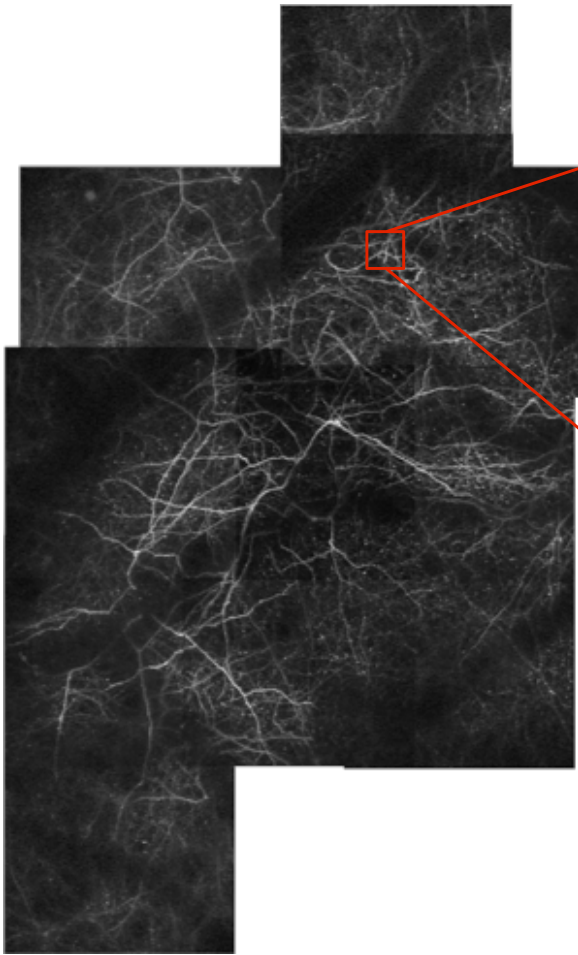


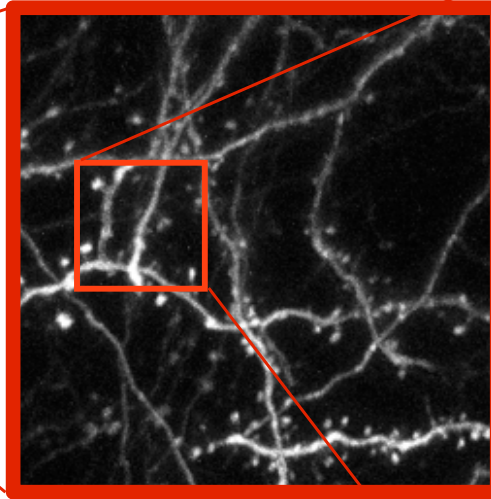
Brain Networks



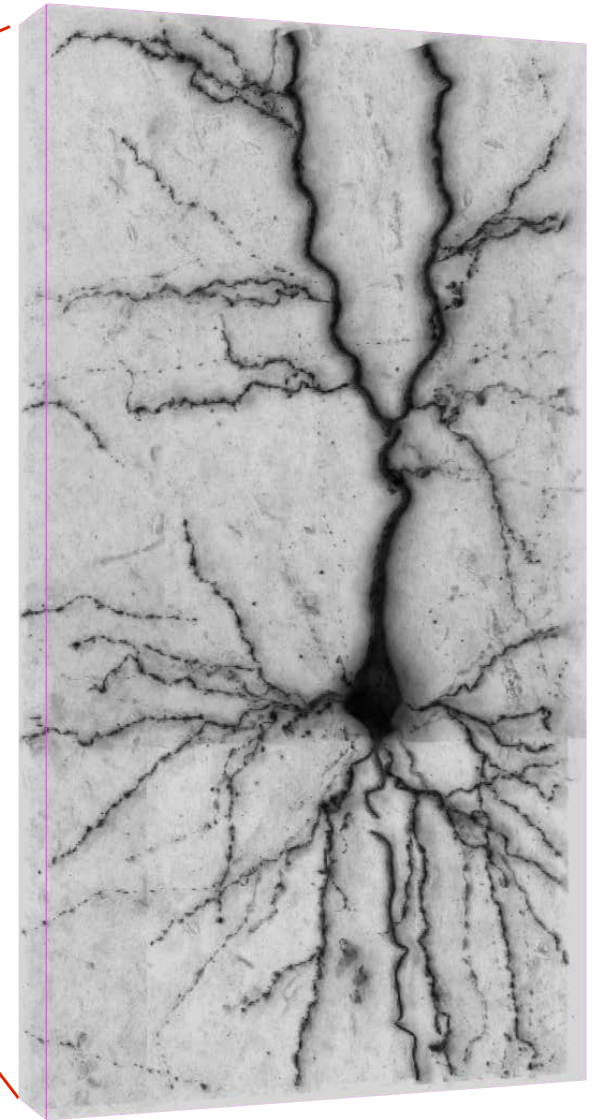
