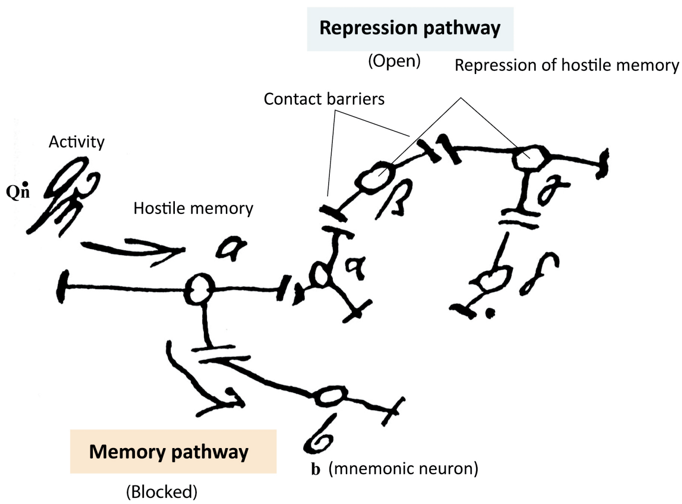
AGE OF INSIGHT

eBook Supplement: Charts and Images

Freud's Neural Model of a Primary Defense: Repression (modified)



Contemporary View of Freud's Neural Model of a Primary Defense: Repression

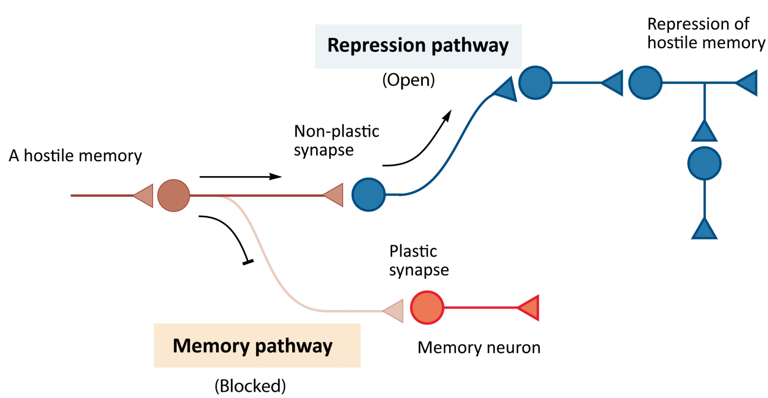


Fig. 5-1. Freud's neural circuit for repression
based on his neural model of mind.

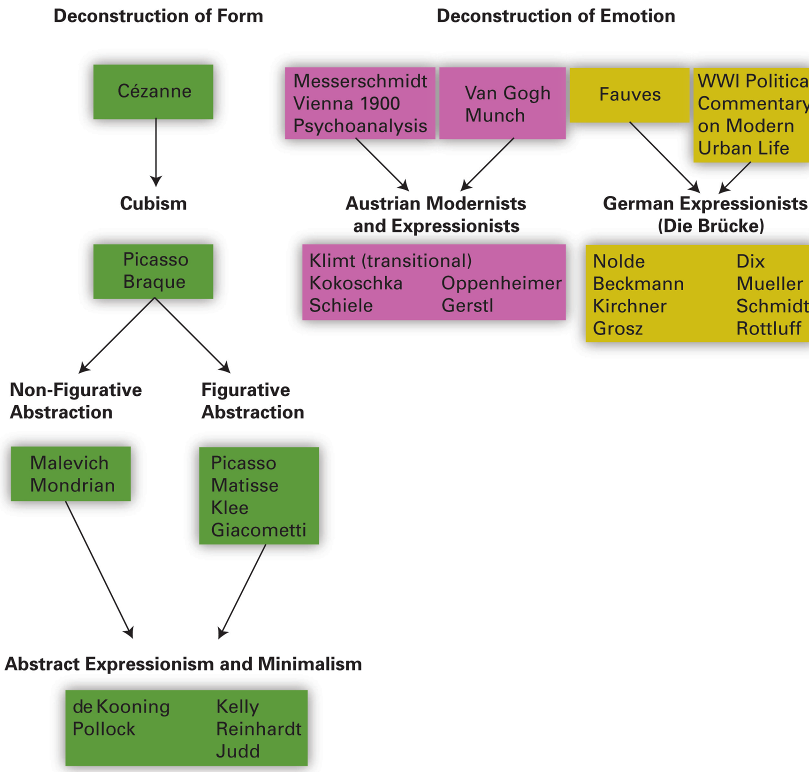


Figure 13-1. Highly simplified illustration of the two types of experiments that have charcterized art since impressivism.

