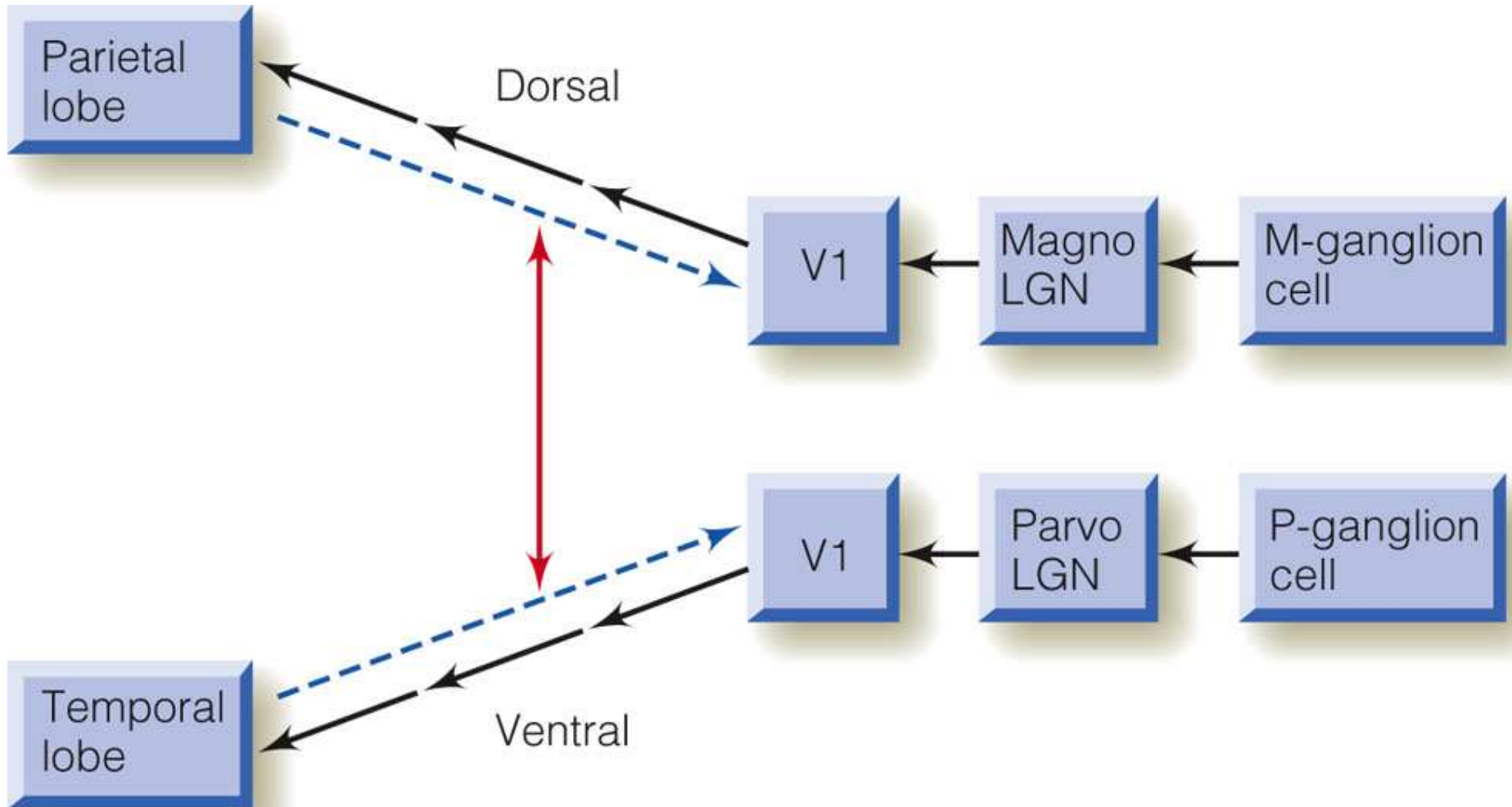


Table 4.1 ■ *Retinal ganglion cells and their functions*

| Type of Ganglion Cell | Destination in LGN | Function |
|-----------------------|---|---------------------------|
| M ganglion cell | Magnocellular layers (1 and 2) | Movement |
| P ganglion cell | Parvocellular layers (3, 4, 5, and 6) | Color Texture Depth |

Dorsal and Ventral visual pathways



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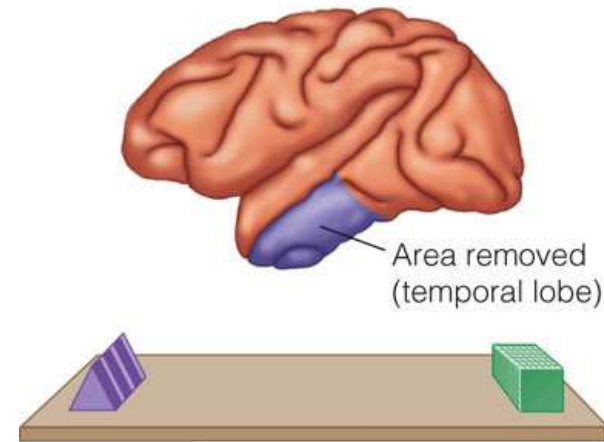
Figure 4.15 The dorsal and ventral streams in the cortex originate with the magno and parvo ganglion cells and the magno and parvo layers of the LGN. The red arrow represents connections between the streams. The dashed blue arrows represent feedback - signals that flow "backward."

Lesioning or Ablation Experiments

- First, an animal is trained to indicate perceptual capacities
- Second, a specific part of the brain is removed or destroyed
- Third, the animal is retrained to determine which perceptual abilities remain
- The results reveal which portions of the brain are responsible for specific behaviors

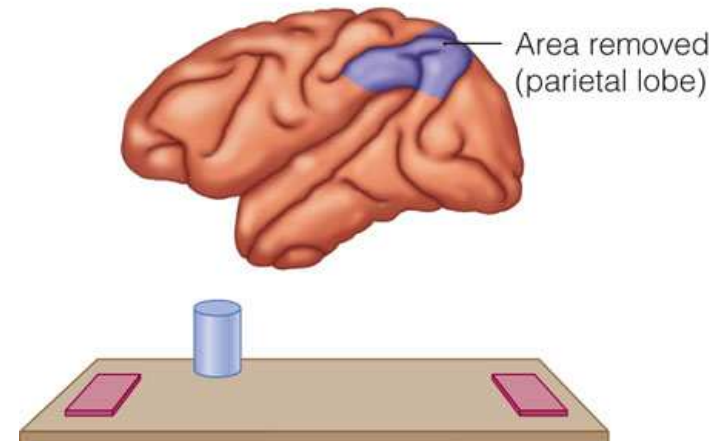
What and Where Pathways

- Ungerleider and Mishkin experiment
 - Object discrimination problem
 - Monkey is shown an object
 - Then presented with two choice task
 - Reward given for detecting the target object



(a) Object discrimination

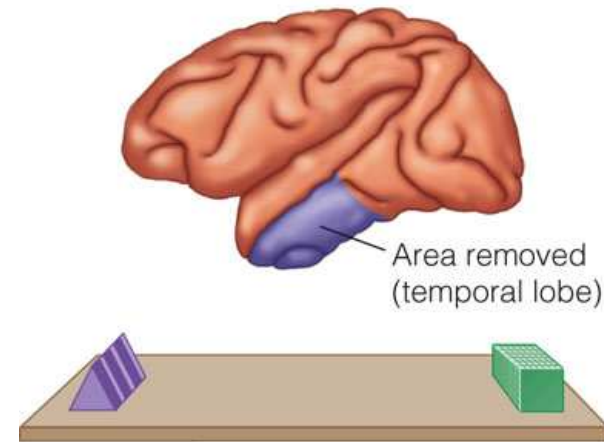
- Landmark discrimination problem
 - Monkey is trained to pick the food well next to a cylinder