Biological Neural Nets



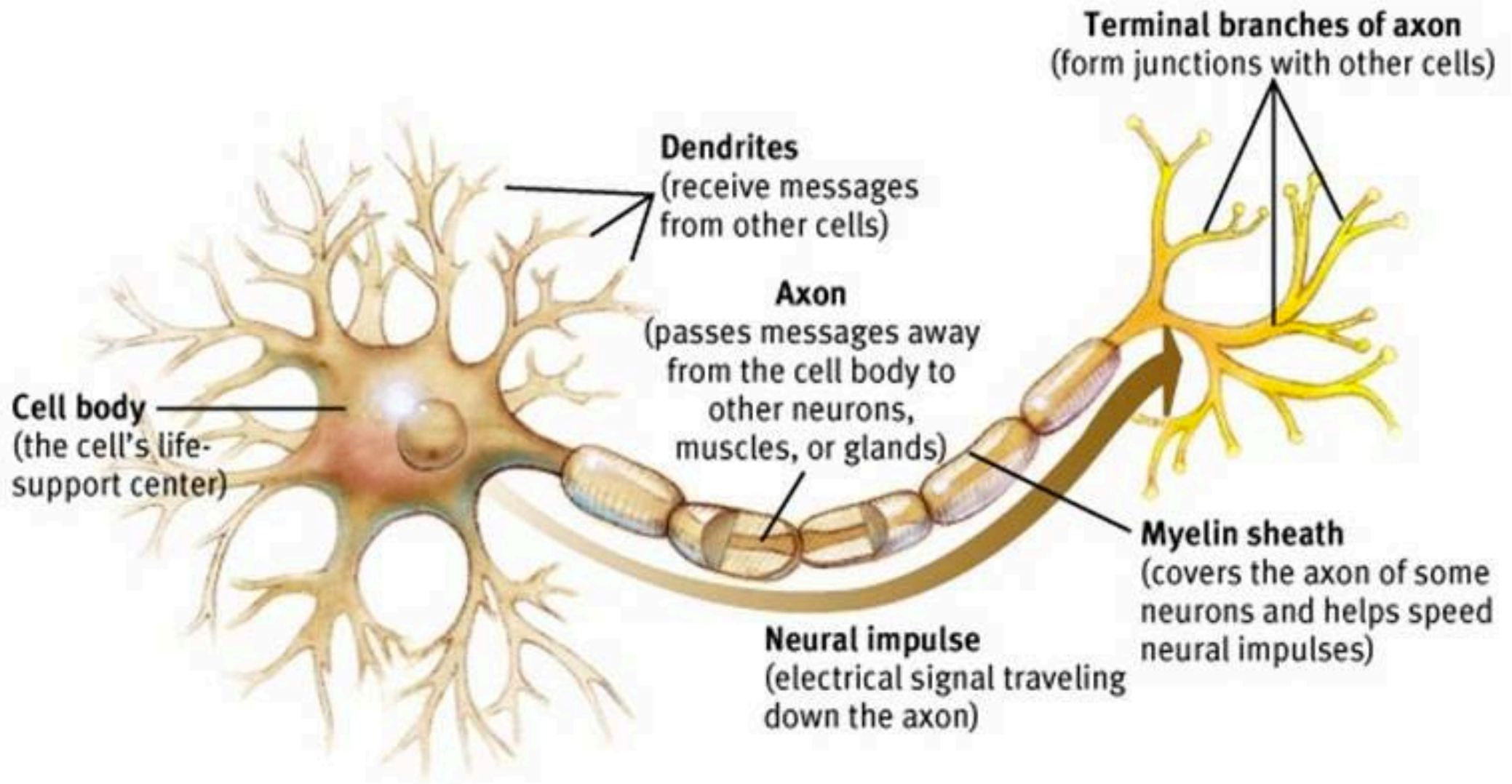
Fluorescent neurons in vivo
in the adult mouse brain.



