

The Dorsal Visual Stream

MEDS 487 / NRSC 500B

Dr. Olav E. Krigolson

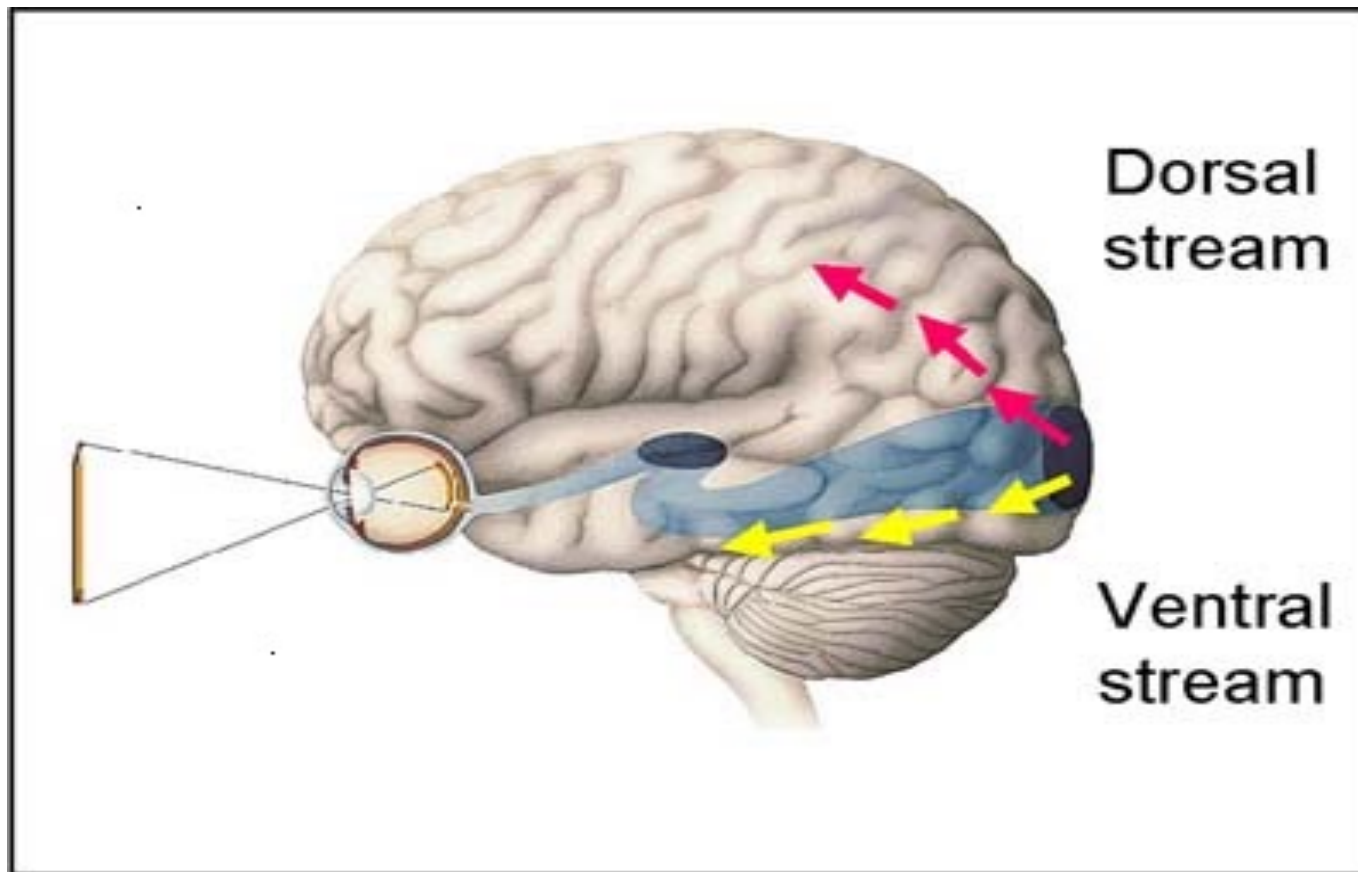
Quiz

What does the dorsal visual stream “do”?

Admin

Assessment - make decisions early if possible, run ideas by me.

Lots of teaching still available.

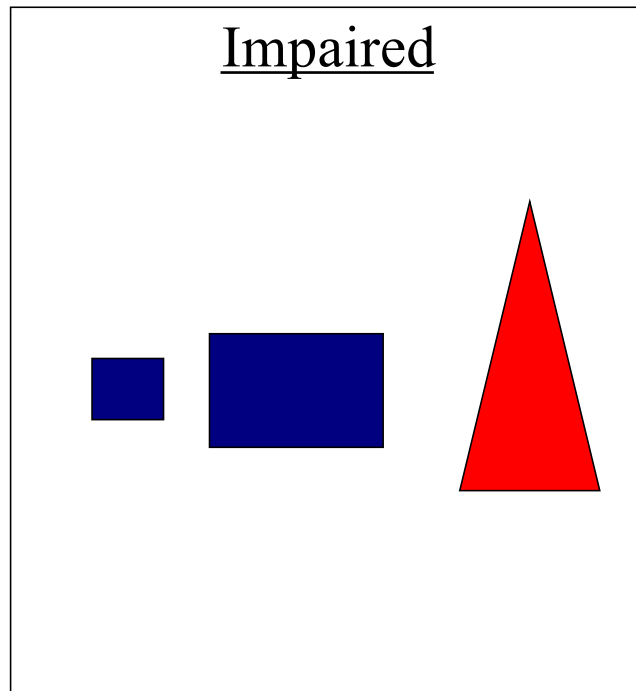


Evidence of Cortical Streams: Patient DF

carbon monoxide poisoning in temporal lobe leading to object agnosia

Evidence of Cortical Streams: Patient DF

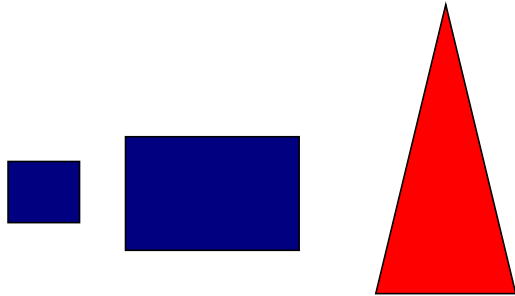
carbon monoxide poisoning in temporal lobe leading to object agnosia



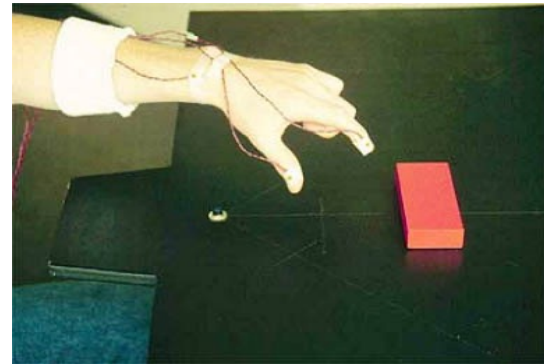
Evidence of Cortical Streams: Patient DF

carbon monoxide poisoning in temporal lobe leading to object agnosia

Impaired



Unimpaired

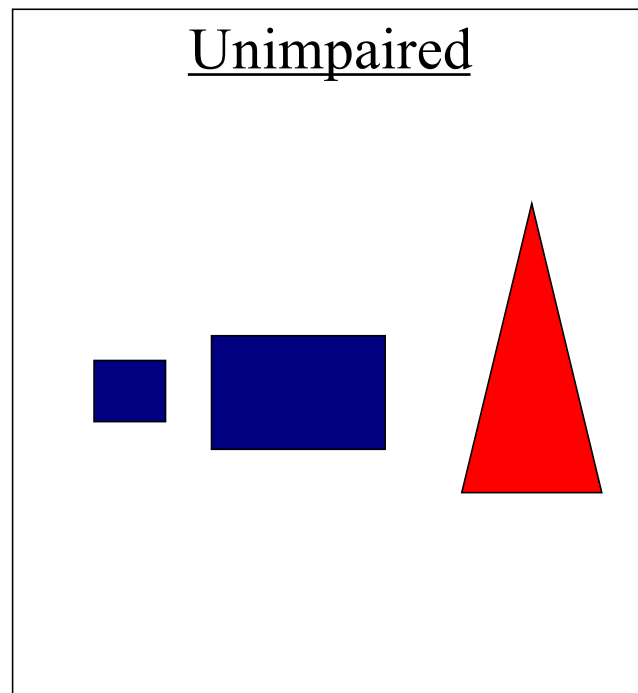


Evidence of Cortical Streams: Patient RV

stroke in parietal cortex causing visual ataxia

Evidence of Cortical Streams: Patient RV

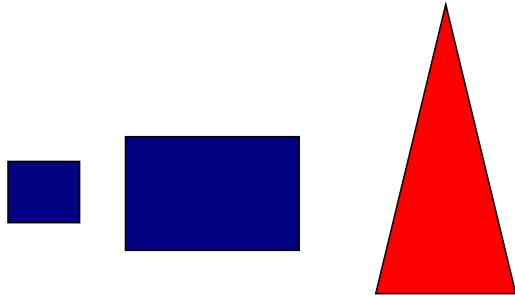
stroke in parietal cortex causing visual ataxia