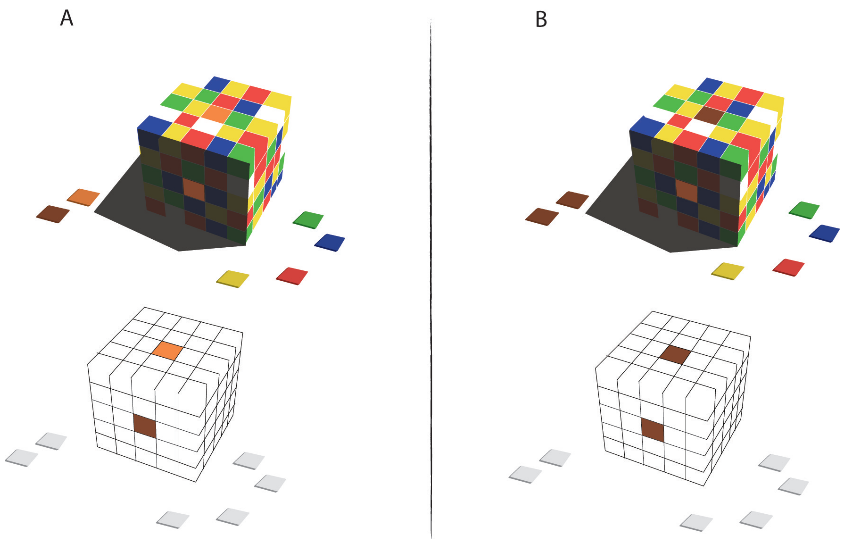


Figure 14-6. Color constancy. In the top portion of Panel A, the center square of both the front and the top of the cube appear to be the same shade of orange. When these two squares are seen in isolation from lighting cues, in the bottom portion of the panel, it is apparent they are in fact different colors. The reason they appear the same is the brain understands that the cube's front is shadowed and so it adjusts color perception accordingly to compensate for a darker set of hues. In Panel B, the two squares are the same color. Yet the brain compensates for the shadow again so the squares appear to be different colors.

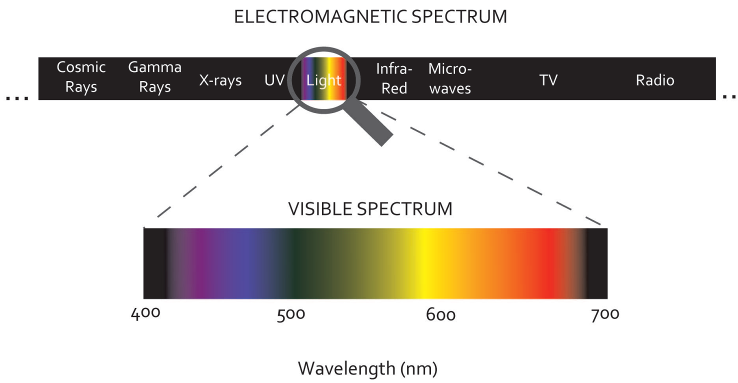


Figure 15-2. Humans have evolved to perceive the visible spectrum which is a small portion of the entire electromagnetic spectrum.

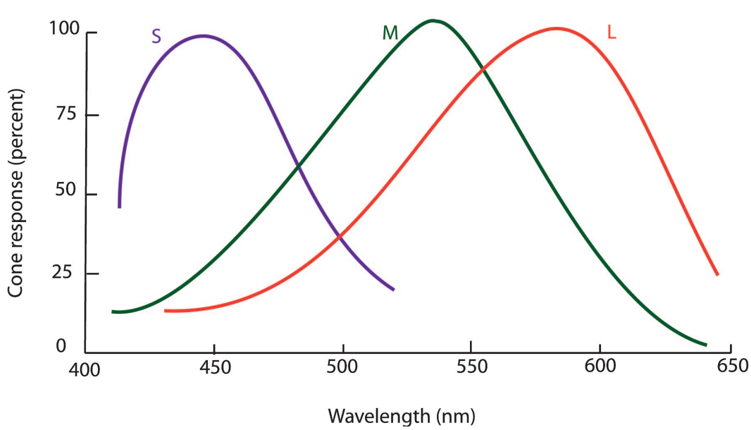


Figure 15-3. Sensitivity of three cone types.