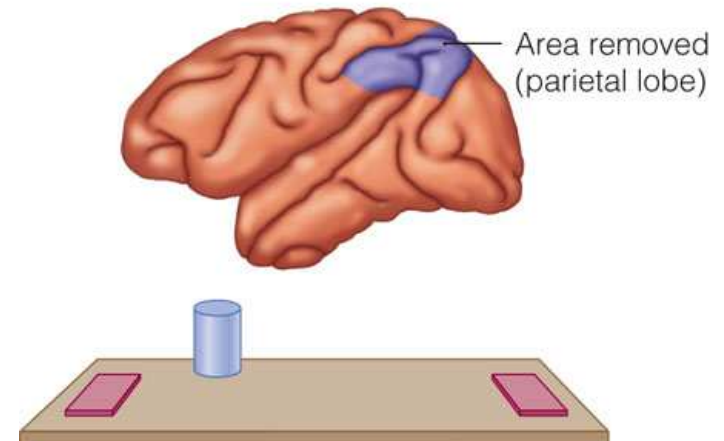
(b) Landmark discrimination

What and Where Pathways

- Ungerleider and Mishkin (cont.)
 - Using ablation, part of the parietal lobe was removed from half the monkeys and part of the temporal lobe was removed from the other half
 - Retesting the monkeys showed that:
 - Removal of temporal lobe tissue resulted in problems with the object discrimination task - **What pathway**
 - Removal of parietal lobe tissue resulted in problems with the landmark discrimination task - **Where pathway**