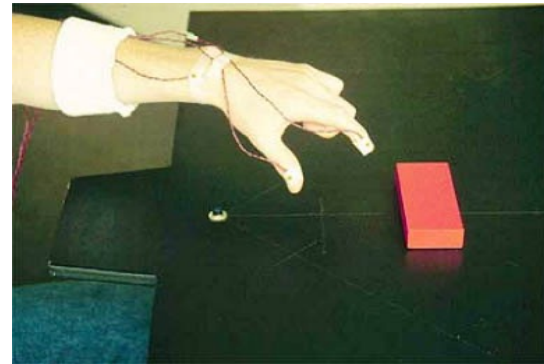
Evidence of Cortical Streams: Patient RV

stroke in parietal cortex causing visual ataxia

Unimpaired



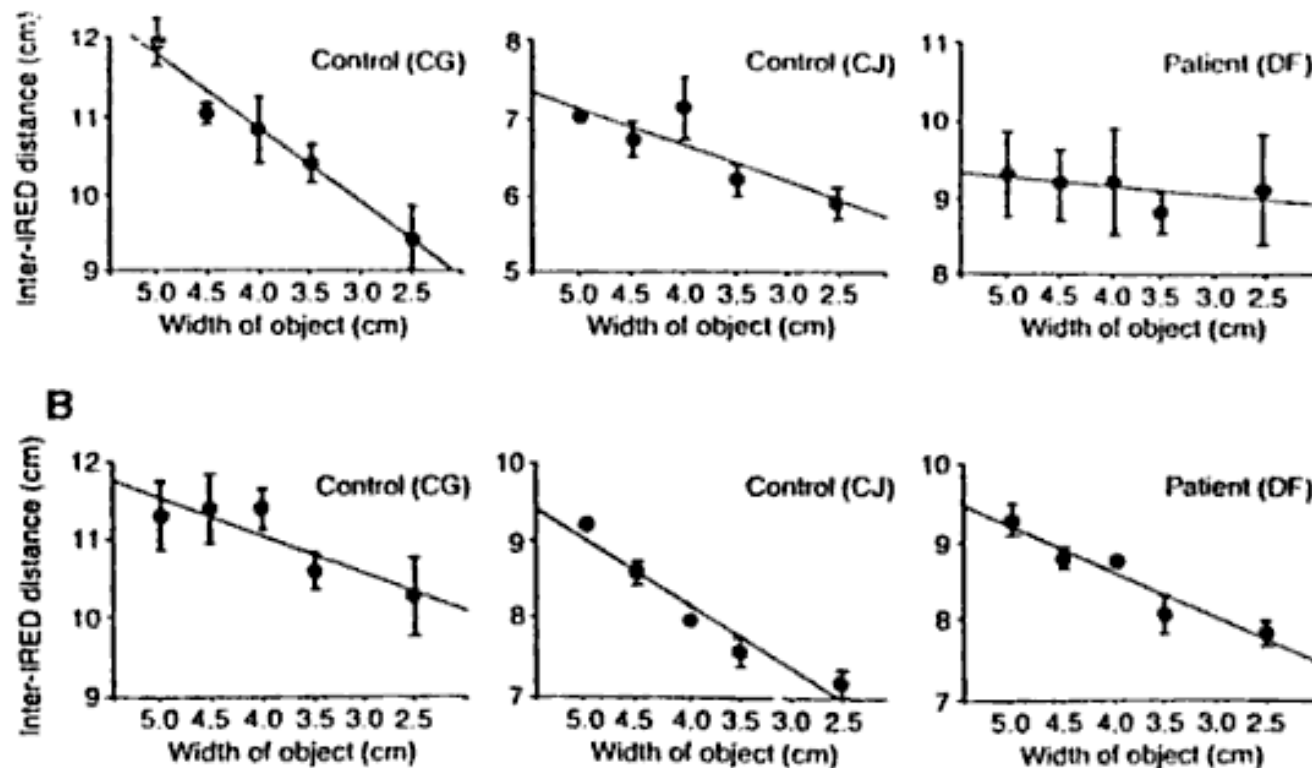
Impaired



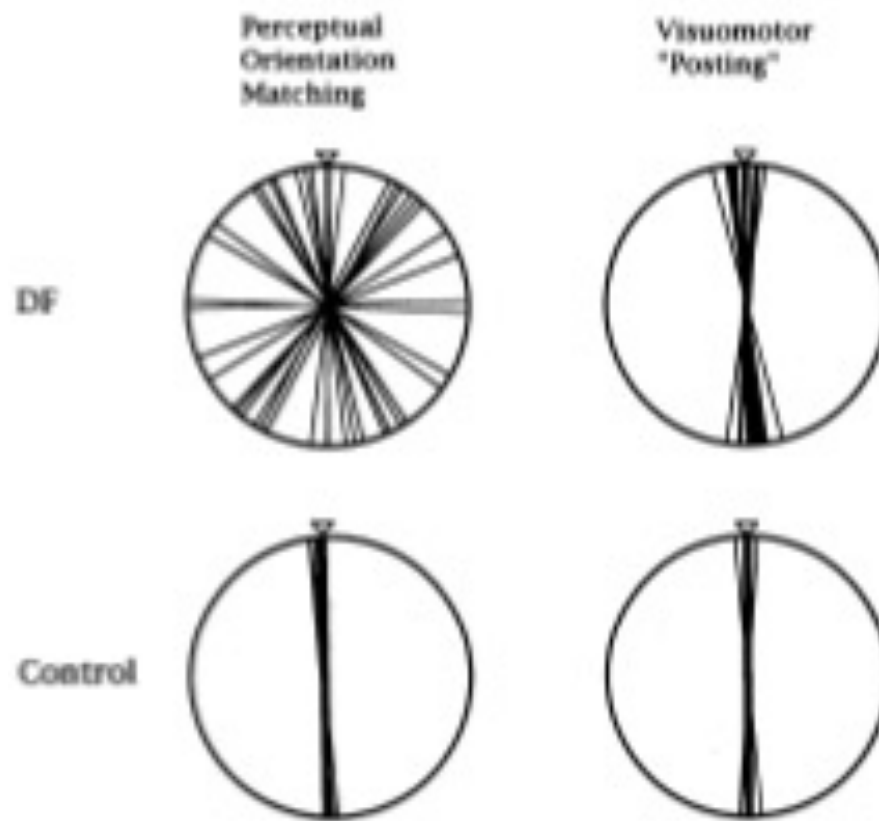
Patient DF

Top Panel: Demonstrate

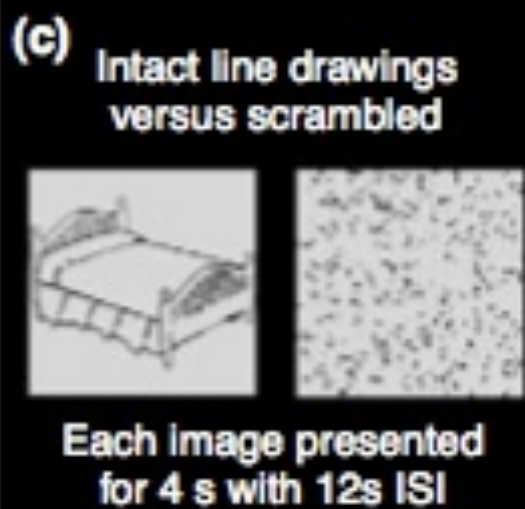
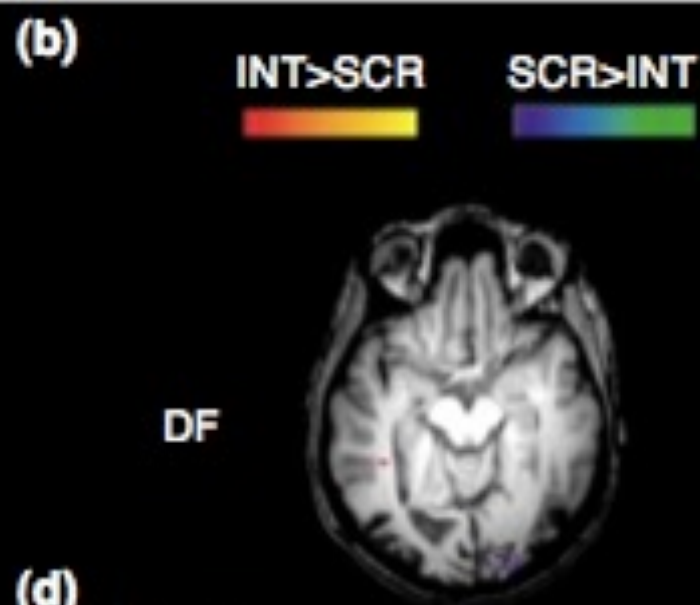
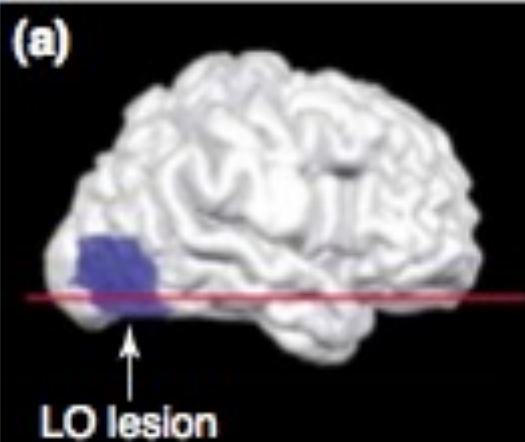
Bottom Panel: Grab