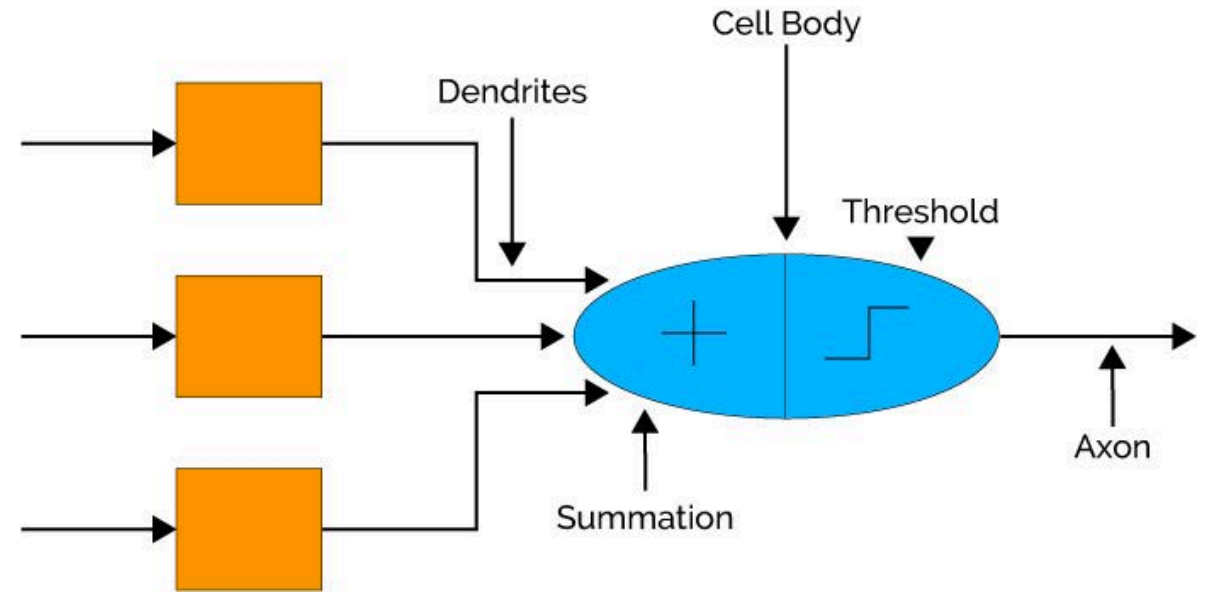
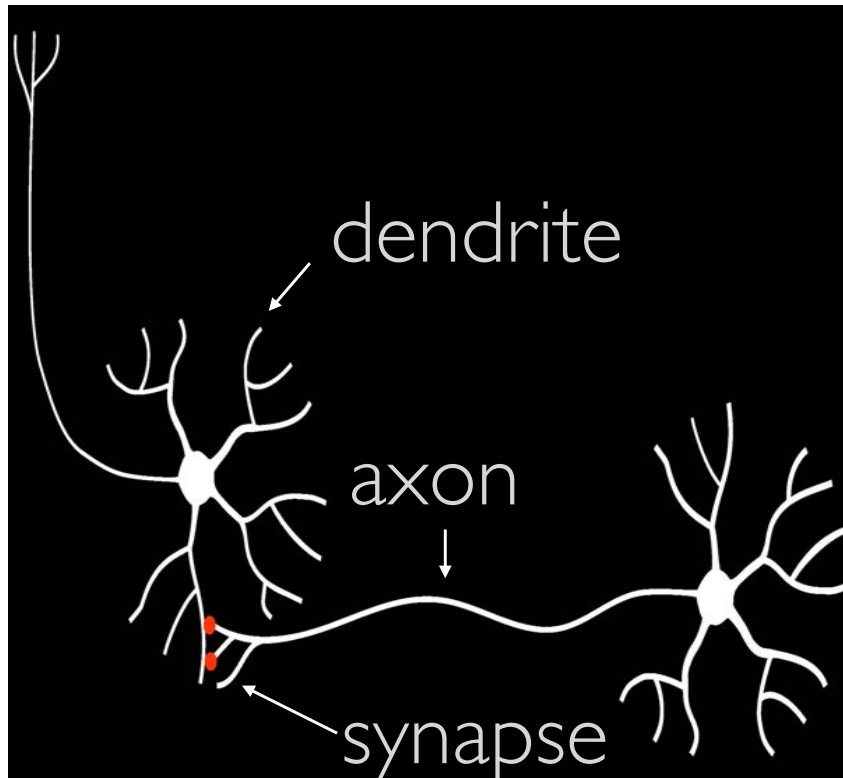
Imaged through a cranial
window using a 2-photon
microscope.