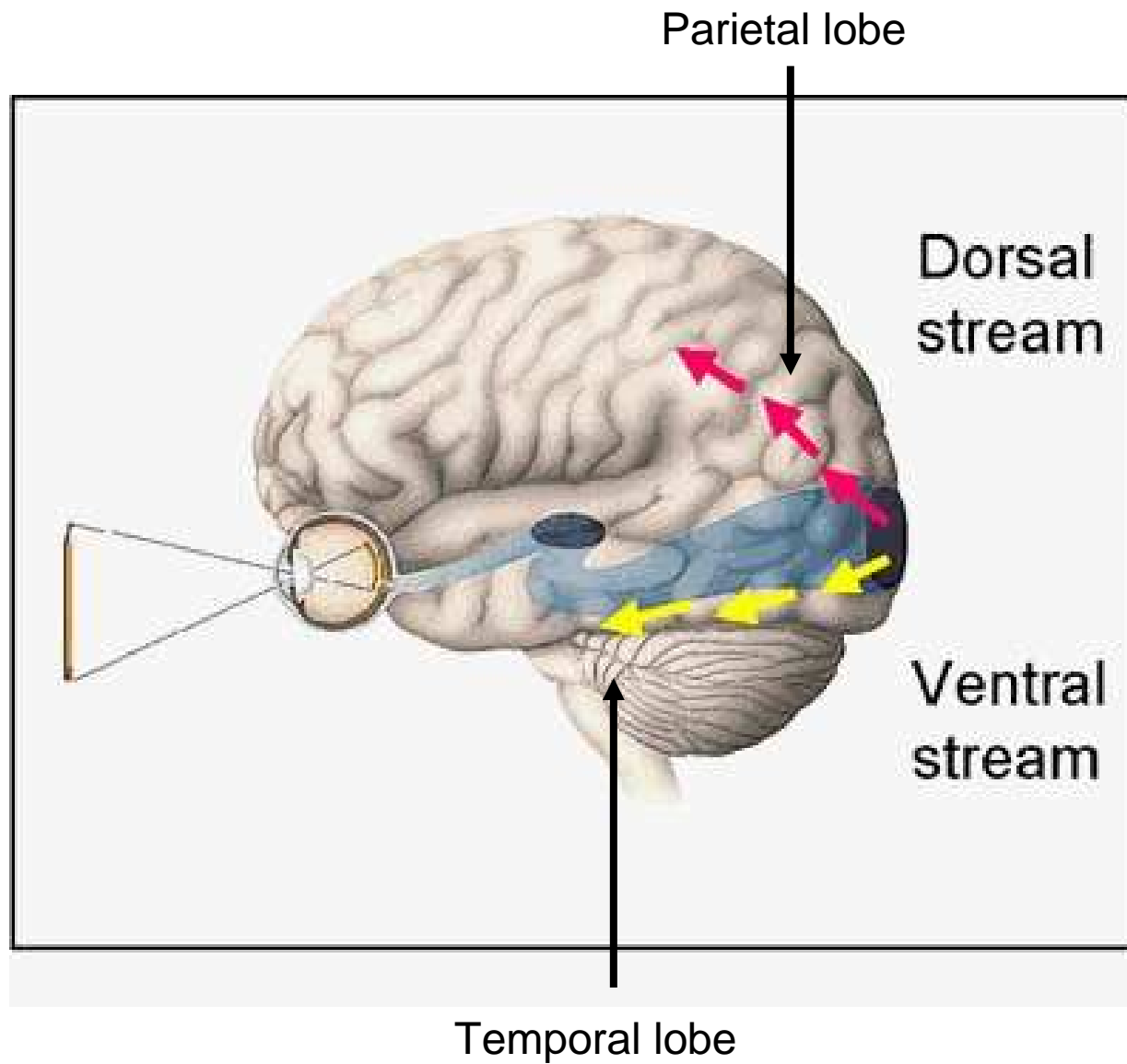


(a) Object discrimination



(b) Landmark discrimination

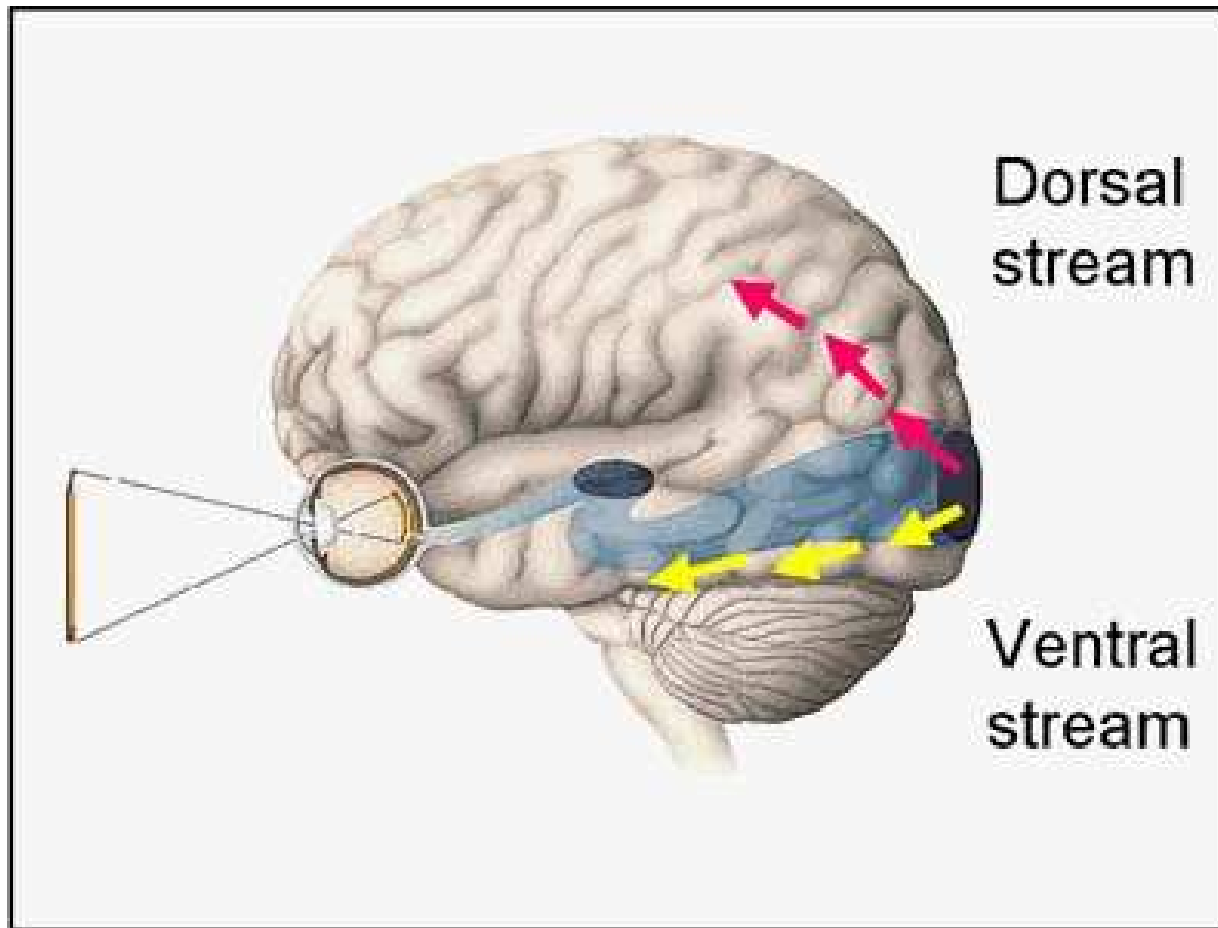
Beyond V1: Dorsal and Ventral pathways



Dorsal and Ventral pathways: a second interpretation

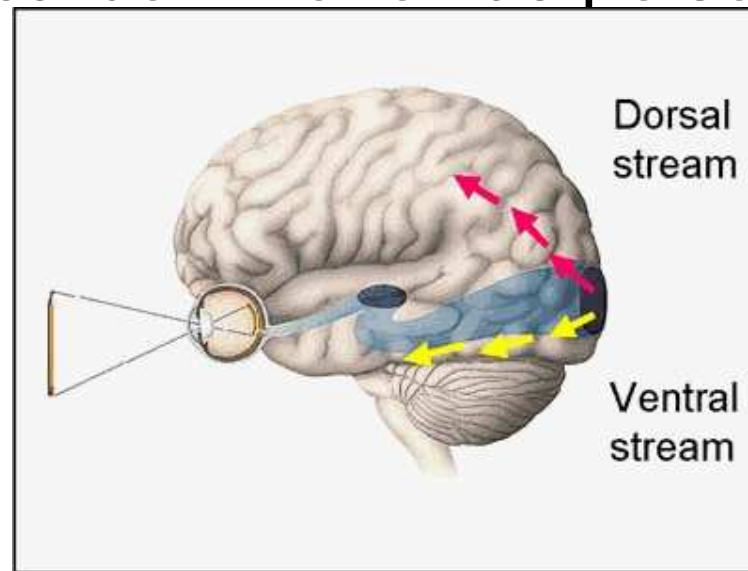
Milner and Goodale's idea:

- Dorsal pathway – not where, but 'how'

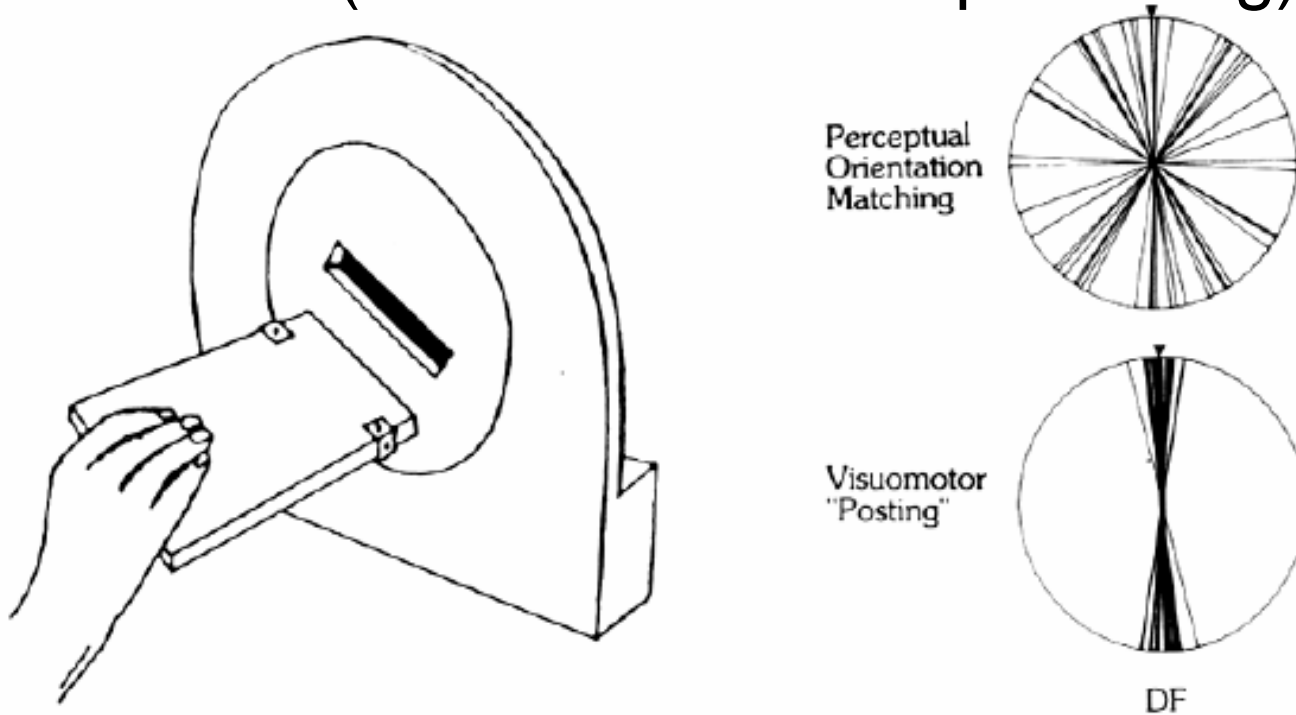


What and How Pathways – Neuropsychological Evidence

- Behavior of patient D.F.
 - Damage to ventral pathway due to gas leak (carbon monoxide poisoning)

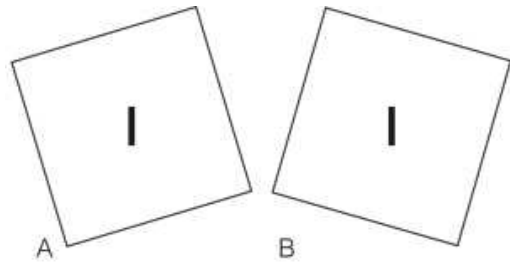


- Behavior of patient D.F.
 - Damage to ventral pathway due to gas leak (carbon monoxide poisoning)

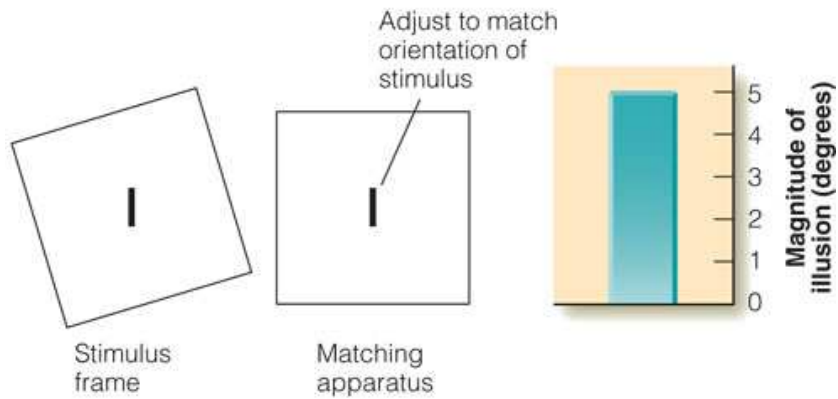


D.F. can't tell you the orientation of the slot, but he can actively post a letter into it.

The Rod and frame illusion.