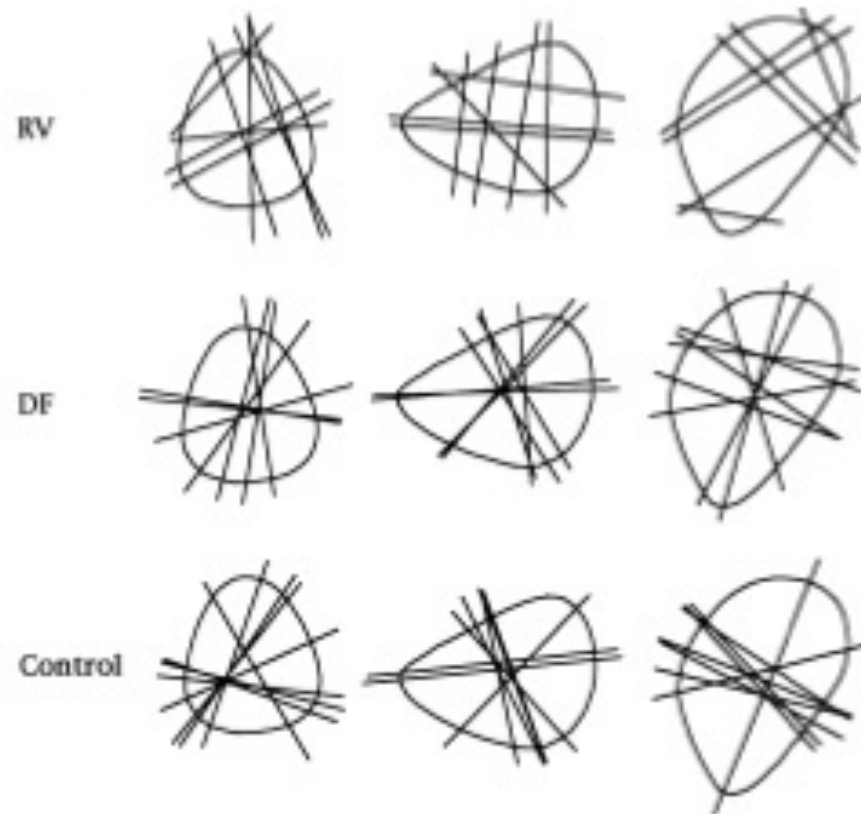
Patient DF



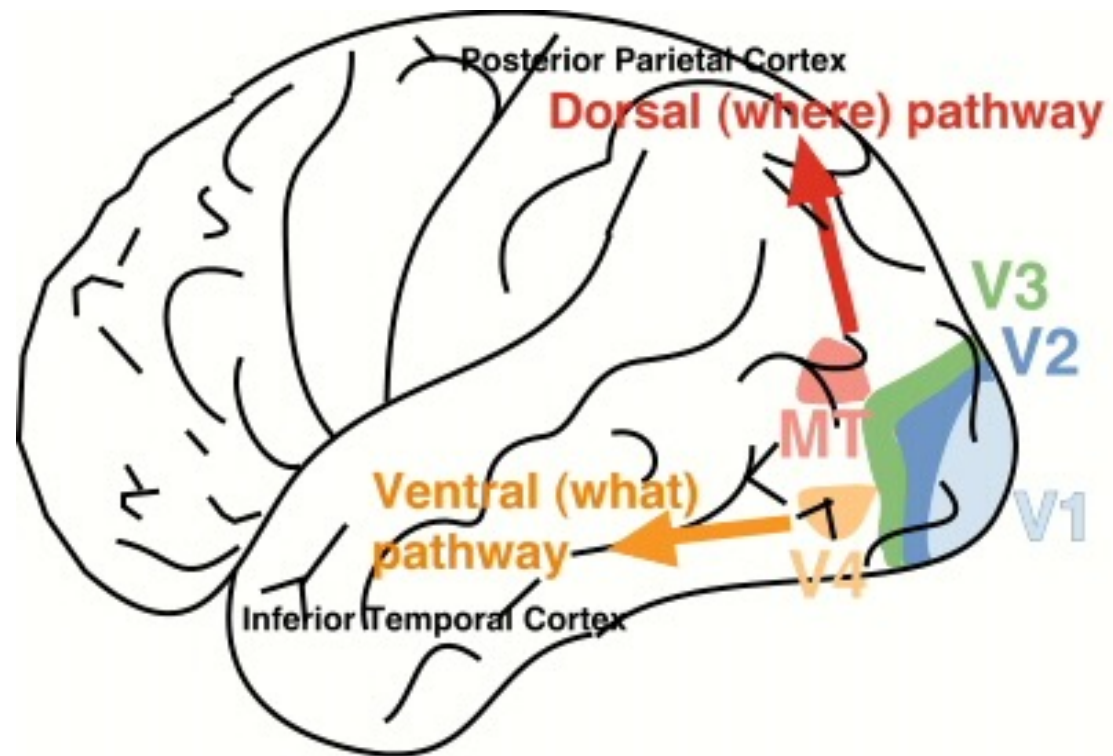
The Mail Slot

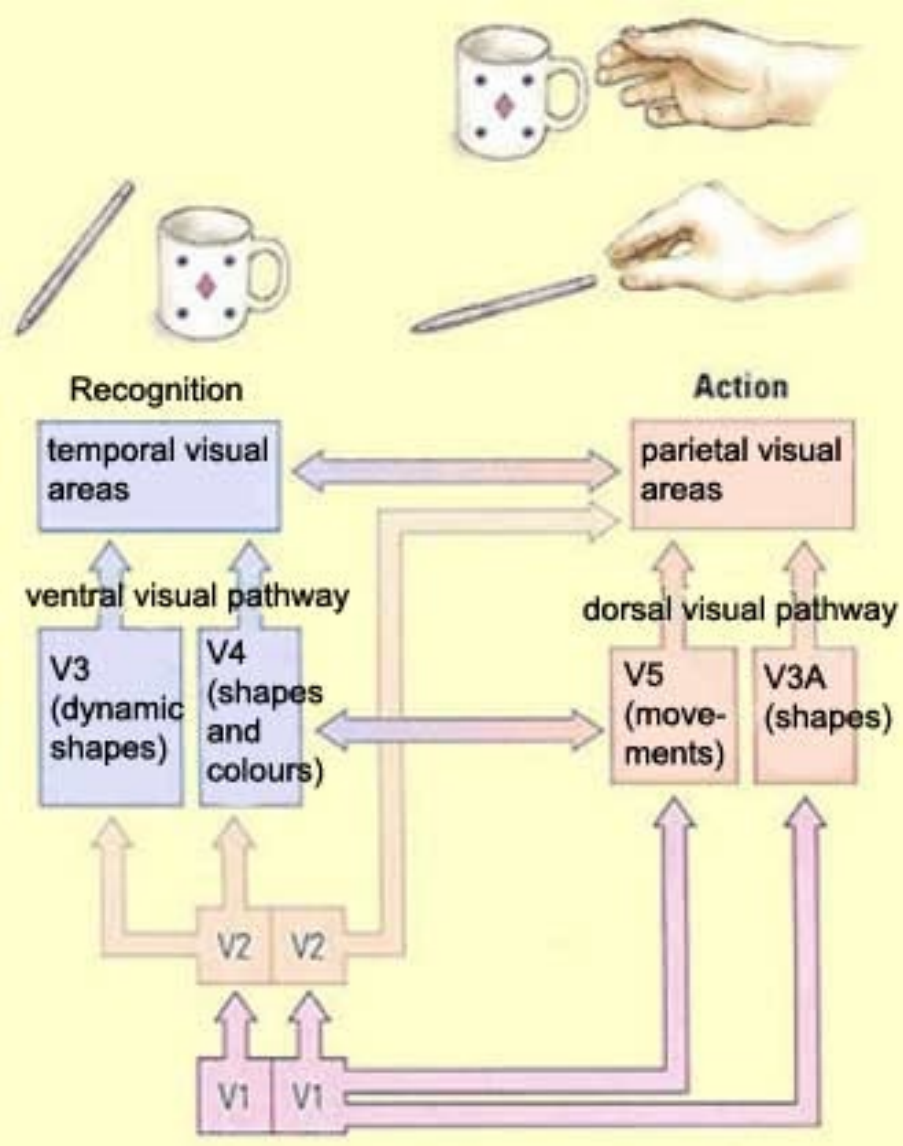


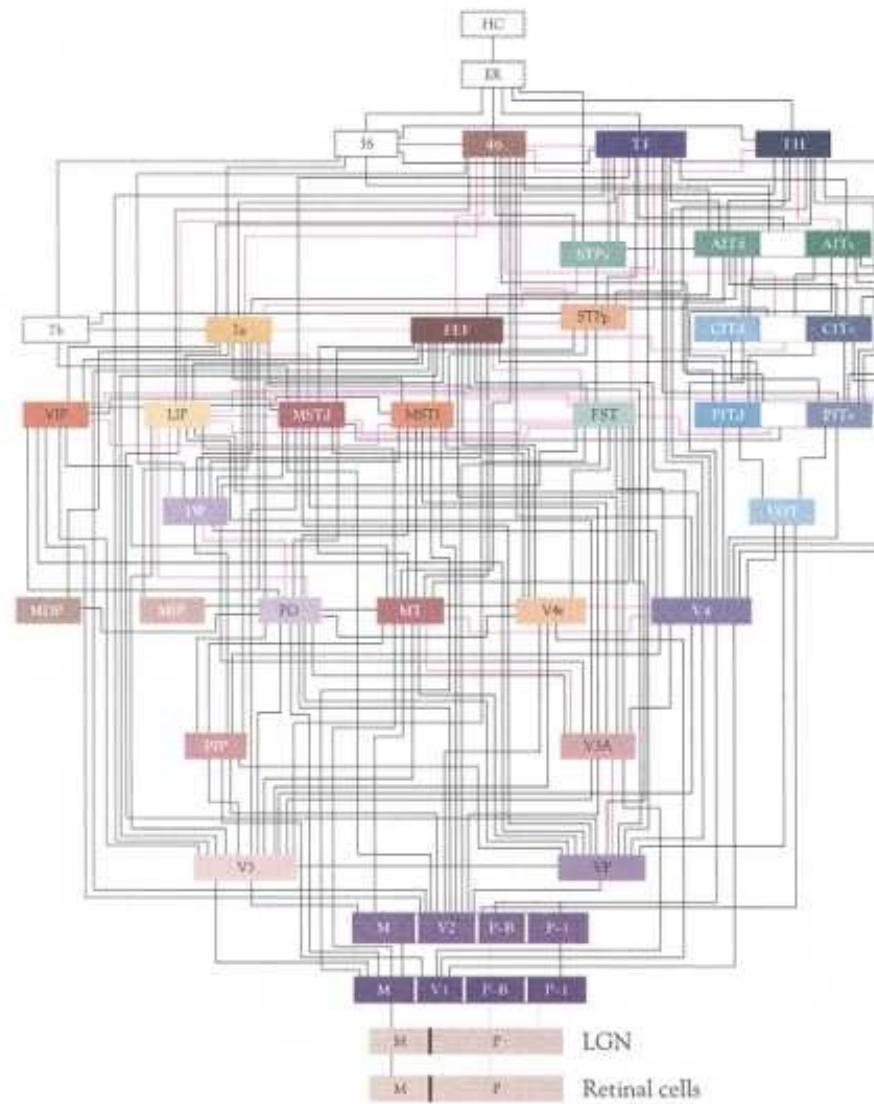
Patient RV and DF



“Grasp Lines”