Individual Neuron



Biological vs Artificial Networks



- An intriguing analogy.
- But, we don't really understand how the brain works.

Classify Animal vs No Animal

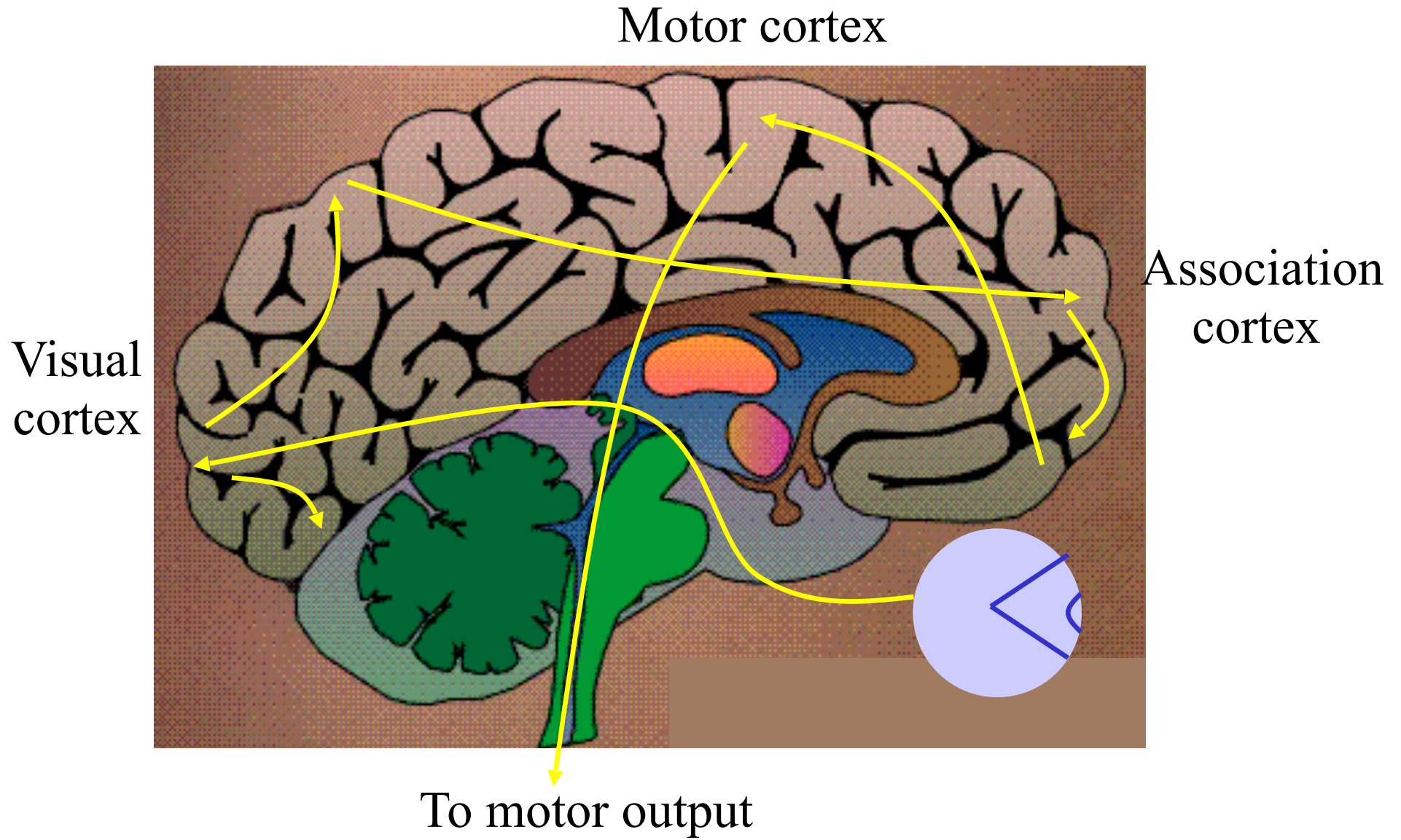
Subjects must raise their hand if they see an animal:

