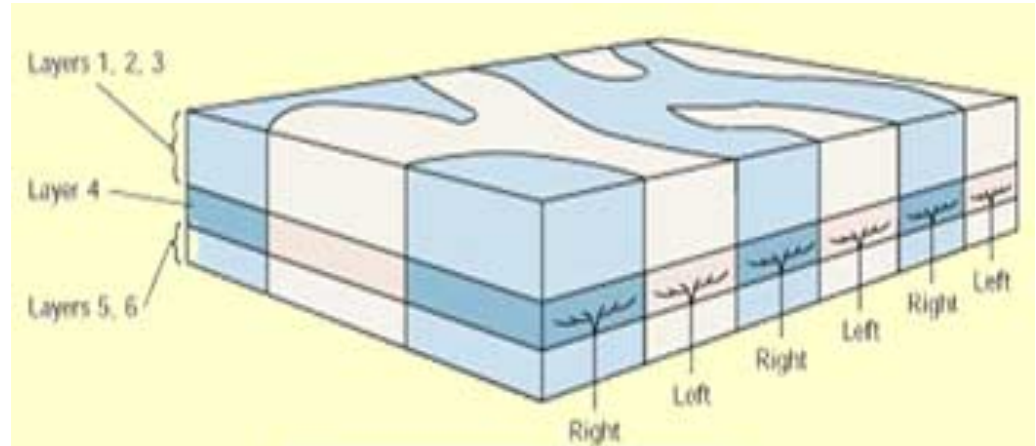




Ocular dominance columns



UCSF

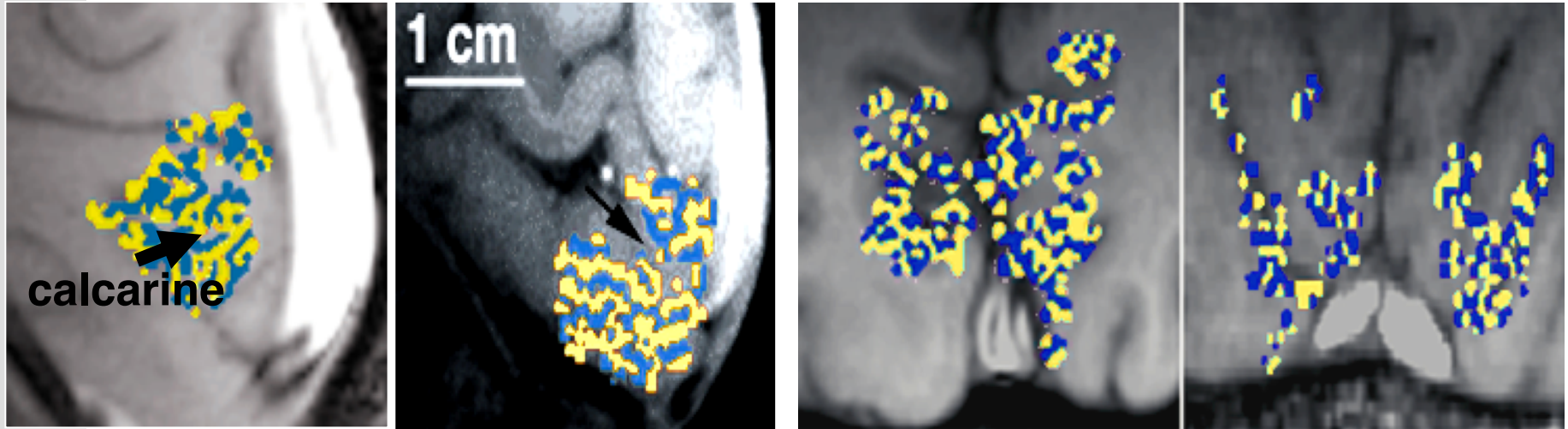


McGill



Limits to resolution – physiology?

Ocular dominance columns (<1mm) can be mapped with fMRI

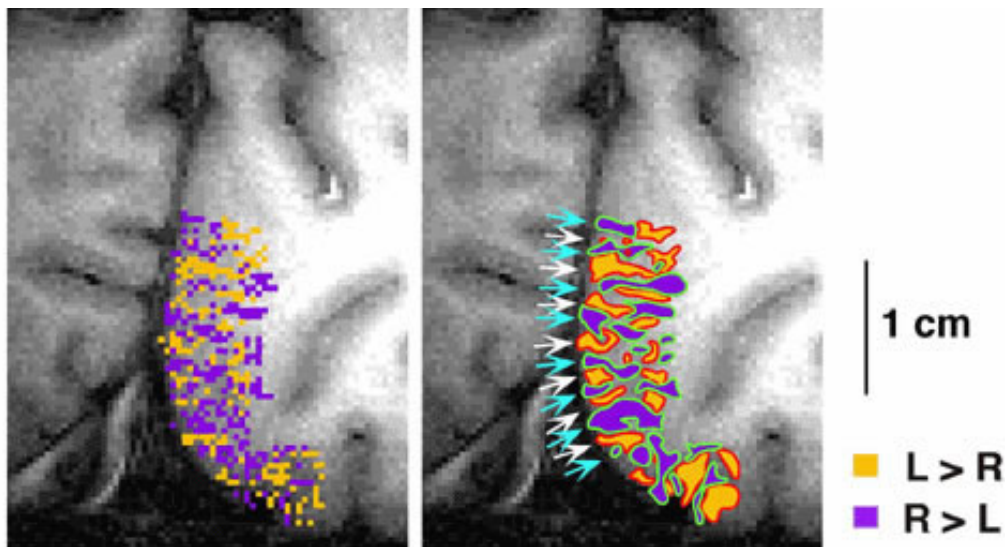


Menon, R. S., S. Ogawa, et al. (1997). "Ocular dominance in human V1 demonstrated by functional magnetic resonance imaging." J Neurophysiol 77(5): 2780-7.

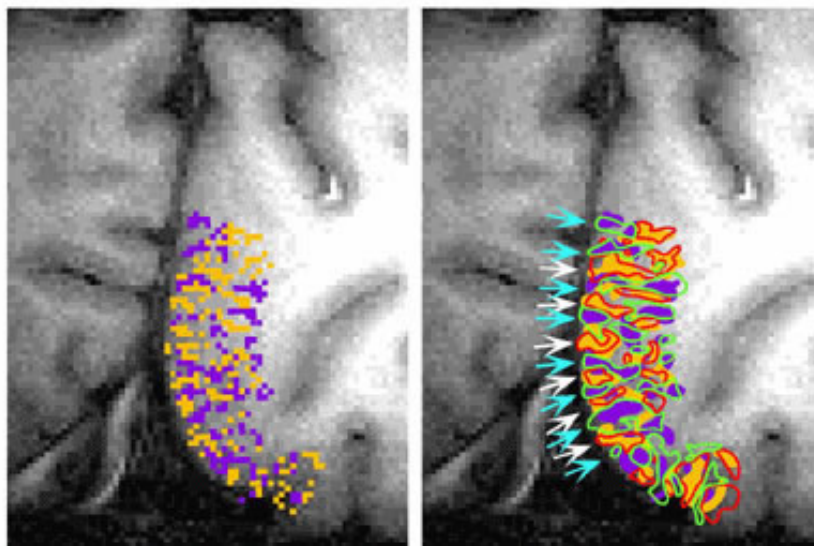


Limits to resolution – physiology?

First experiment



Second experiment



*K Chen, K Tanaka,
et al.*



The Hemodynamic Response Function (HRF)