A. Full color image

Figure 15-6A. A normal full-color image of flowers contains information about variations in brightness and color.

B. Black and white only

B. A black-and-white image shows brightness variations. Spatial detail is easily discerned in this kind of image.

C. Color only

C. A purely chromatic image contains no information about variations in brightness, only information about hue and saturation. Spatial detail is hard to discern.

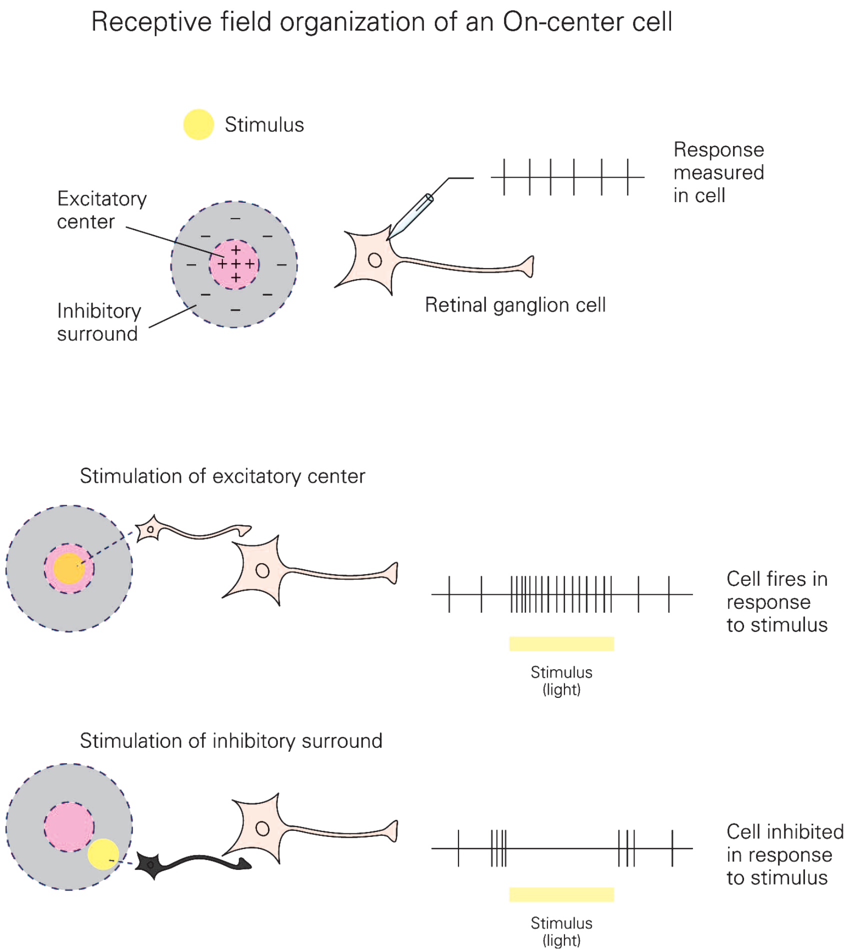

Receptive field organization of an On-center cell
Stimulus
Response measured in cell
Excitatory center
Inhibitory surround
Retinal ganglion cell
Stimulation of excitatory center
Cell fires in response to stimulus
Stimulus (light)
Stimulation of inhibitory surround
Cell inhibited in response to stimulus
Stimulus (light)