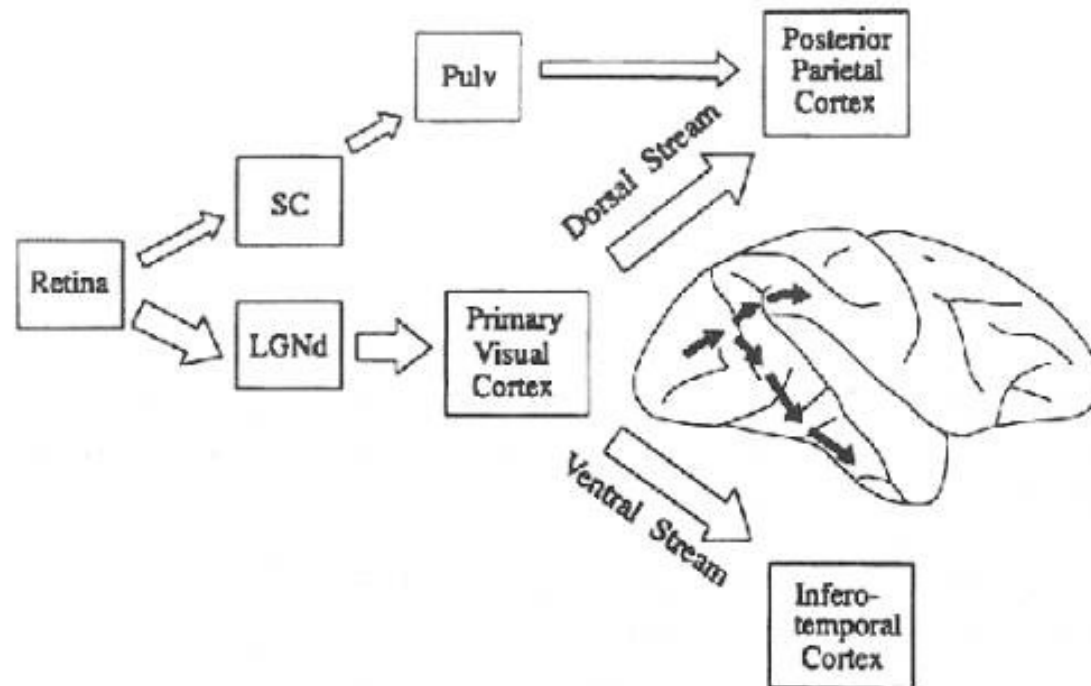






Explain the functional roles of the dorsal visual stream.
You will need to understand this in terms of:

1. Attention (pgs 638-642).



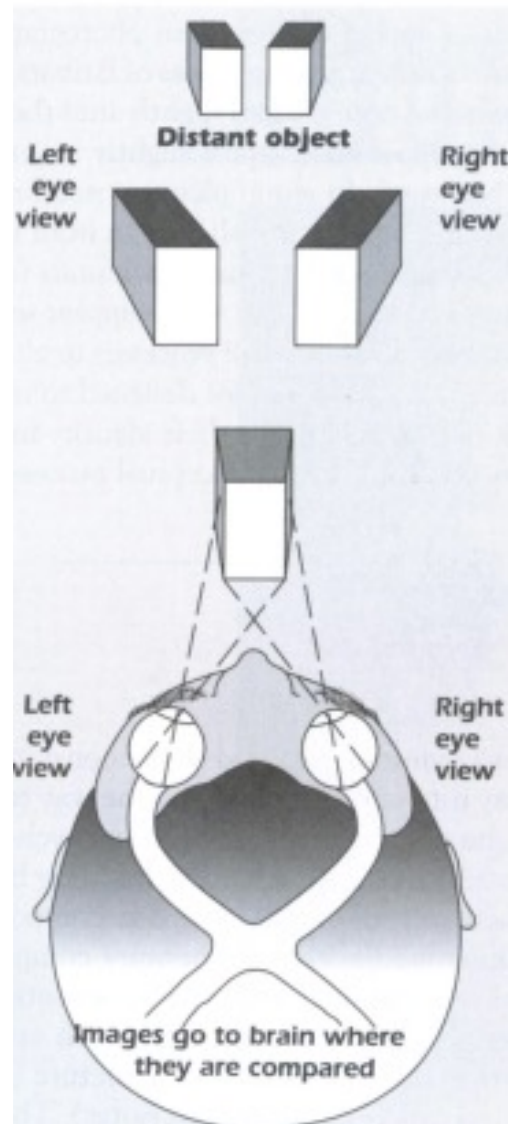
Explain the functional roles of the dorsal visual stream.

You will need to understand this in terms of:

2. The construction of visual space (pgs 642-646).

Determining Object Location

Disparity



Disparity

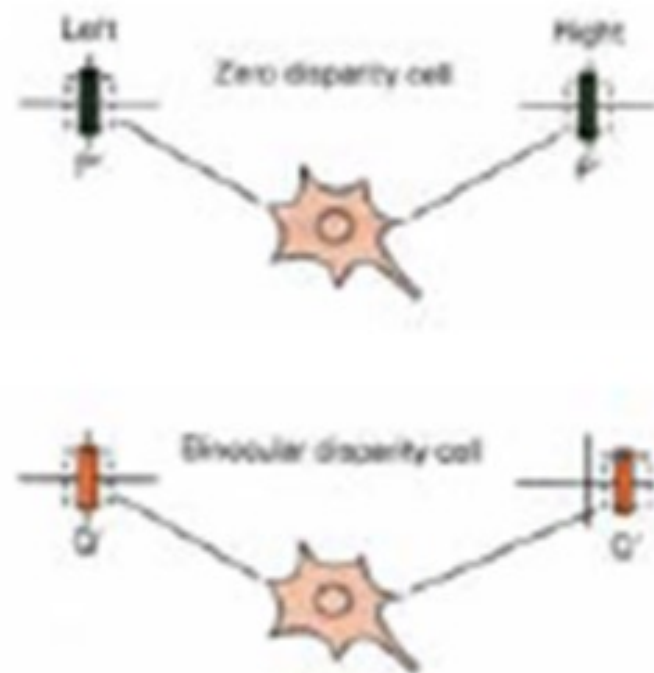
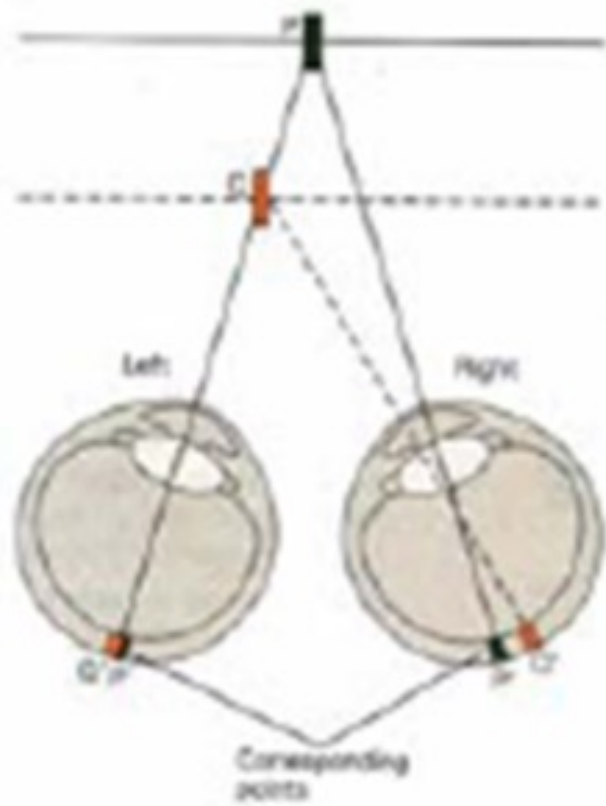


