Slide 1

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Slide 8

fMRI Studies of Grasping

Dr. Jody Culham

4-T magnet, London , Ontario

Slide 9

The "Grasparatus"

Slide 10

THE TASKS
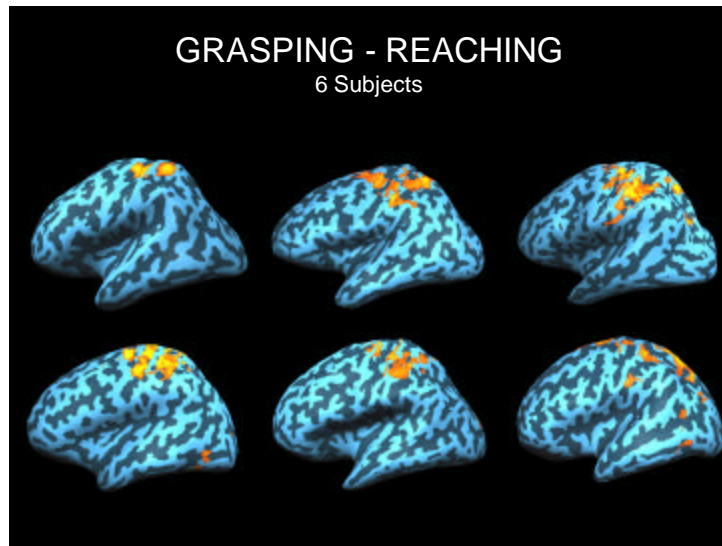Cued by Fixation LED color

Grasping
• precision grip = finger + thumb
• transport + grip components
• requires object processing

Reaching
• touch object with knuckles
• transport component only
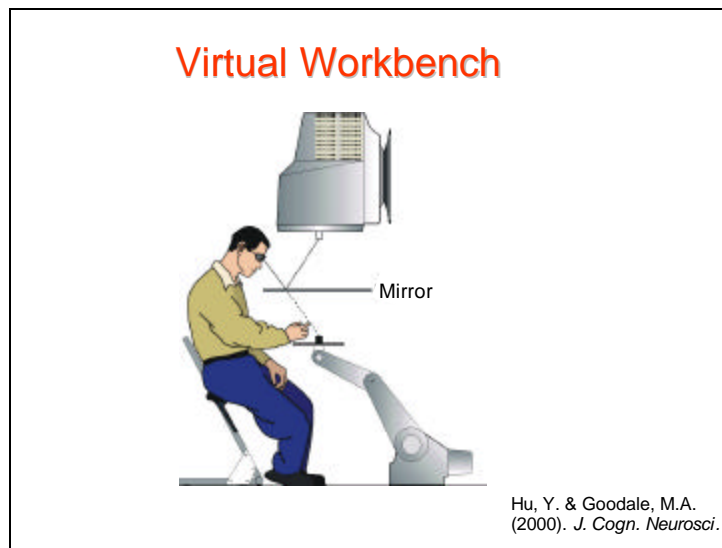• does not require object processing

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GRASPING - REACHING
6 Subjects

Slide 12

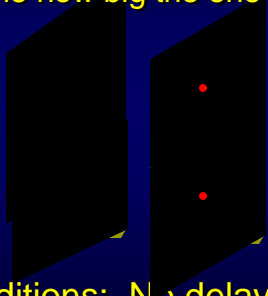| Ventral Stream	Dorsal Stream
Scene-parsing and object identification	Visual control of motor output
Scene-based frame of reference	Effector-based frames of reference
Relational metrics	Absolute metrics
Propositional	Isomorphic
Long-term representations	Moment-to-moment computations
"Conscious"	"Unconscious"

Goodale, M.A. & Humphrey, G.K. (1998). *Cognition.*

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Virtual Workbench

Mirror

Hu, Y. & Goodale, M.A. (2000). *J. Cogn. Neurosci.*

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Slide 15

Slide 16

Size-contrast Effect: Estimation

Difference (mm)