- 60 images
- 1 image per second

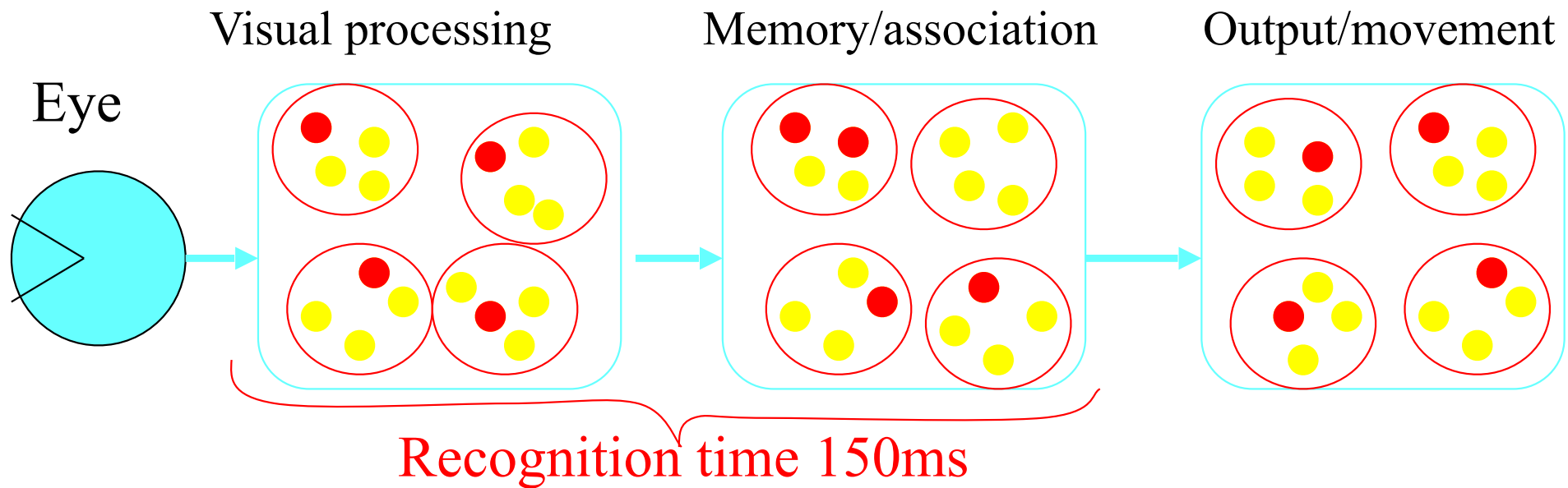
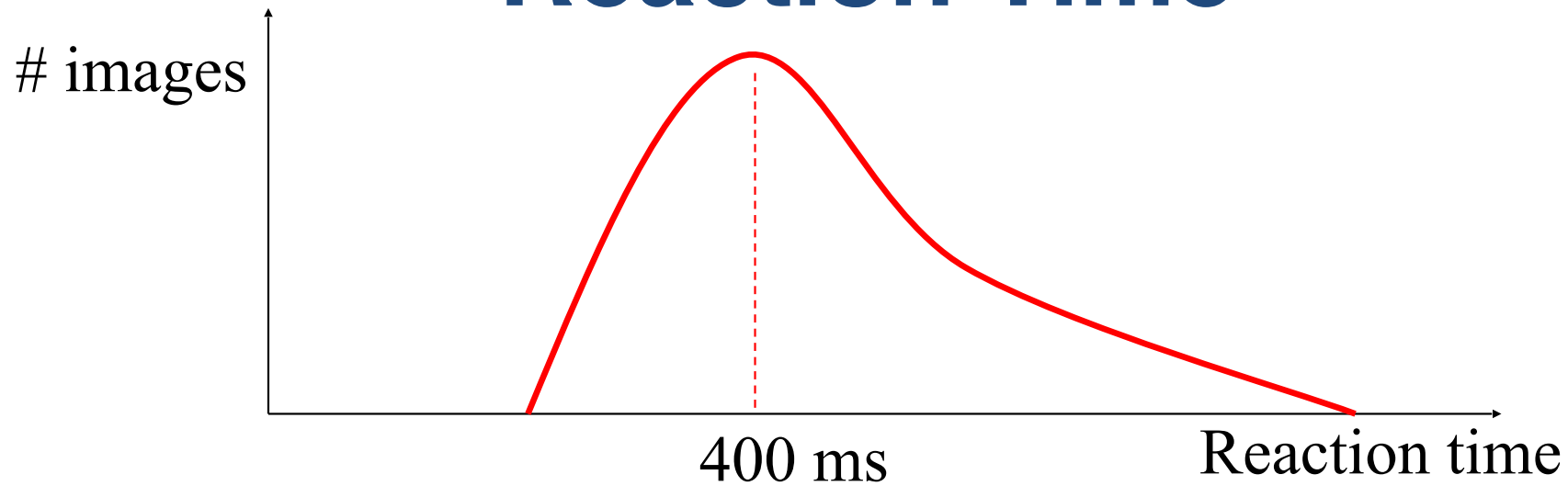
→ Measure their reaction time.