Figure 15-12

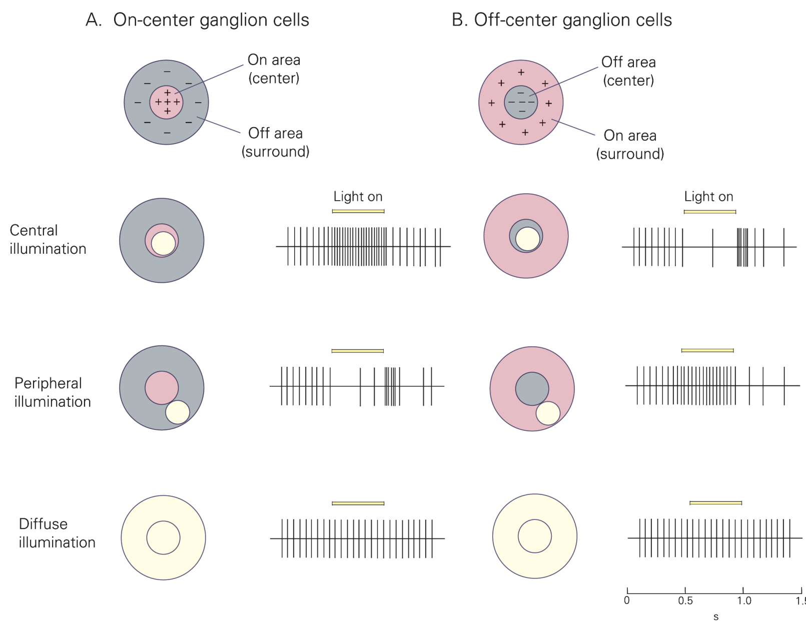


Figure 15-13. Retinal ganglion cells respond optimally to contrast in their receptive fields. Ganglion cells have circular receptive fields, with specialized center and surround regions. On-center cells are excited when stimulated by light in their center and inhibited when light strikes their surround; off-center cells have the opposite responses. The figure shows the responses of both types of cells to three different light stimuli (the stimulated portion of the receptive field is shown in yellow). The pattern of action potentials fired by the cell in response to each stimulus is shown in extracellular recordings. The duration of illumination is indicated by a bar above each record. (Adapted from Kuffler, 1953.)

A. On-center cells respond best when the entire central part of the receptive field is stimulated by a spot of light. These cells also respond well, but less vigorously, when only a portion of the central field is stimulated by a spot of light. Illumination of the surround by a spot of light reduces or suppresses the cell's firing, which resumes more vigorously for a short period after the light is turned off. Diffuse illumination of the entire receptive field elicits a relatively weak response because the center and surround oppose each other's effects.

B. The spontaneous firing of off-center cells is suppressed when the central area of the receptive field is illuminated, but it accelerates for a short period after the stimulus is turned off. Light shone onto the surround of the receptive field excites the cell.

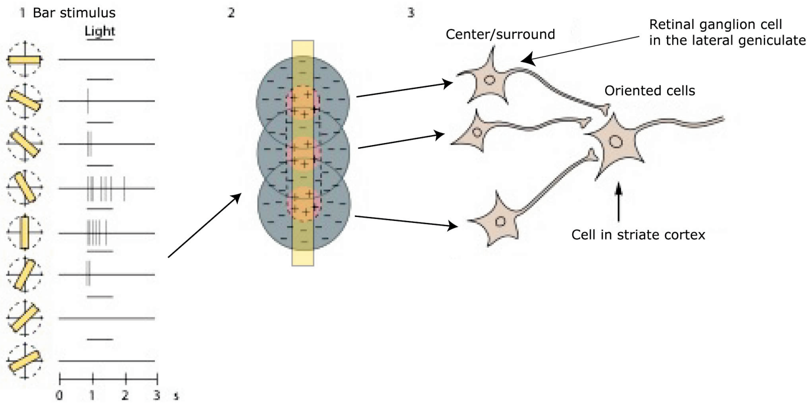


Figure 16-6. 1. The receptive field of a cell in the primary visual cortex is determined by recording its activity while bars of light are projected onto the receptive field on the retina. The duration of illumination is indicated by a horizontal line above each record of action potentials. The cell's response to a bar of light is strongest if the bar is vertically oriented in the center of its receptive field.

2. The receptive fields of simple cells in the primary visual cortex have narrow, elongated zones with either excitatory (+) or inhibitory (-) areas. Though the types of stimuli they respond to vary, the receptive fields of these cortical cells share three features: 1) a specific position on the retina, 2) discrete excitatory and inhibitory zones, and 3) a specific axis of orientation.