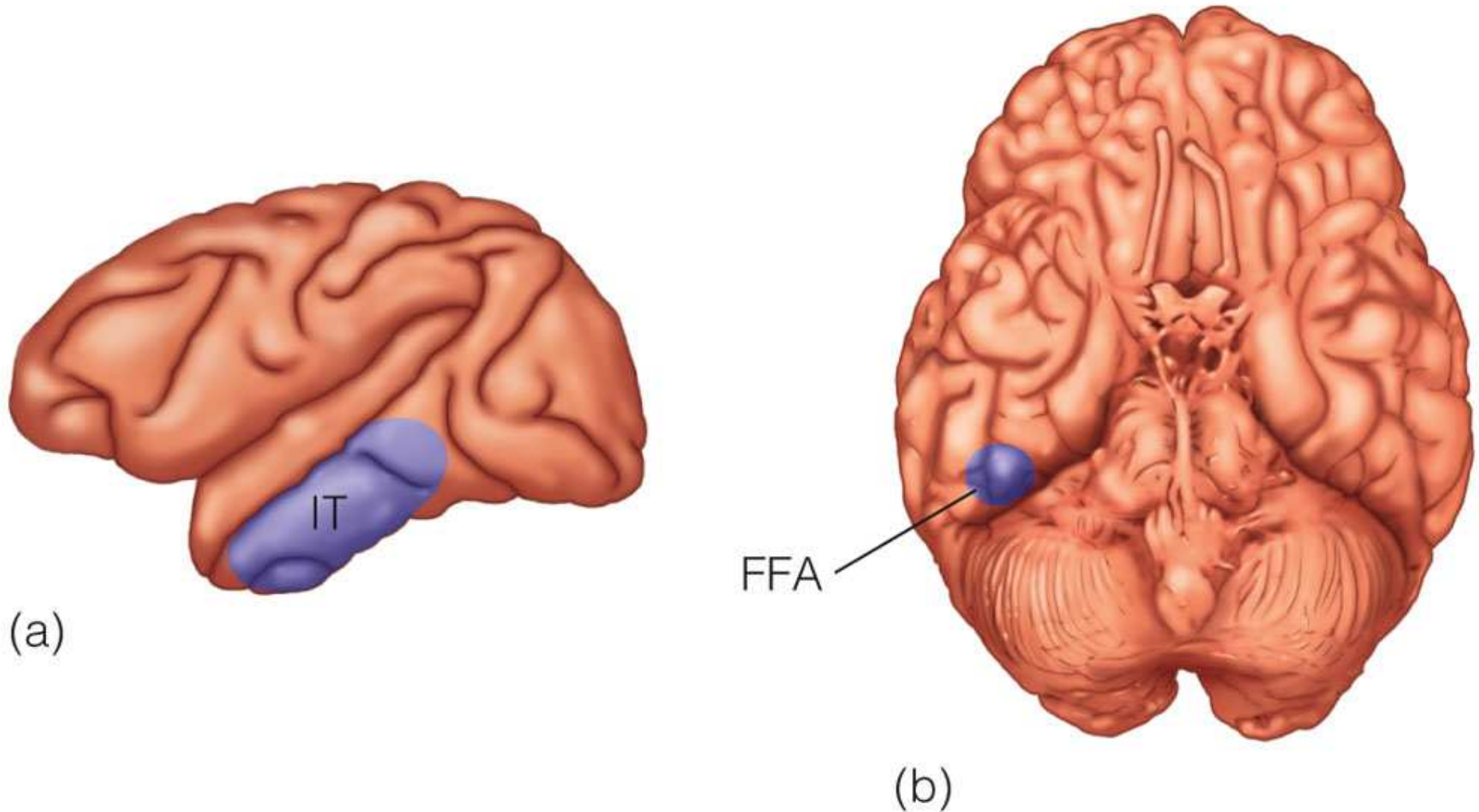
(a) Rod and frame illusion



(b) Matching task

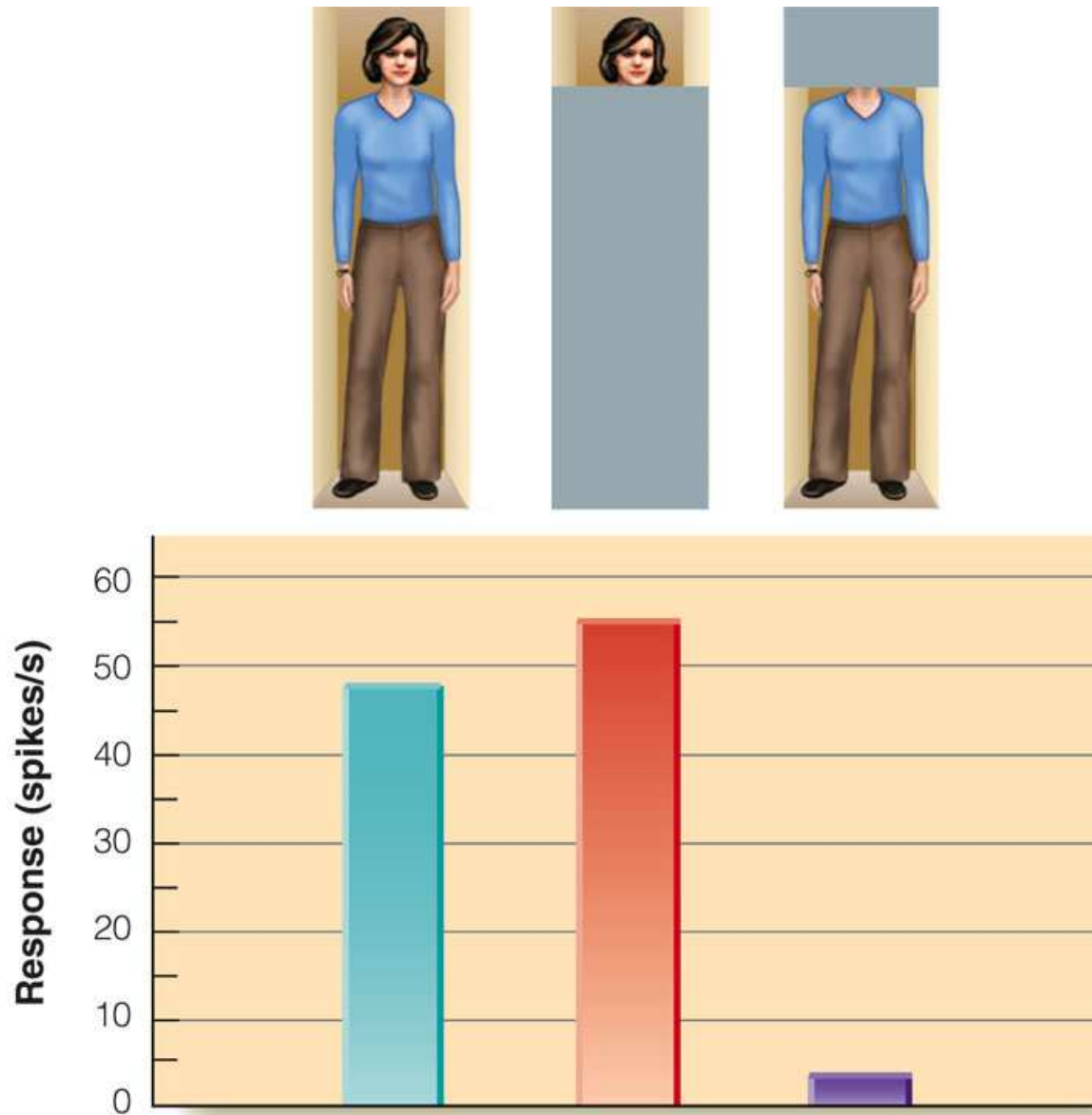
Subjects see the illusion

'Modules' in the ventral pathway of the macaque and humans



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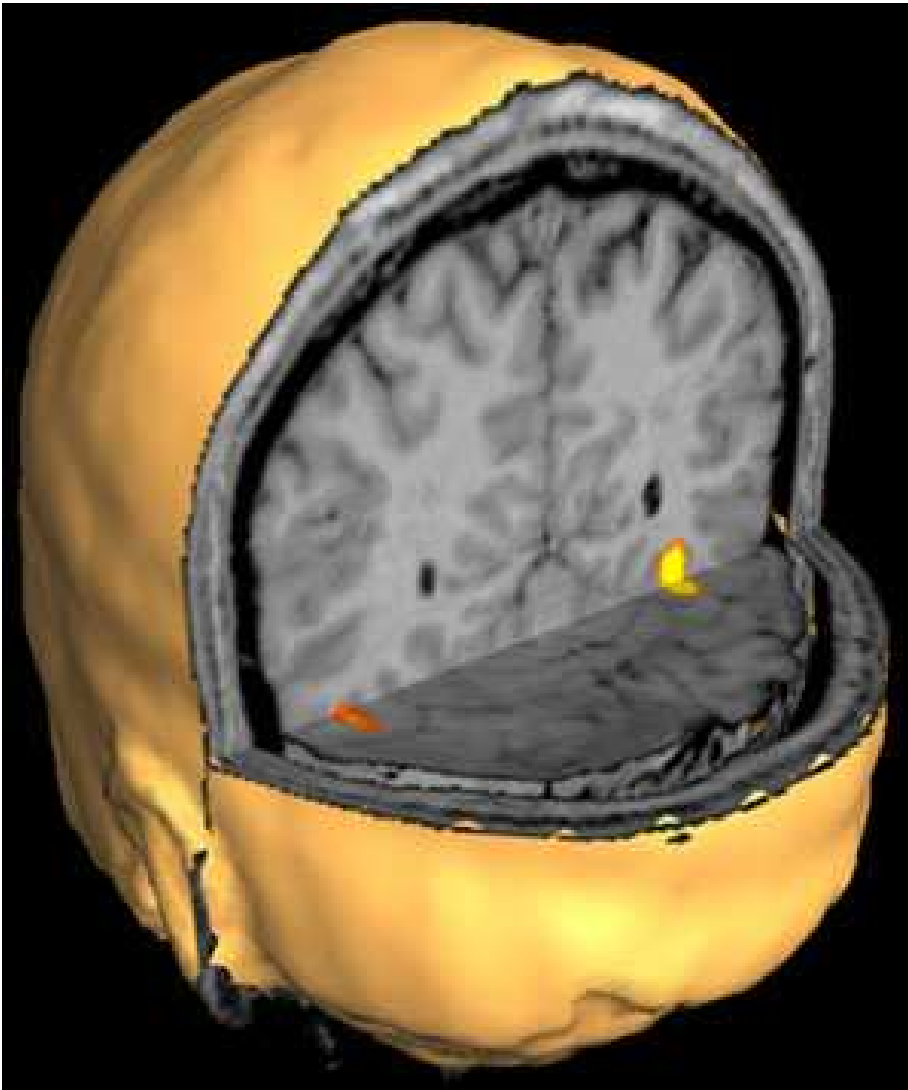
Figure 4.18 (a) Monkey brain showing location of the inferotemporal cortex (IT) in the lower part of the temporal