Left Eye



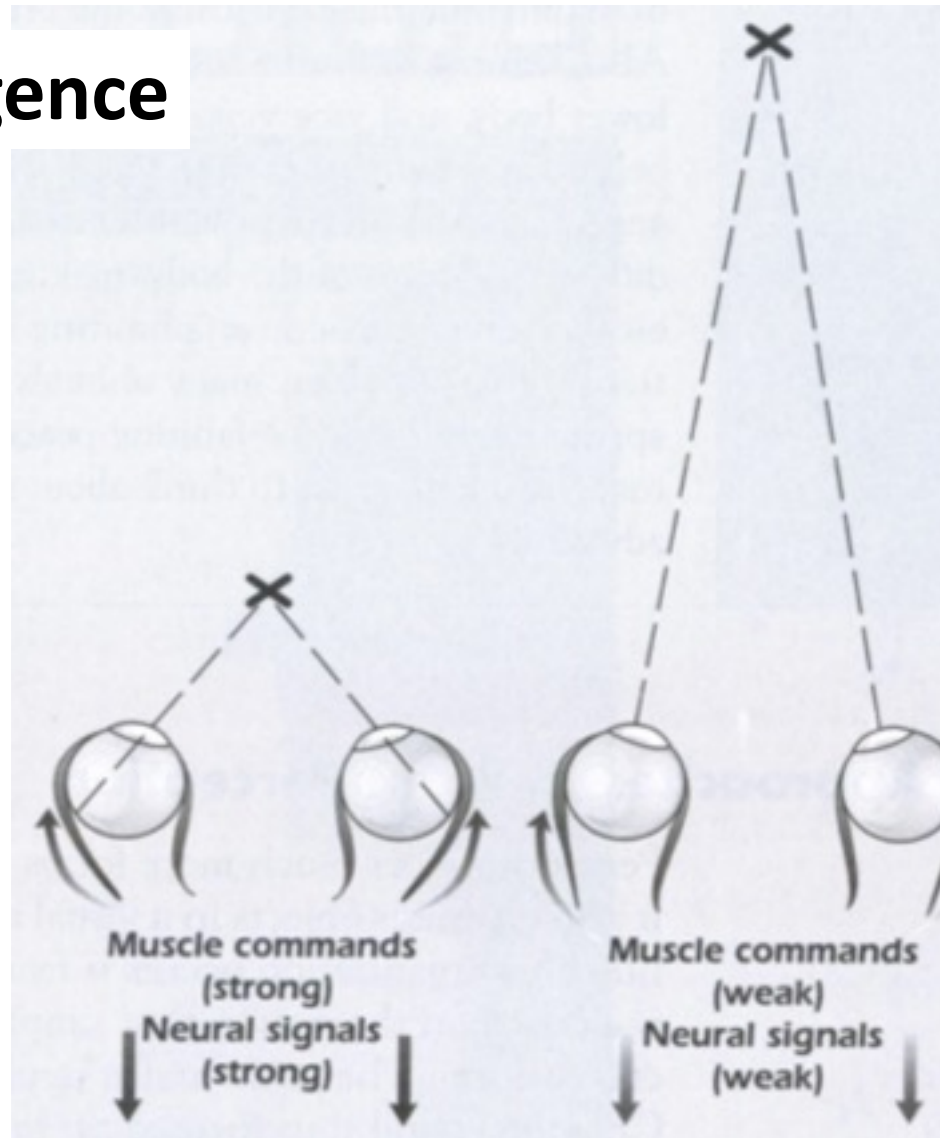
Right Eye

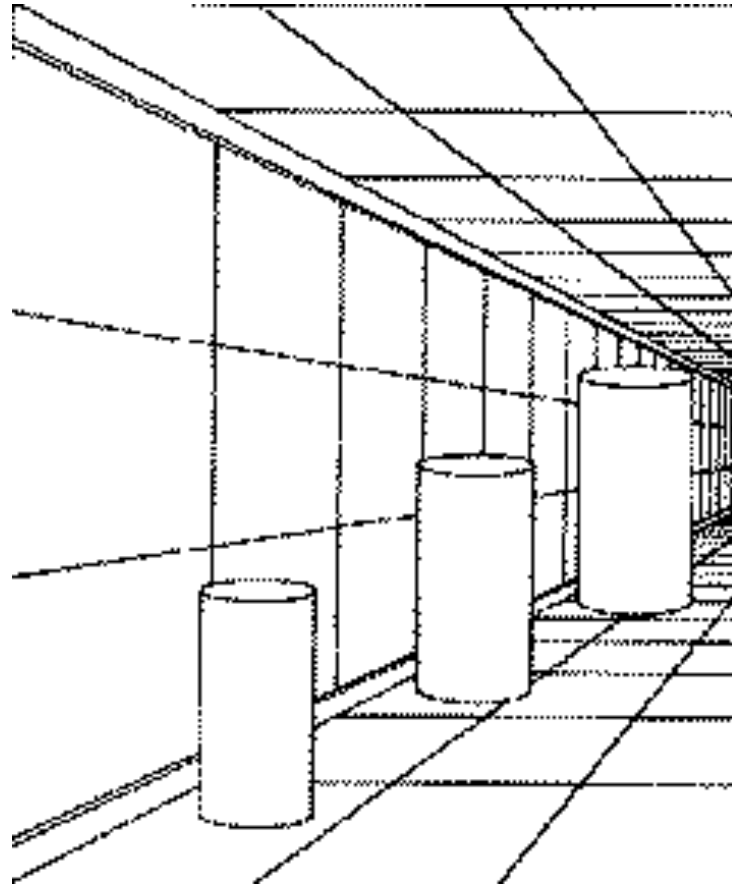
Disparity



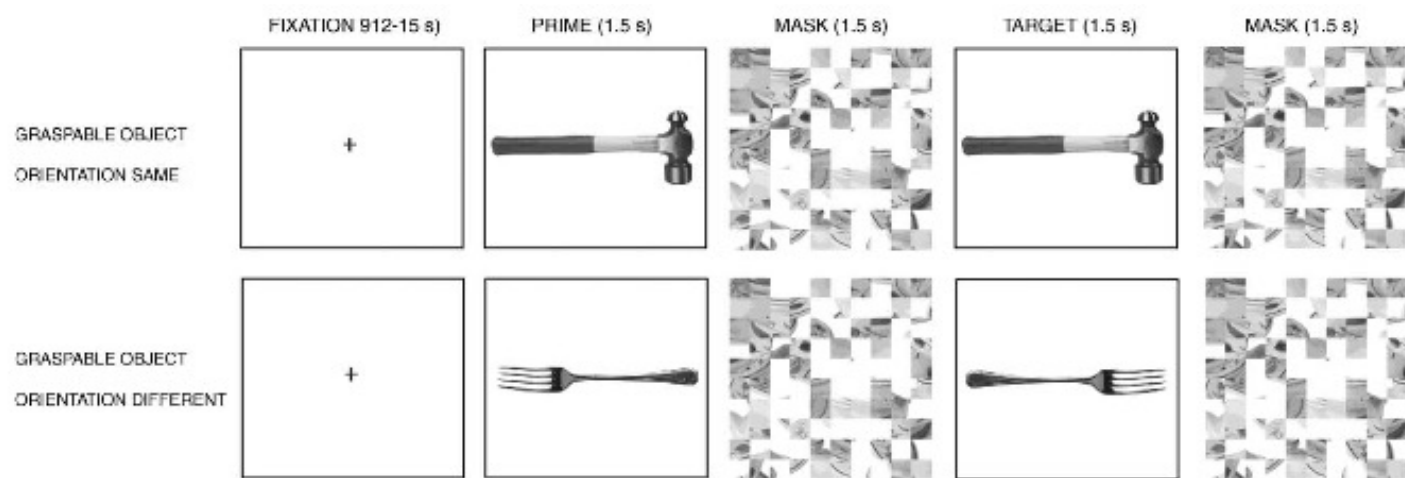


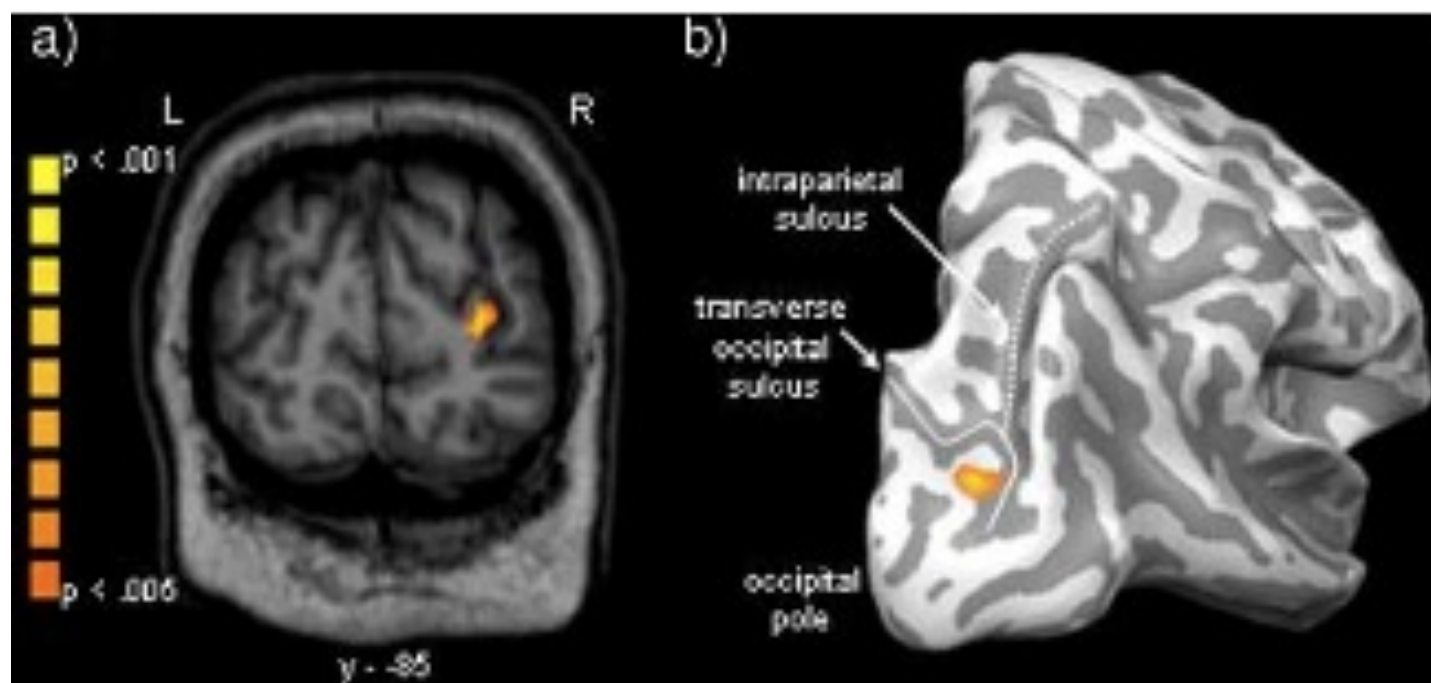
Convergence



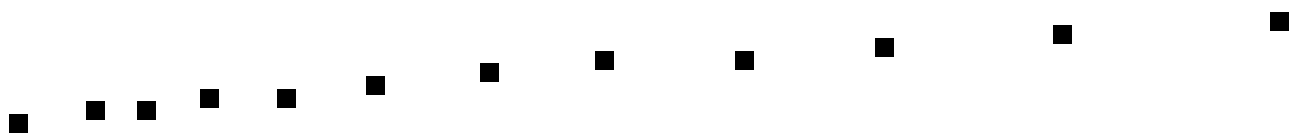


Object Orientation

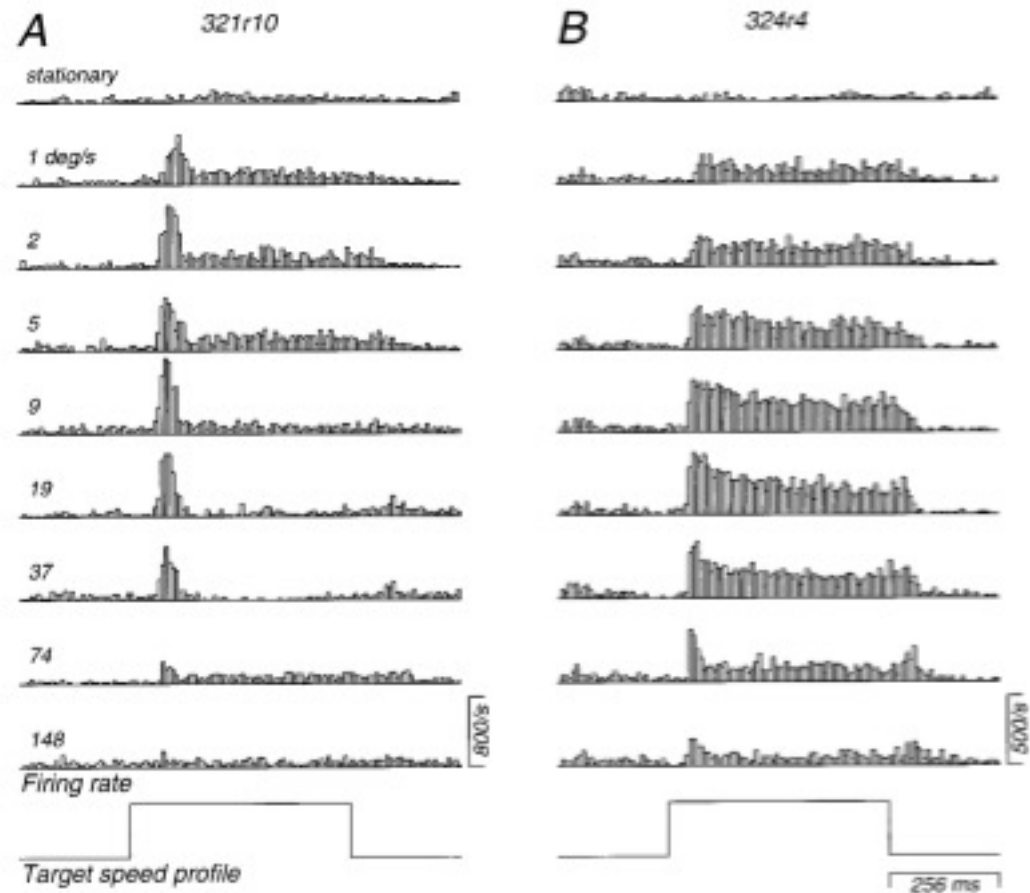




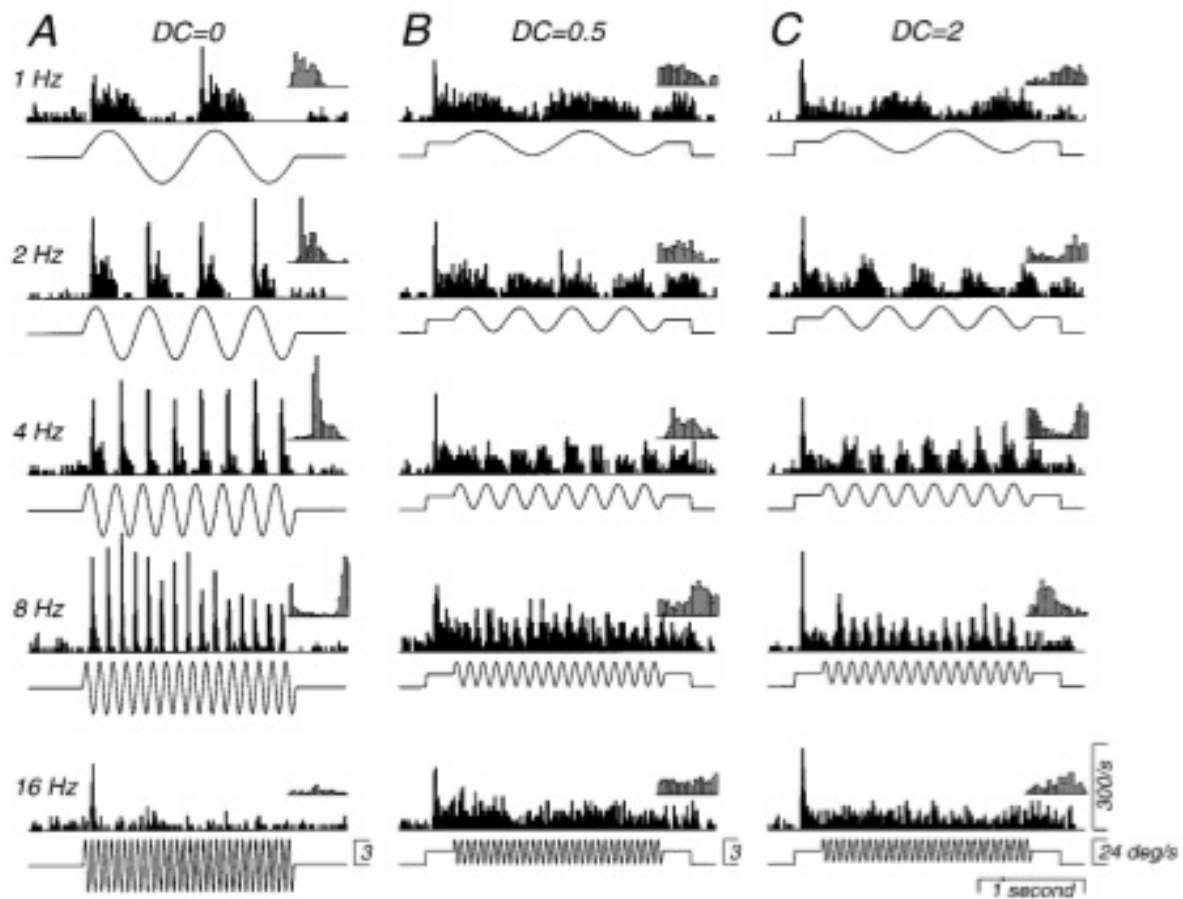
Motion Sensitive Neurons



Area MT

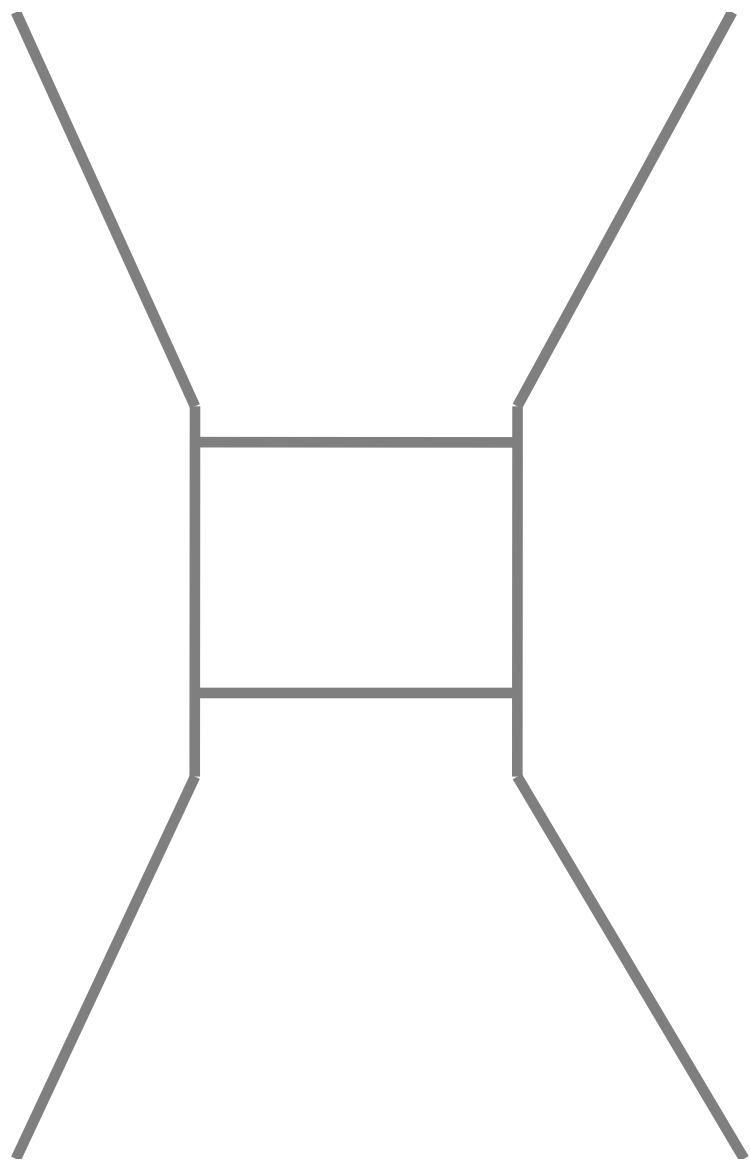


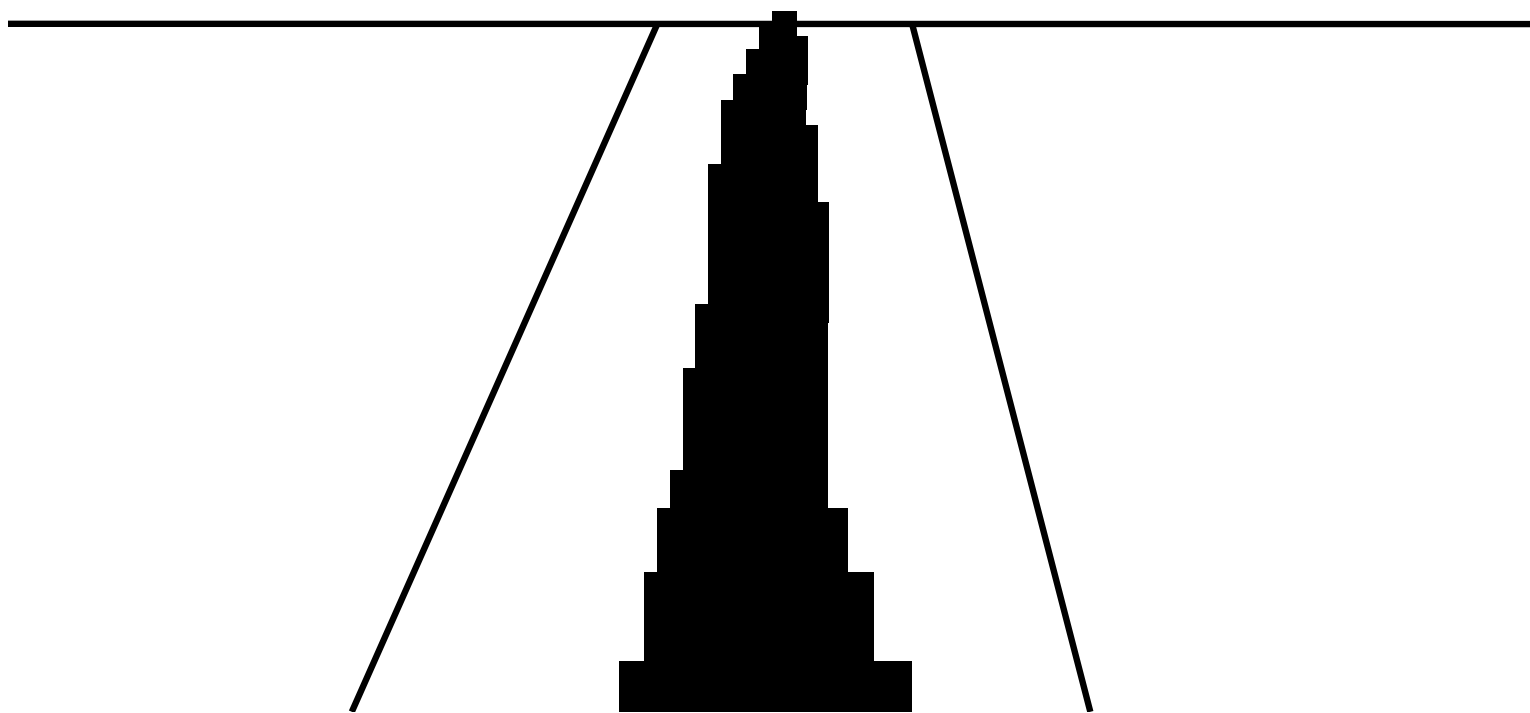
Area MT





Learned Cues





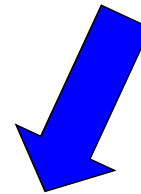
Explain the functional roles of the dorsal visual stream.

You will need to understand this in terms of:

3. Action (pgs 647-652).