3. A model of the organization of inputs in the receptive field of simple cortical cells first proposed by Hubel and Wiesel. According to this model a neuron in the primary visual cortex receives excitatory connections from three or more on-center cells that together represent light falling along a straight line in the retina. As a result, the receptive field of the cortical cell has an elongated excitatory region, indicated by the colored outline in the diagram. The inhibitory surround is probably provided by off-center cells whose receptive fields (not shown) are adjacent to those of the on-center cells. (Adapted from Hubel and Wiesel, 1962.)

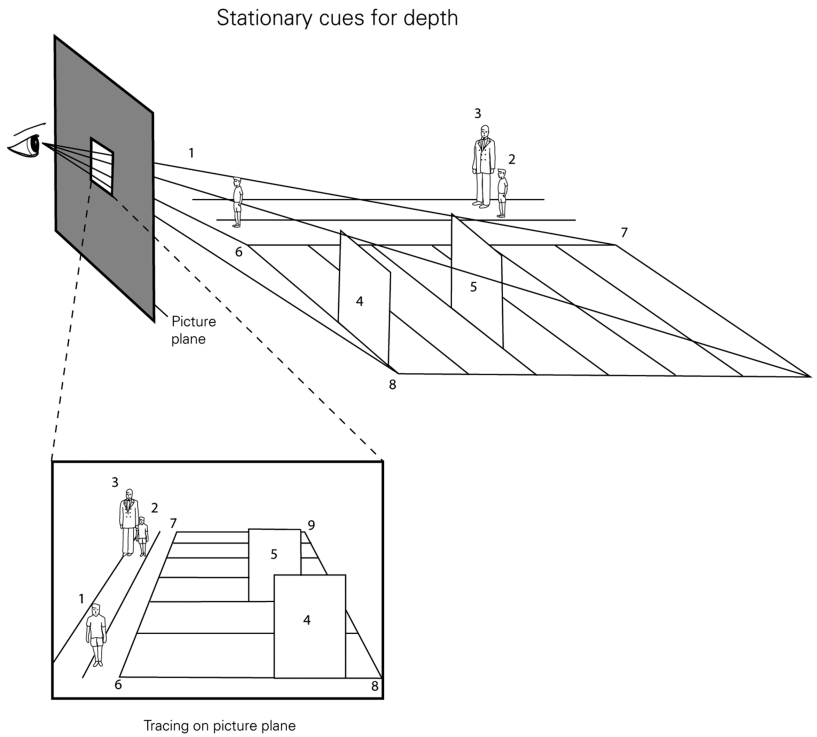


Figure 16-7. *Occlusion:* The fact that rectangle 4 interrupts the outline of rectangle 5 indicates that rectangle 4 is in front, but not how much distance there is between them.

Linear perspective: Although lines 6-7 and 8-9 are parallel, they begin to converge in the picture plane.

Relative size: Because we assume the two boys are the same size, the smaller boy (2) is assumed to be more distant than the larger boy (1) in the picture plane. This is also how we know how much closer rectangle 4 is than 5.

Familiar size: The man (3) and the nearest boy are drawn to nearly the same size in the picture. If we know that the man is taller than the boy, we deduce on the basis of their sizes in the picture that the man is more distant than the boy. This type of cue is weaker than the others. (Adapted from Hochberg 1968 as cited in Kandel et al., "Principles of Neural Science IV," p. 559.)