lobe. (b) Human brain showing location of the fusiform face area (FFA) in the fusiform gyrus, which is located under the temporal lobe.



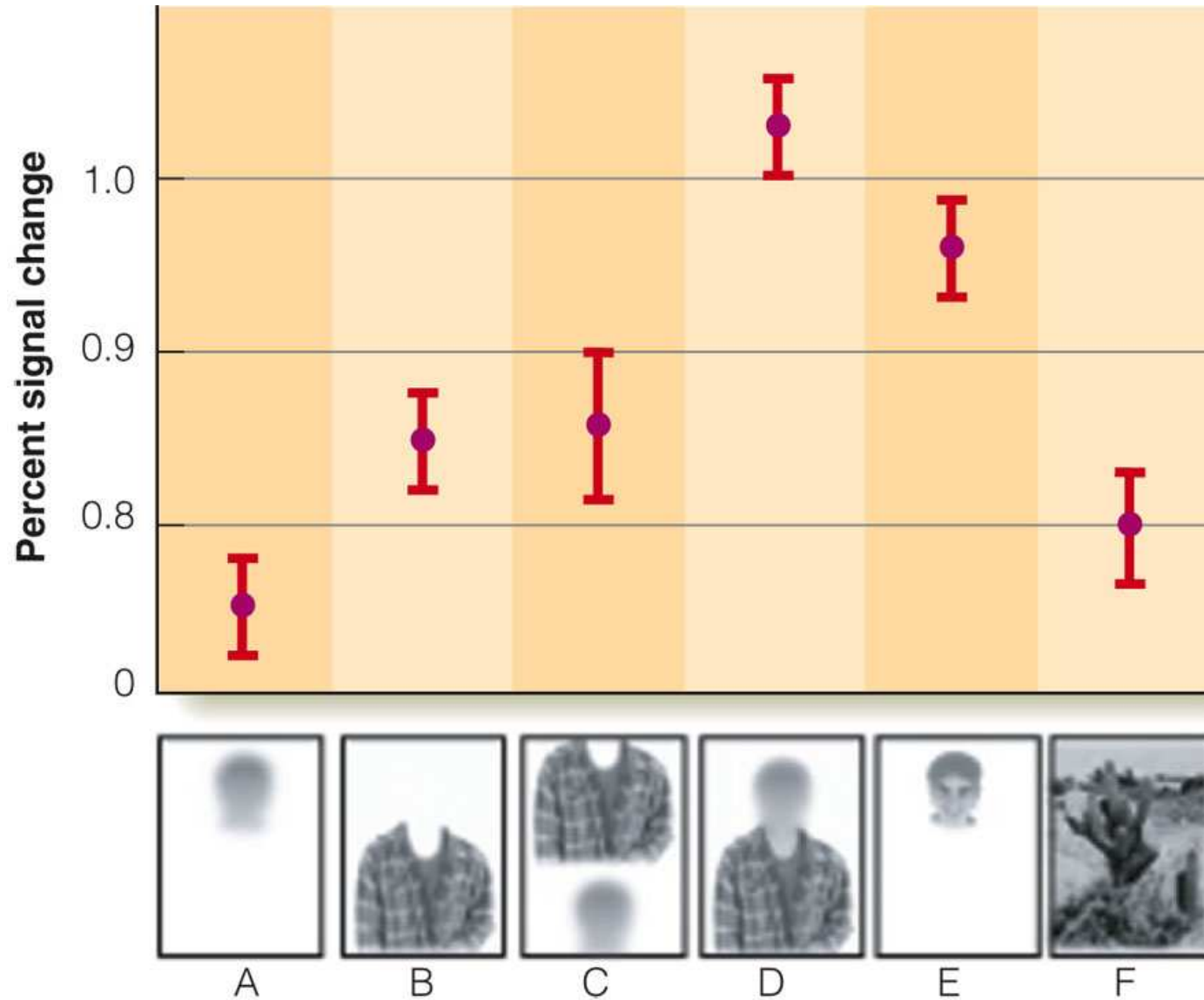
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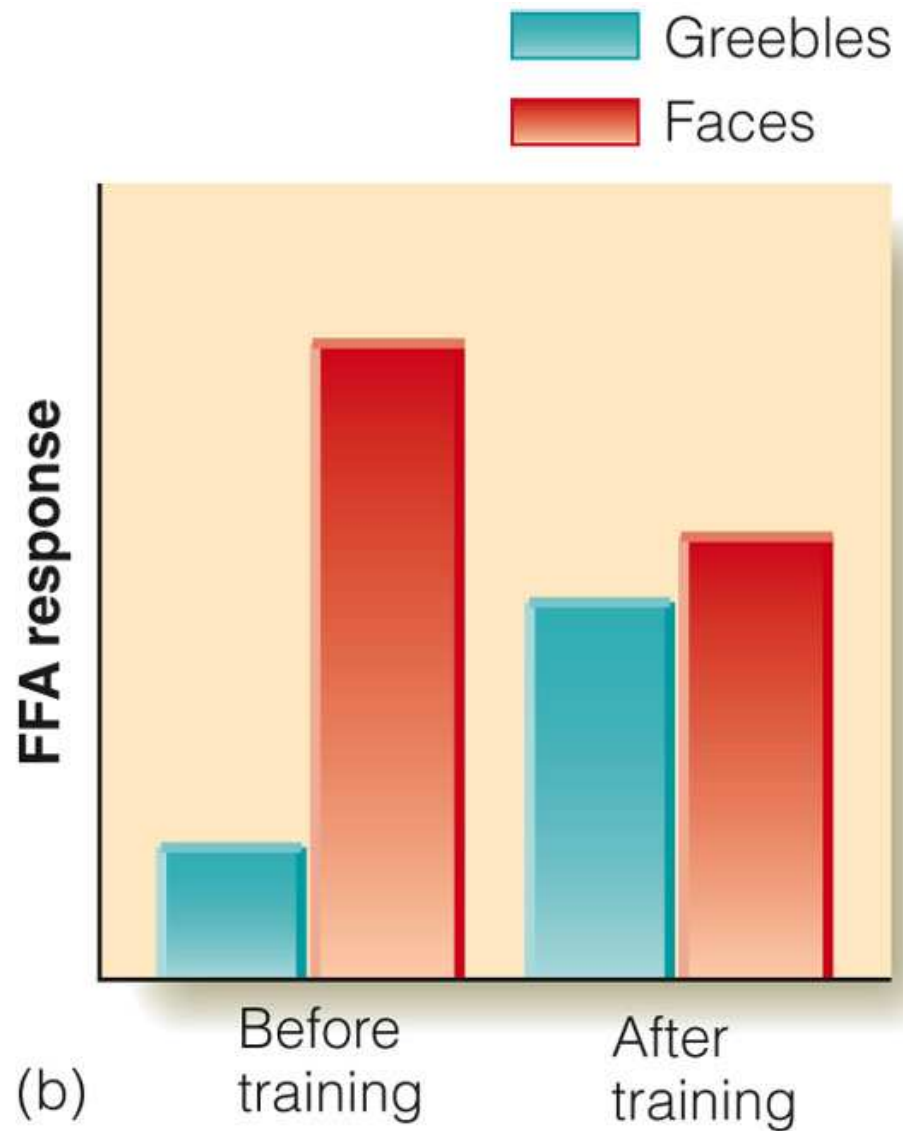
Figure 4.20 Response of a neuron in the IT cortex for which the person's head is an important part of the stimulus because firing stops when the head is covered.