2.5
2.0
1.5
1.0
0.5
0

*   *

No Delay   Delay

Hu, Y. & Goodale, M.A.
(2000). *J. Cogn. Neurosci.*

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Real-time vs. Delayed Grasping
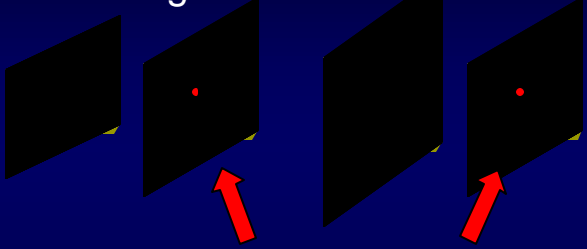
"Pick up the one with the dot"

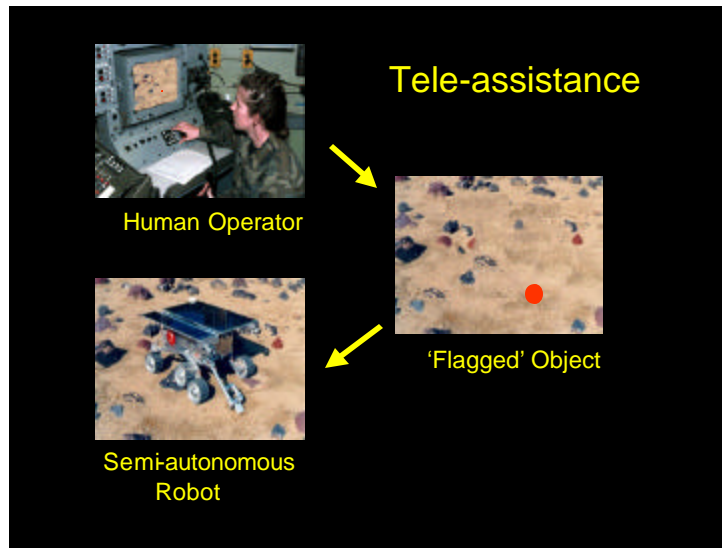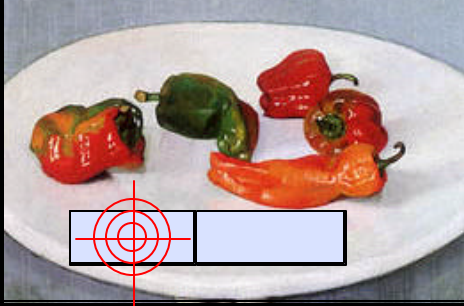Two conditions: No delay vs. 5s delay
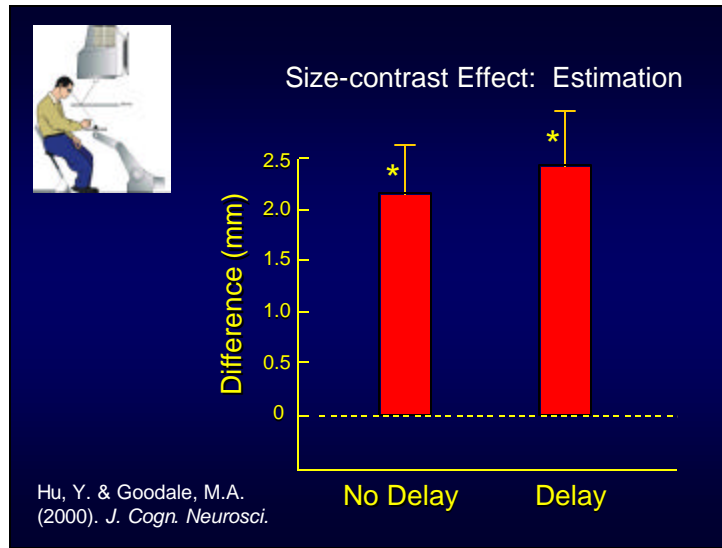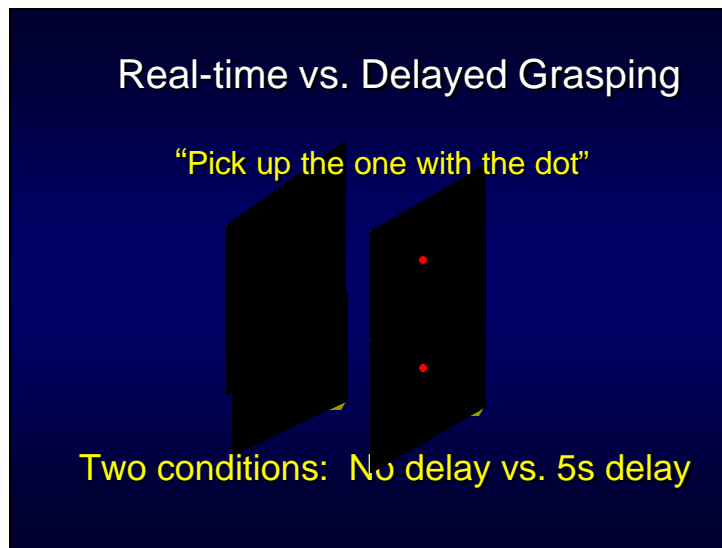
Slide 18
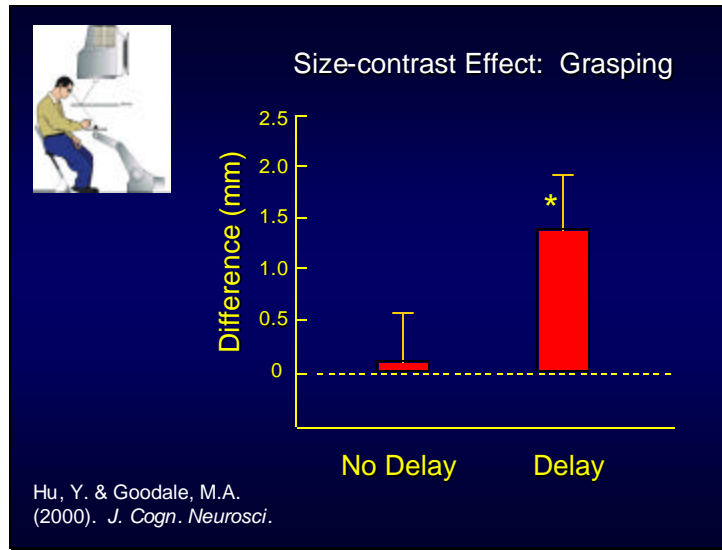
Slide 19