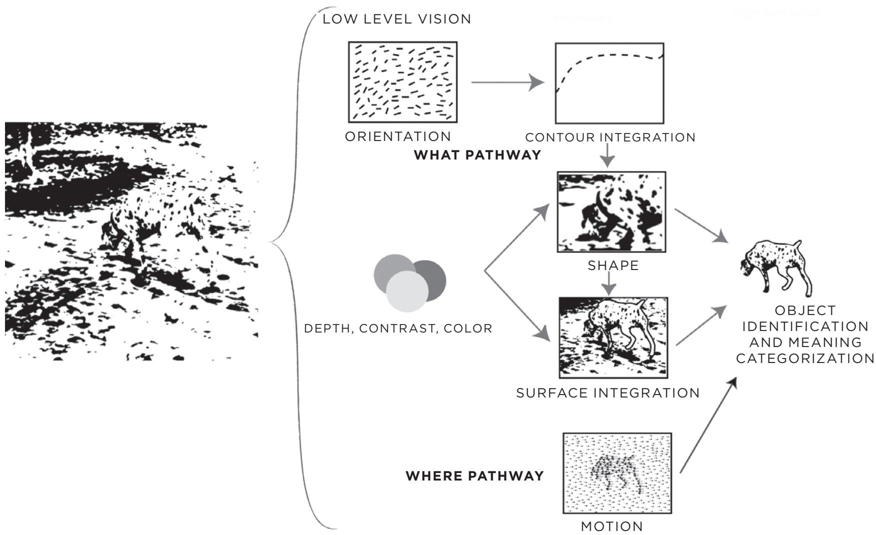


Figure 16-12. The image of the dog at the left is deconstructed and processed at three different levels of vision and along two pathways. *Low-level vision* identifies the location of the dog in space and its color. *Intermediate-level vision* assembles the shape of the dog and defines it as separate from its background. *High-level vision* enables the recognition of a specific object, the dog, and its setting.

The *what pathway* is concerned with the shape and color of the dog's image, and the *where pathway* is concerned with the movements of the dog. The what pathway deconstructs and reconstructs the image in three processing stages.

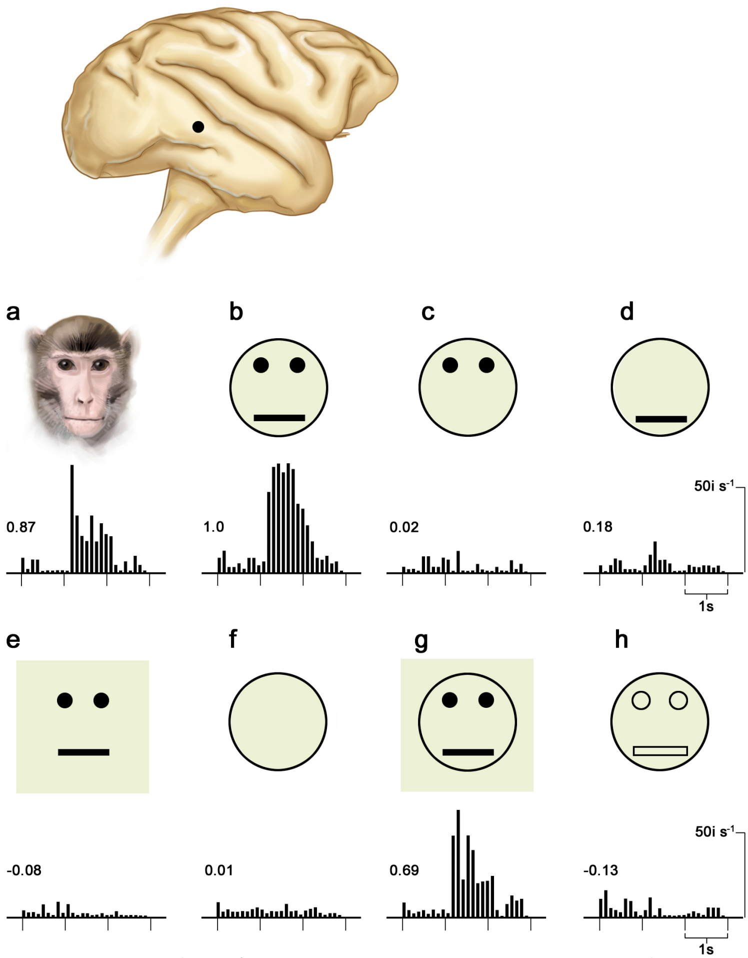
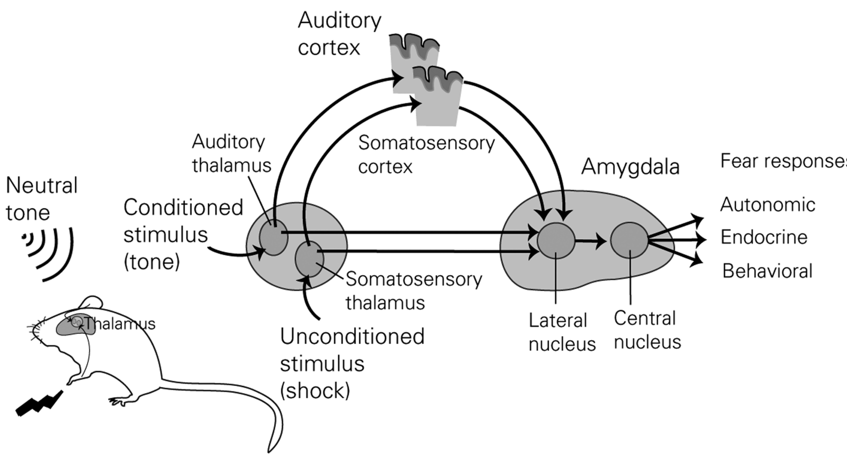