the 'Fusiform Face Area' (FFA) in the human ventral pathway



fMRI responses in the 'Fusiform Face Area' (FFA)

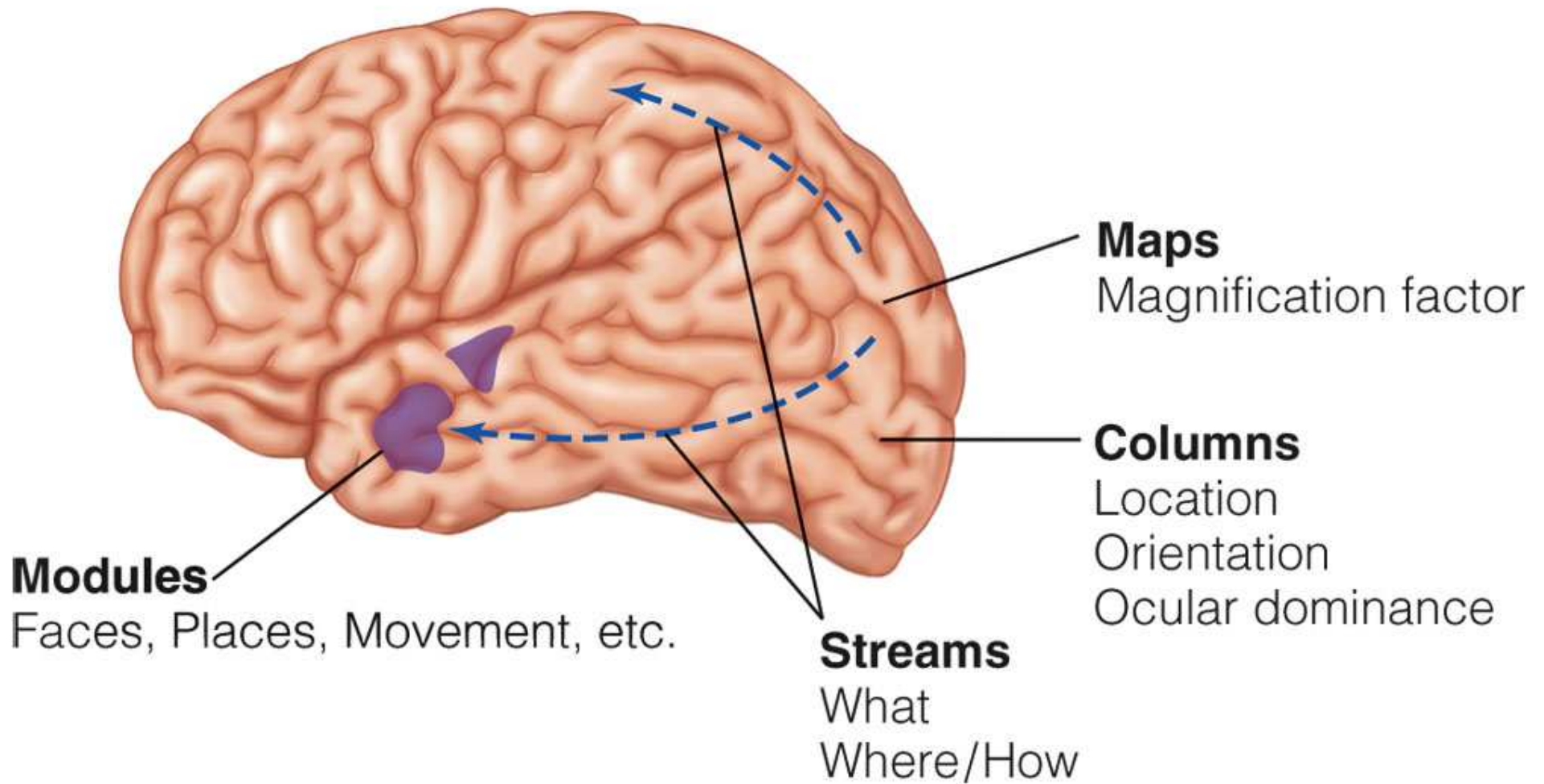




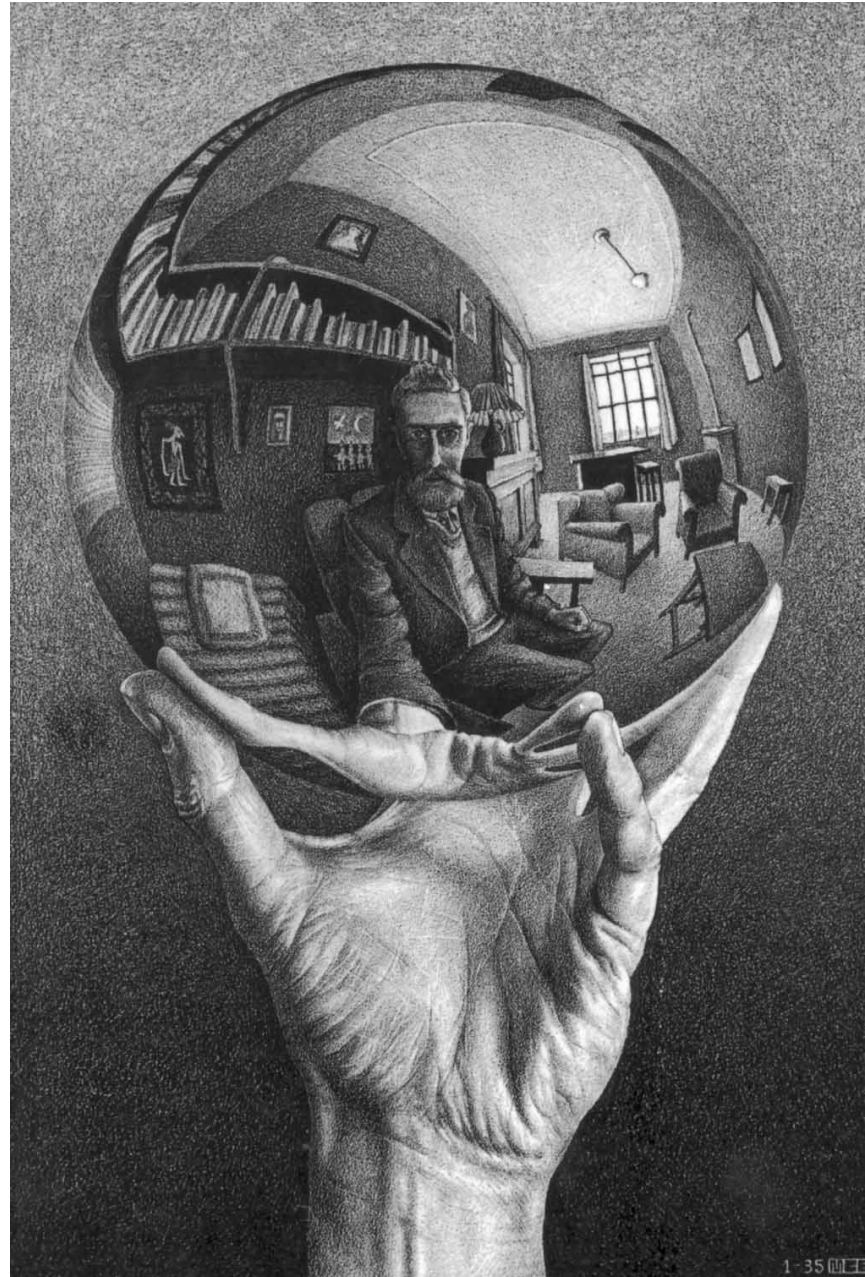
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Figure 4.24 (a) Greeble stimuli used by Gauthier. Participants were trained to name each different Greeble. (b) Brain responses to Greebles and faces before and after Greeble training. (a: From Figure 1a, p. 569, from Gauthier, I., Tarr, M. J., Anderson, A. W., Skudlarski, P. L., & Gore, J. C. (1999). Activation of the middle fusiform “face area” increases with experience in recognizing novel objects. *Nature Neuroscience*, 2, 568-573.)