The Dorsal Visual Stream

Goodale, Pelisson, & Prablanc (1986)

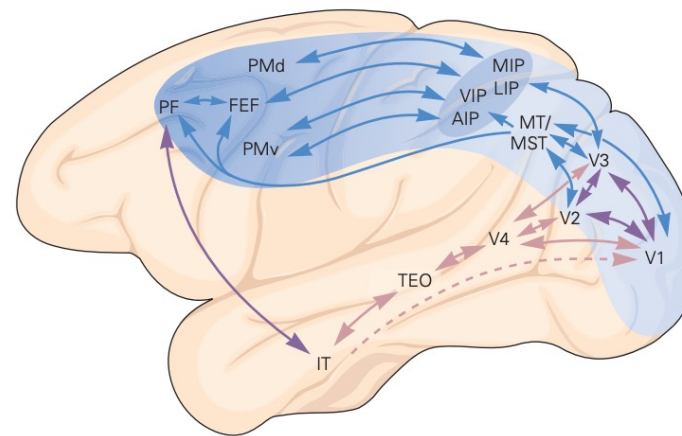




Explain the functional roles of the dorsal visual stream.
You will need to understand this in terms of:

4. The location, components, and projections of the Dorsal Stream (Figure 29-1)

Figure 29-1 Pathways involved in visual processing for action. The dorsal visual pathway (blue) extends to the posterior parietal cortex and then to the frontal cortex. The ventral visual pathway (pink) is considered in Chapter 27. (AIP, anterior intraparietal cortex; FEF, frontal eye field; IT, inferior temporal cortex; LIP, lateral intraparietal cortex; MIP, medial intraparietal cortex; MST, medial superior temporal