Slide 20

But how does the dorsal stream 'know' what the location, dimensions, orientation, and shape of the goal object are?

In other words, how does the ventral stream actually 'flag' the goal object in a frame of reference that the dorsal stream can understand?

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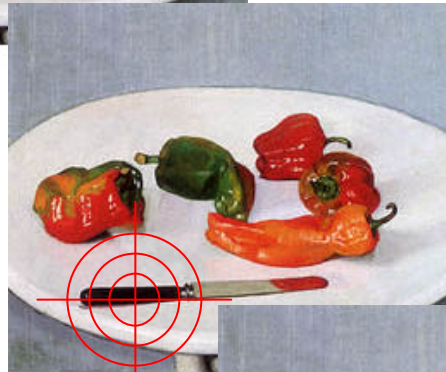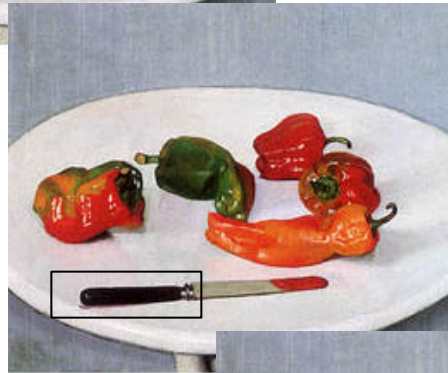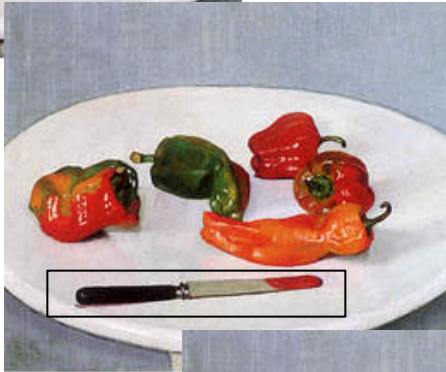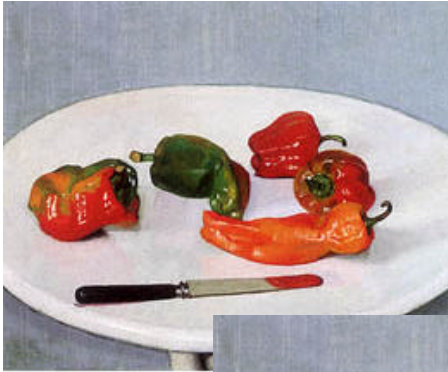Attention is the key: Bottom-up saliency and top-down control

Feedforward sweep and recurrent processing (Lamme, 2000)

Reverse hierarchy theory (Hochstein & Ahissar, 2001)

and many others in the last few years

Prefrontal Premotor

IT

LIP

Action

Directed attention

Conscious perception

Move attention

Move eyes

Initial locus of attention

Final locus of attention

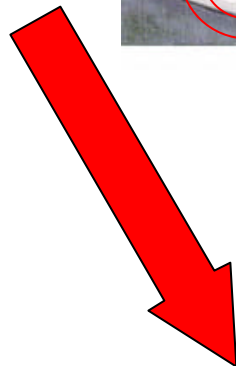Areas V1,V2,V4+ retinocentric map object features

Saliency

SC

Biological Teleassistance
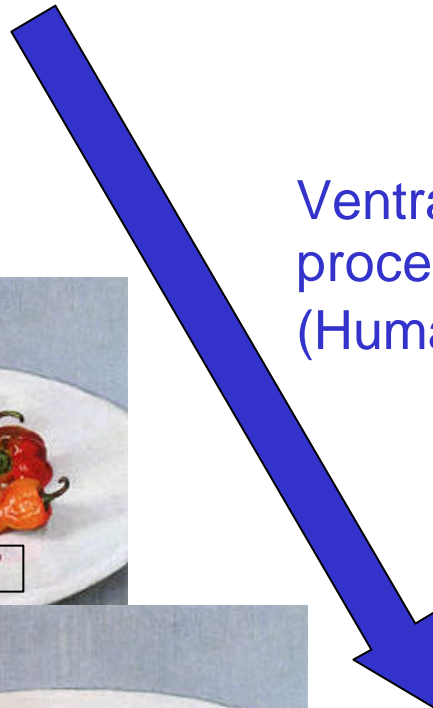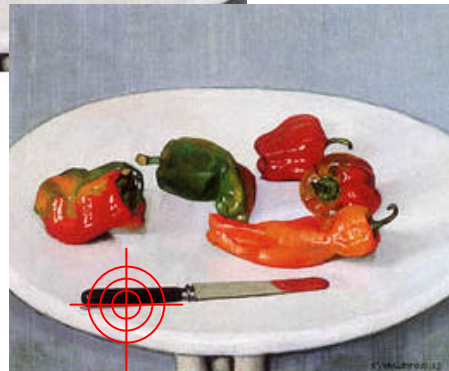
Ventral stream
processing
(Human operator)

Marked by
re-entrant signals
in area V1+

Dorsal
stream
processing

The great end of life is not knowledge
but action.

Thomas H. Huxley
1825-1895