Summary of Chapter 4

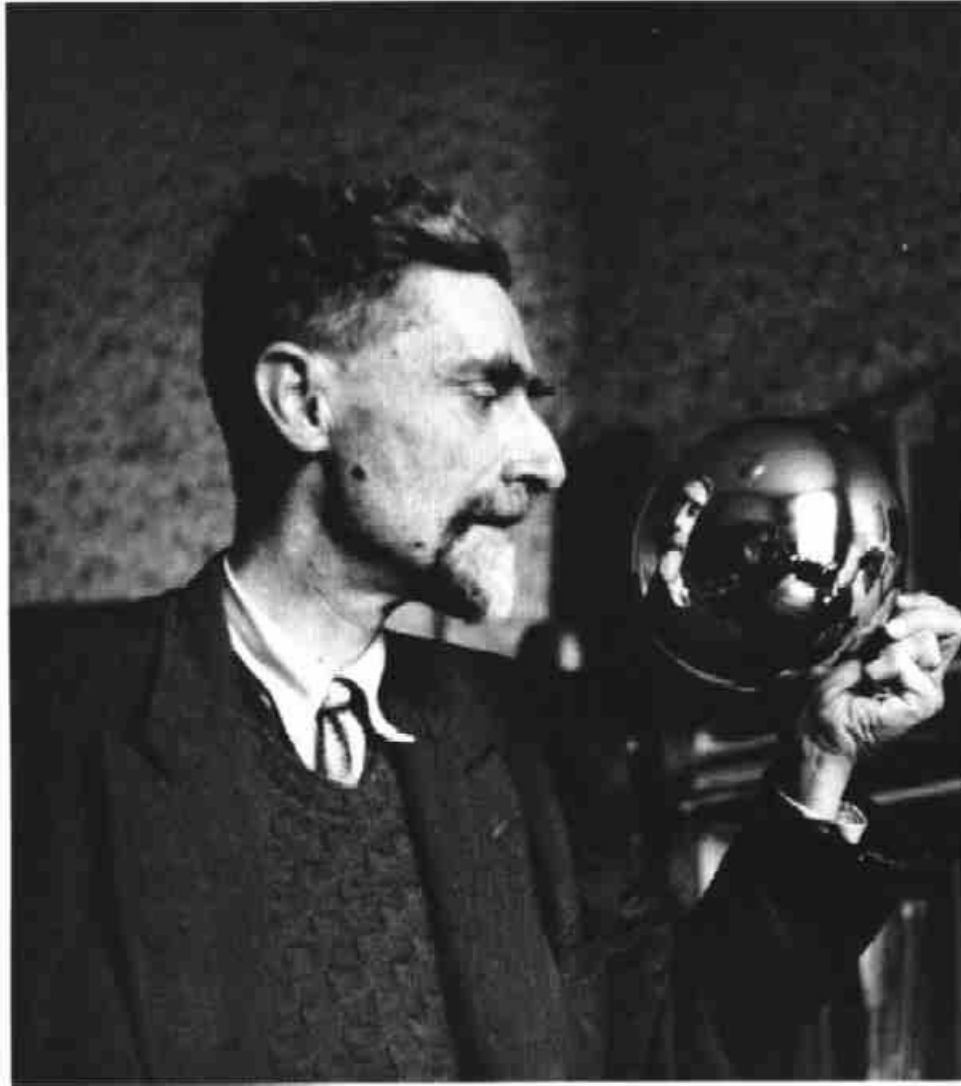


Chapter 5: Perceiving Faces and Objects



M.C. Escher

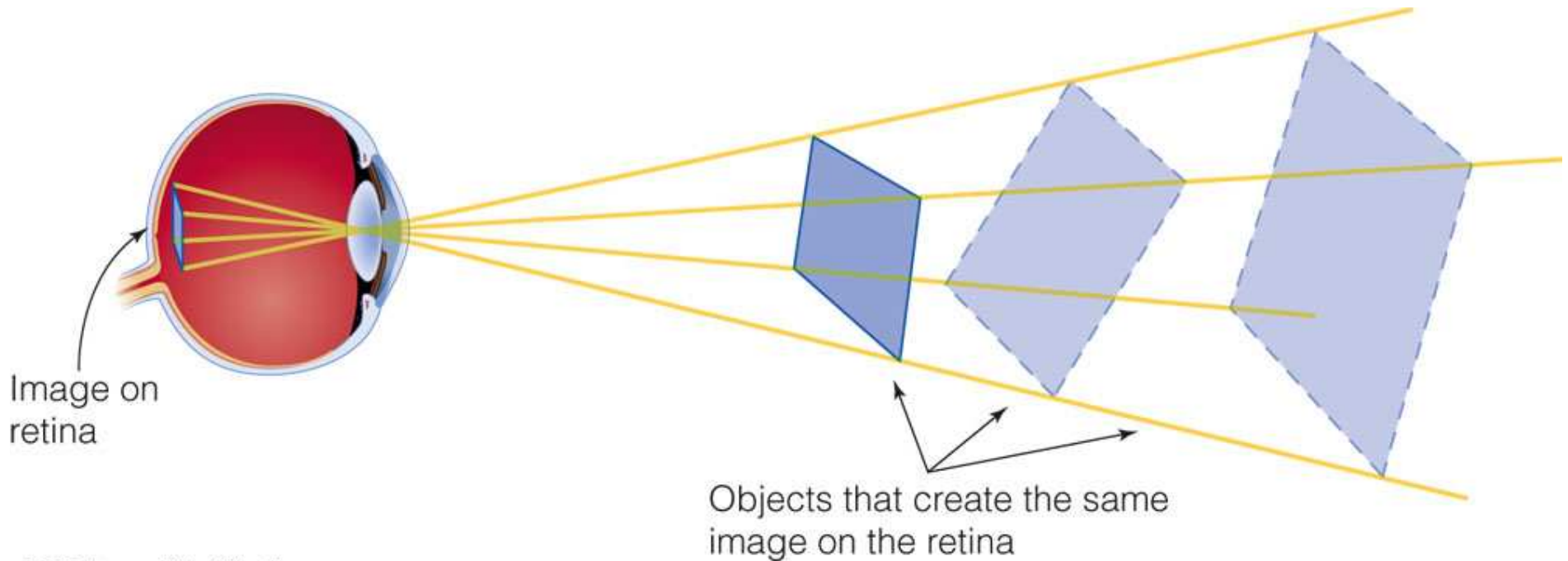
Chapter 5: Perceiving Faces and Objects



M.C. Escher

The Challenge of Object Perception

- The stimulus on the receptors is ambiguous
 - Inverse projection problem: an image on the retina can be caused by an infinite number of objects