cortex; MT, middle temporal cortex; PF, prefrontal cortex; PMd, PMv, dorsal and ventral premotor cortices; TEO, occipitotemporal cortex; VIP, ventral intraparietal cortex; V1–V4, areas of visual cortex.)



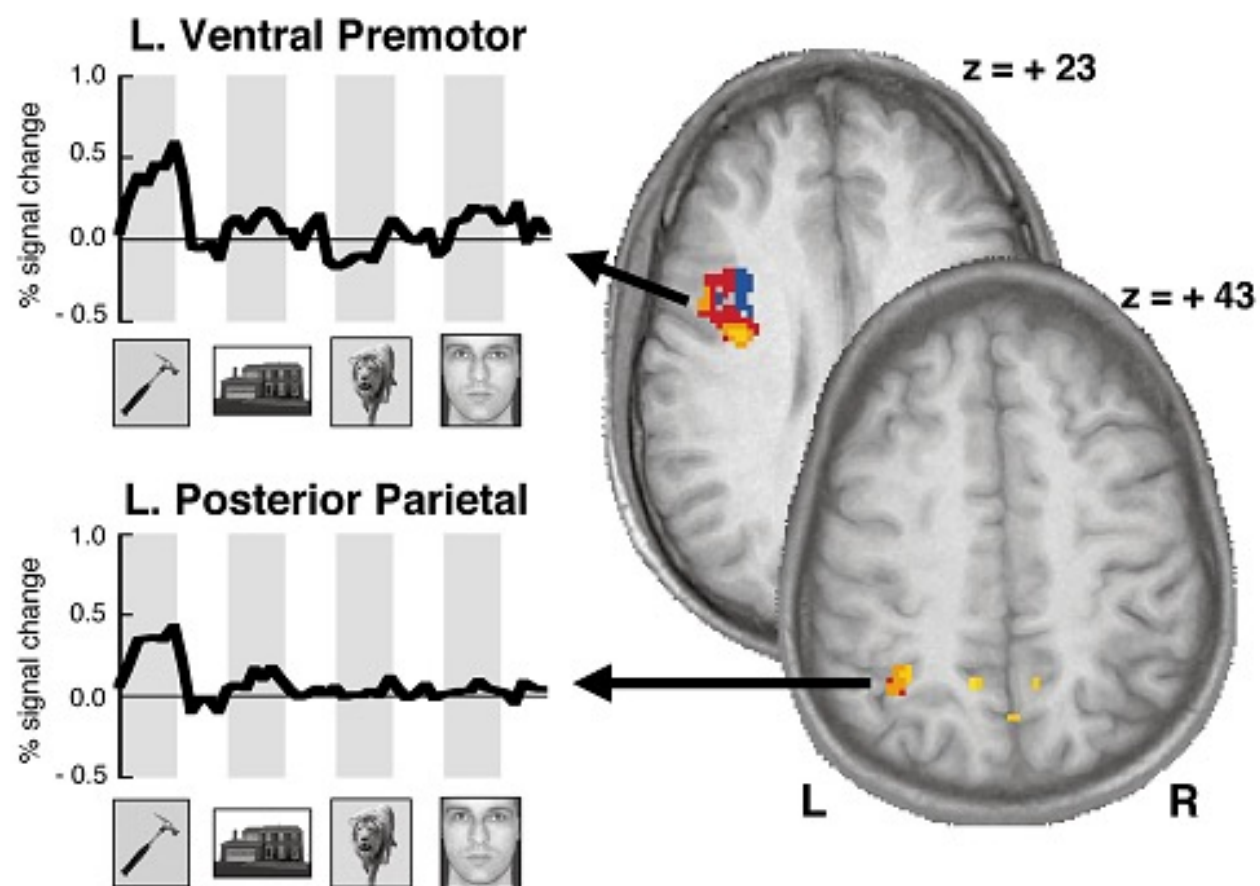
RAPID COMMUNICATION

Representation of Manipulable Man-Made Objects in the Dorsal Stream

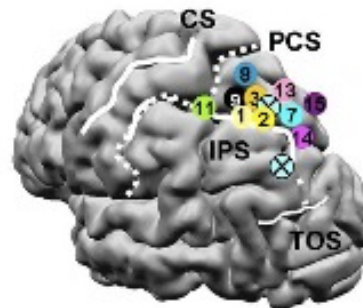
Linda L. Chao and Alex Martin

Laboratory of Brain and Cognition, National Institute of Mental Health, Bethesda, Maryland 20892-1366

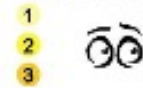
Received March 6, 2000



(a) postero-lateral view



Eye movements



Multimodal stimulation



Pointing or Reaching



Reaching (lesion study)