Brain Pathways



Reaction Time



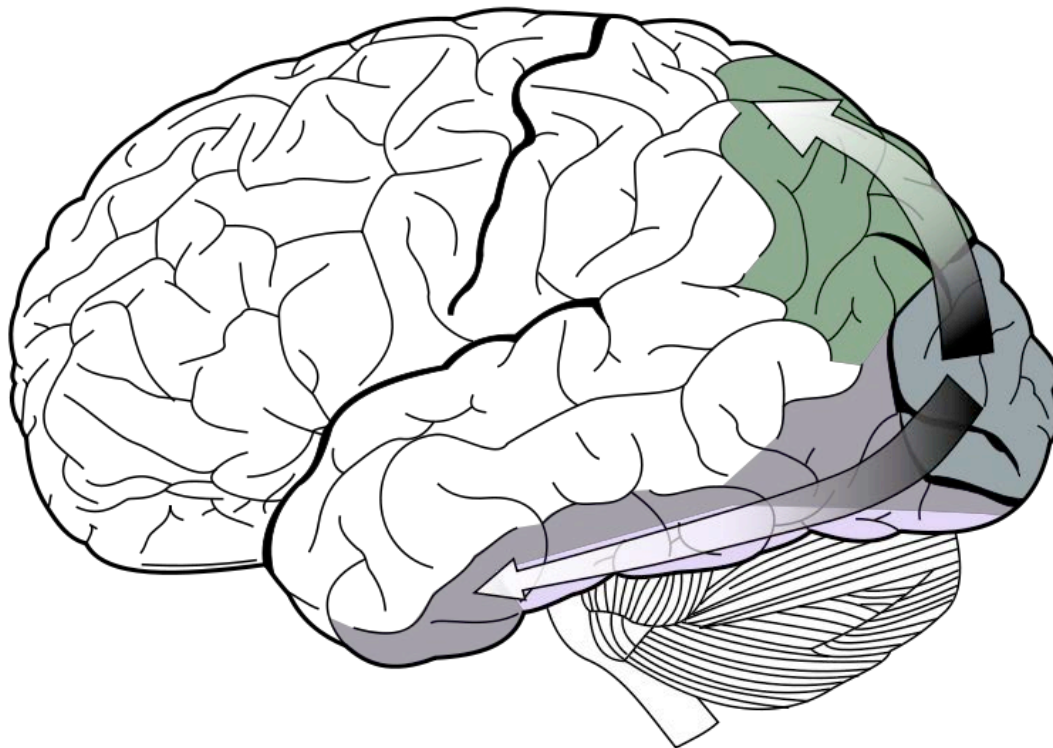
—> **Suggests** purely feed-forward processing because there is not enough time for feedback loops.