The Challenge of Object Perception

- 1) Gestalt laws of perceptual organization
- 2) Figure-Ground segregation
- 3) Face perception



The Challenge of Object Perception

- Objects can be hidden or blurred
 - Occlusions are common in the environment



The Challenge of Object Perception

- The reasons for changes in lightness and darkness in the environment can be unclear – shadows cause huge differences in illumination



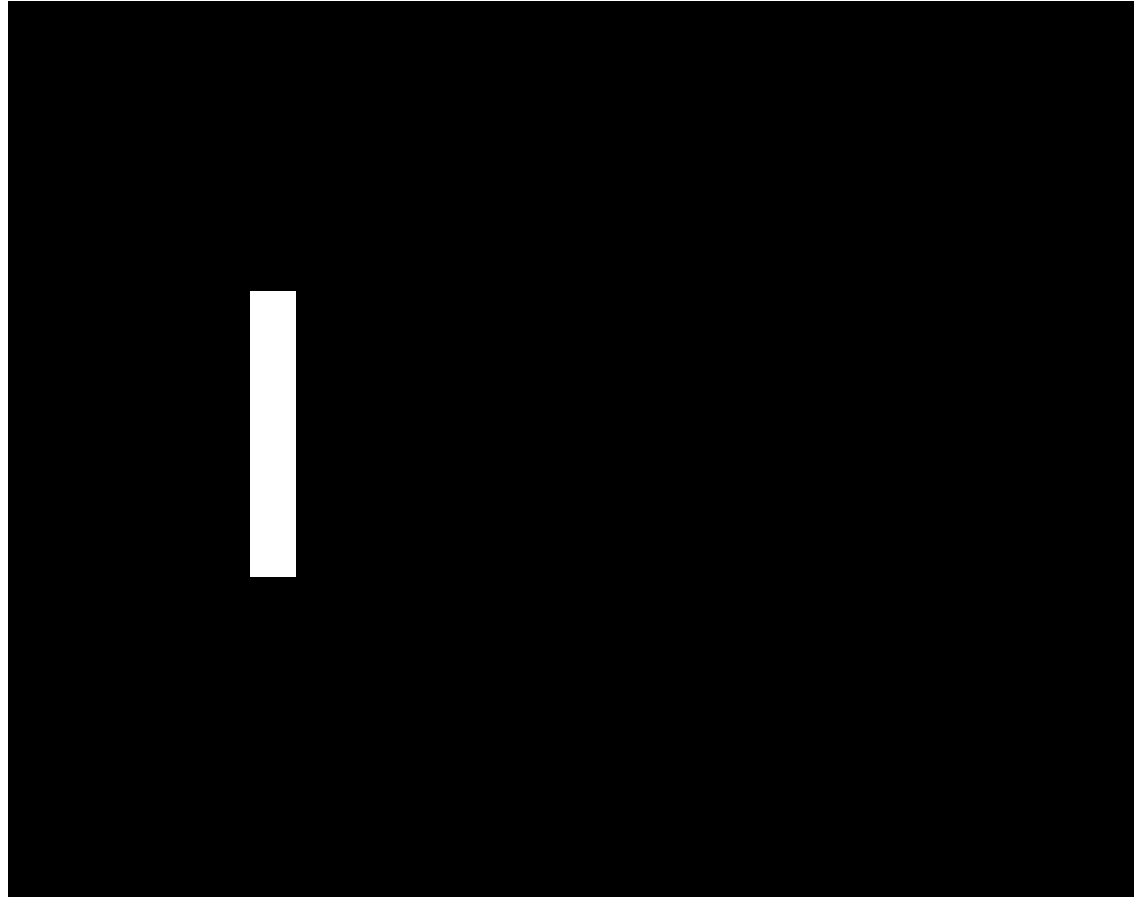
The Structuralist Approach

- Approach established by Wundt (1830-1920)
 - States that perceptions are created by combining elements called sensations
 - Popular in mid to late 19th century

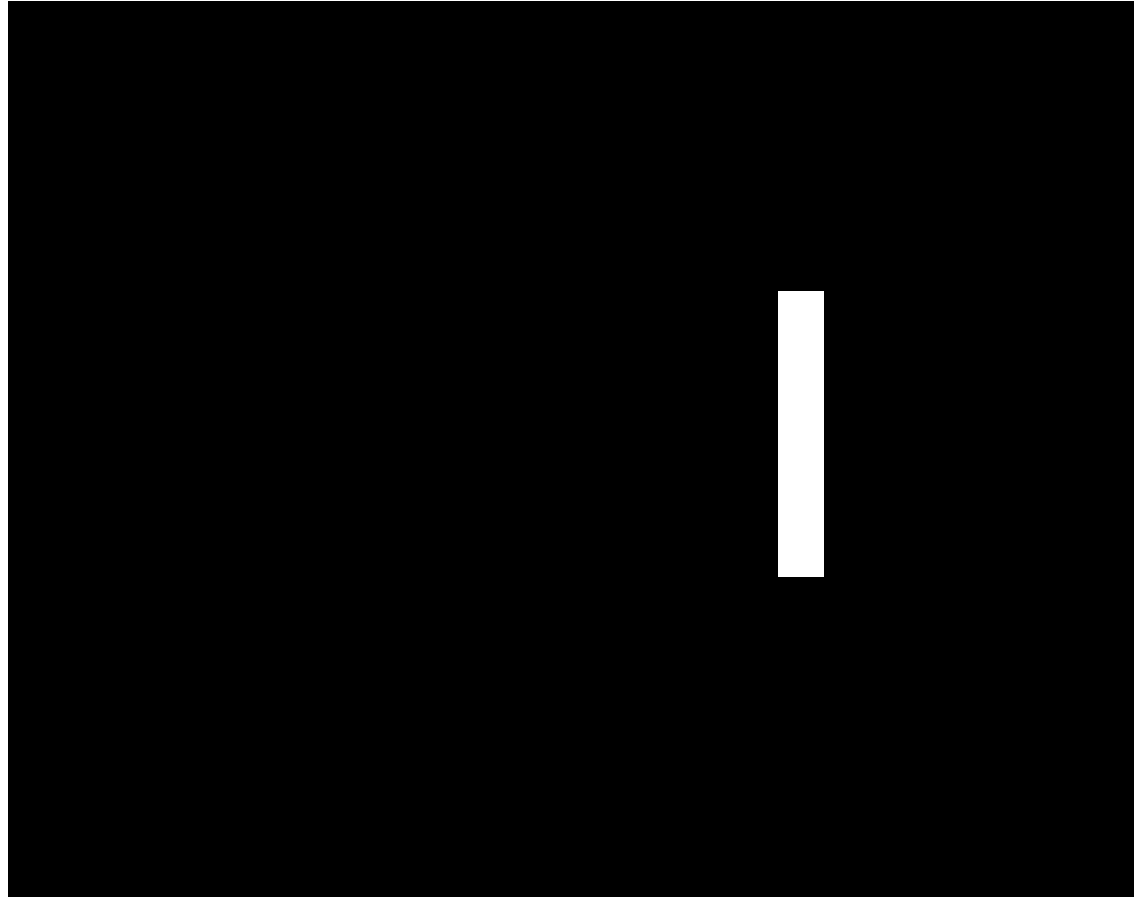


Wundt studied conscious experience by examining its *structure* or components parts (sensations, feelings) using individuals who were trained in *introspection*. This "school of psychology" became known as *structuralism*.

–Structuralism could not explain ‘apparent motion’



–Structuralism could not explain ‘apparent motion’



–Structuralism could not explain ‘illusory contours’ either.