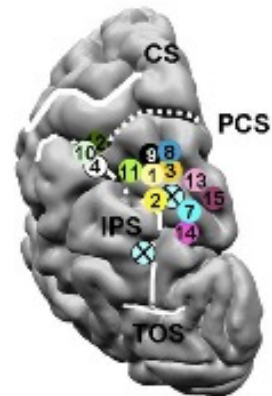
Visually guided grasping



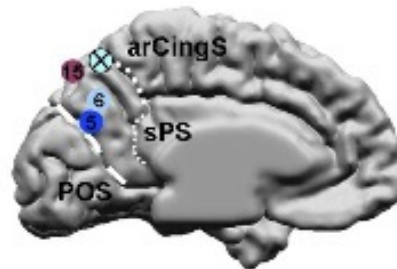
Orientation selectivity



(b) superior view



(c) medial view

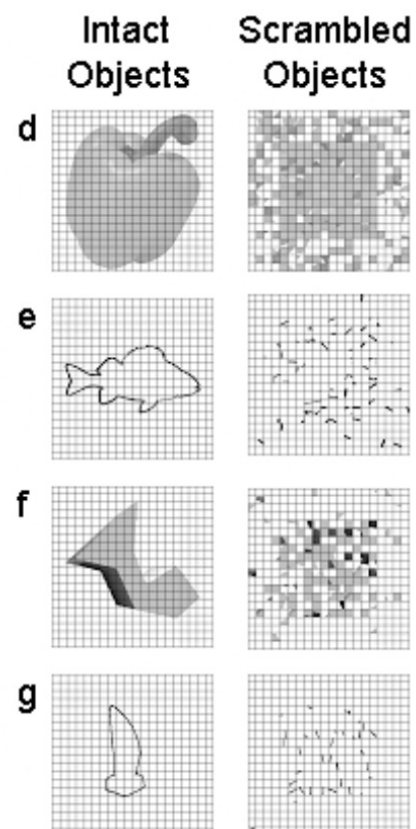
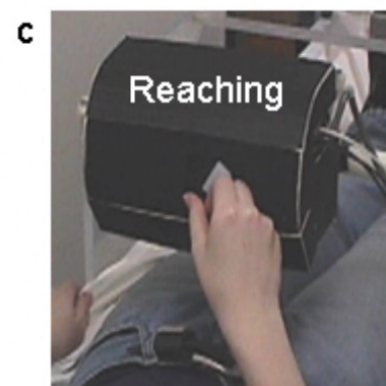
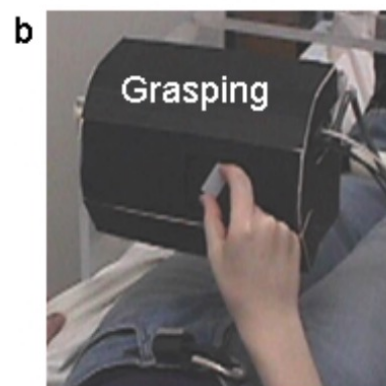
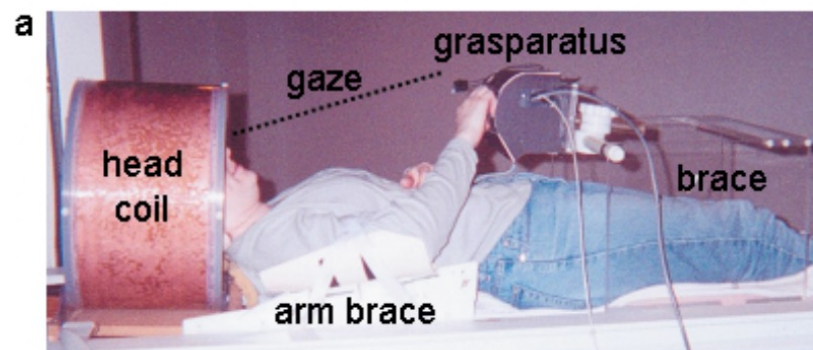


Exp Brain Res (2003) 153: 180–189
DOI 10.1007/s00221-003-1591-5

RESEARCH ARTICLE

Jody C. Culham · Stacey L. Danckert ·
Joseph F. X. DeSouza · Joseph S. Gati · Ravi S. Menon ·
Melvyn A. Goodale

**Visually guided grasping produces fMRI activation in dorsal but
not ventral stream brain areas**



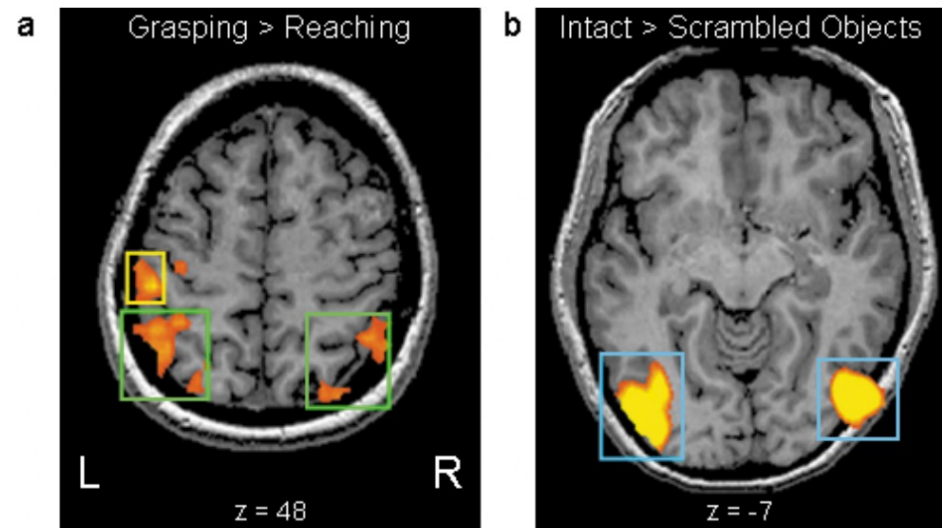


Fig. 2a, b Group activation maps for object grasping and object perception. **a** Three parietal regions were more active for grasping than reaching: one focus (*yellow box*) in the postcentral sulcus of the left hemisphere, and two more posterior bilateral foci (*green boxes*) in the intraparietal sulcus ($t_{(2896)} > 4.0$, $p < .0001$ uncorrected, cluster size $> 100 \text{ mm}^3$). Although the AIP activation appears to consist of

two foci, these were contiguous in other slices. **b** The comparison between intact and scrambled objects activated bilateral foci in lateral occipital cortex ($t_{(2506)} > 4.0$, $p < .0001$ uncorrected, cluster size $> 100 \text{ mm}^3$). Data are based on Talairach averaged group results shown for clarity on a single subject's anatomical (which is not representative of the sulcal patterns for all subjects)

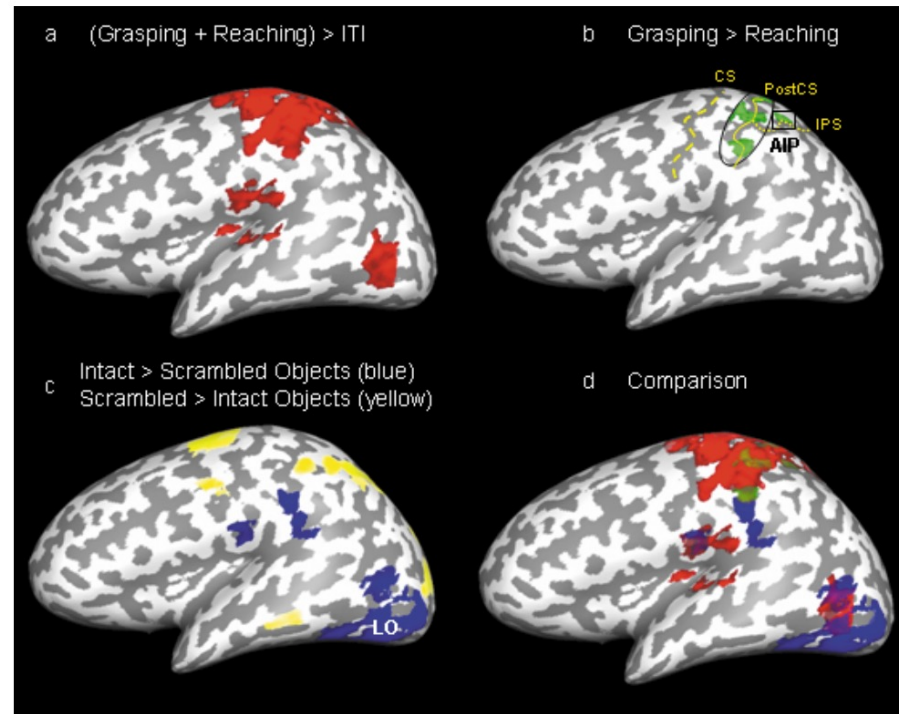


Fig. 3a–d Activation for a single representative subject shown on an inflated cortical surface. **a** Event-related activation for grasping and reaching compared to the intertrial interval (*ITI*) shown in red ($t_{(2884)} > 4.0$, $p < .0001$ uncorrected, cluster size $> 100 \text{ mm}^3$). Data are rendered on an inflated cortical left hemisphere (*dark gray* sulci, *light gray* gyri). **b** Areas with significantly greater activation for grasping than reaching included the postcentral sulcus (*PostCS*) and anterior intraparietal sulcus (*IPS*) shown in *green*. Sulci are shown with *dotted lines* and include the central sulcus (*CS*) for comparison. **c** The lateral occipital (*LOC*) complex was significantly more active

during viewing of intact than scrambled objects (*blue*). Some subjects, including this one, also had activation in the posterior Sylvian fissure. The reverse comparison, scrambled $>$ intact, shown in *yellow*, activated the intraparietal sulcus and, in this subject, frontal eye fields. **d** For comparison, activation for reaching and grasping (*red*), grasping-reaching (*green*) and intact-scrambled (*blue*) are shown in transparent color. *Yellow* indicates the overlap between grasping and reaching data. *Purple* indicates overlap between reaching and grasping and intact-scrambled