Visual Perception

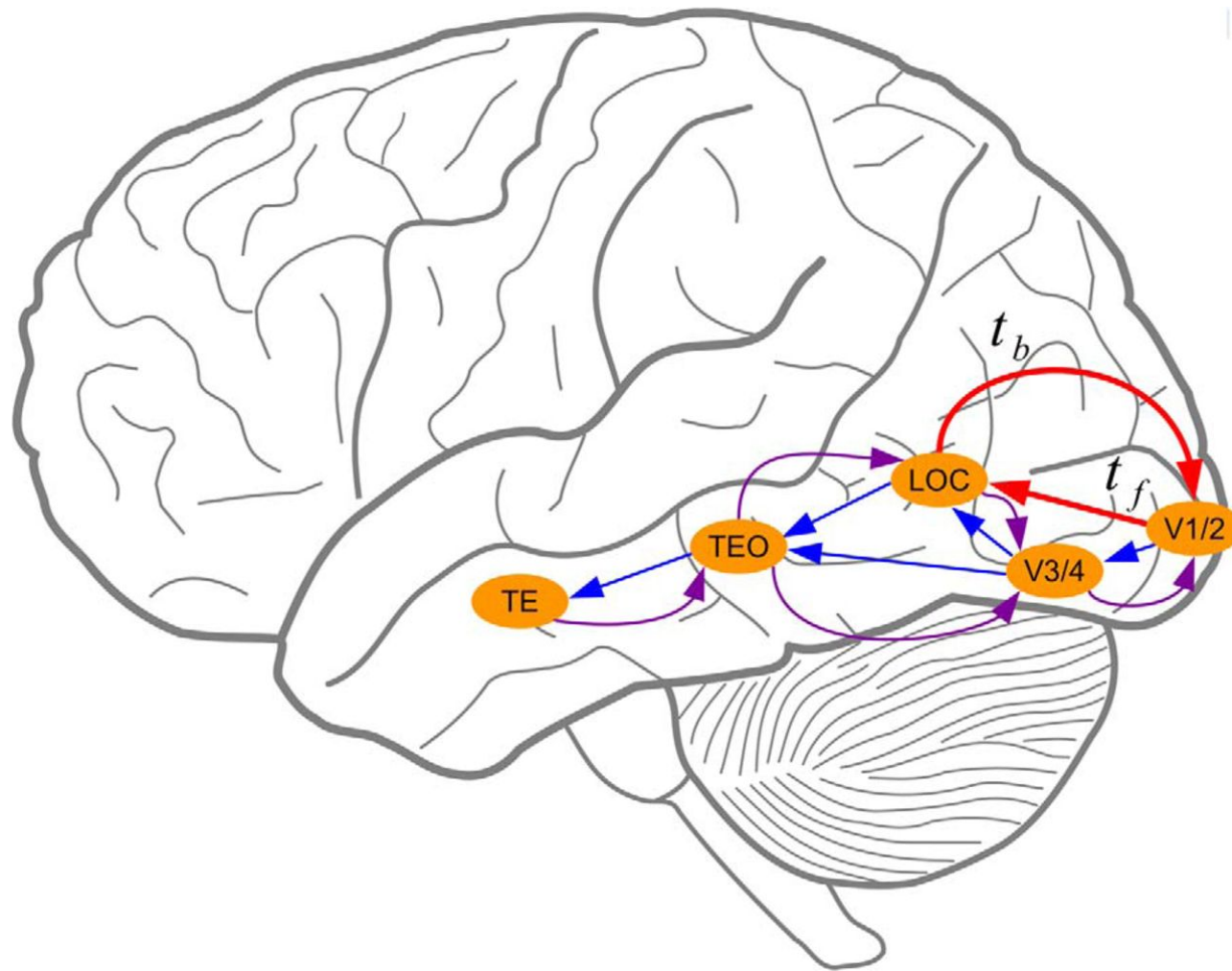
To pathways originate from V1:

- The “where” pathway: $V1 \rightarrow V2 \rightarrow V5 \rightarrow$ parietal lobe.
- The “what” pathway: $V1 \rightarrow V2 \rightarrow V3 \rightarrow V4 \rightarrow$ temporal lobe.

⇒ Motion Detection and Object Recognition are mostly performed in parallel but interconnections exist.



Recurrent Pathways



“Shape stimuli are optimally reinforcing each other when separated in time by ~ 60 ms, suggesting an underlying recurrent circuit with a time constant (feedforward + feedback) of 60 ms.”

A Major Challenge