Figure 17-6. Holistic face detection. *Top:* Recording site and location of a face cell in monkey brain. *Bottom (a–h):* facial stimuli presented and responses of the face cell. The height of the bars indicates the firing rate of that cell and thus the strength of face recognition in relation to each stimulus.



The animal hears a tone then immediately feels a shock to its feet.

Impulses from the ear and the foot converge in the thalamus (in separate auditory and somatosensory areas).

The impulses travel from the thalamus through both a direct and an indirect pathway to the amygdala, where they cause the fear responses.

Figure 21-3

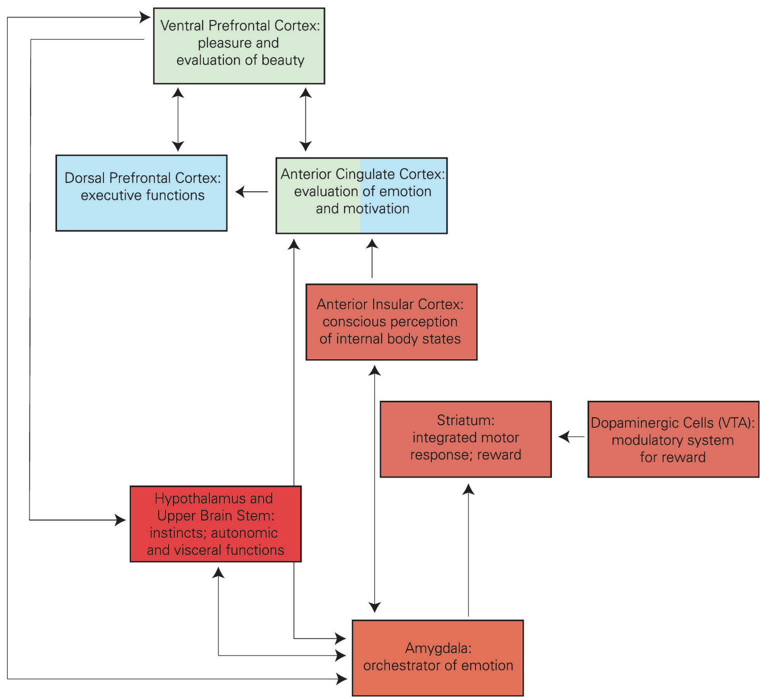


Figure 22-7. Interconnectivity of the amygdala with other structures involved in emotion: the striatum, cingulate cortex, and the prefrontal cortex.

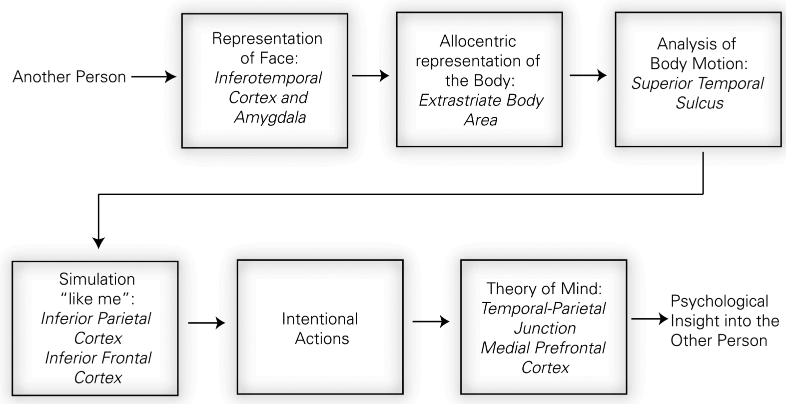


Figure 25-2. Flow diagram for neural circuits involved in the beholder's share and in the social brain.

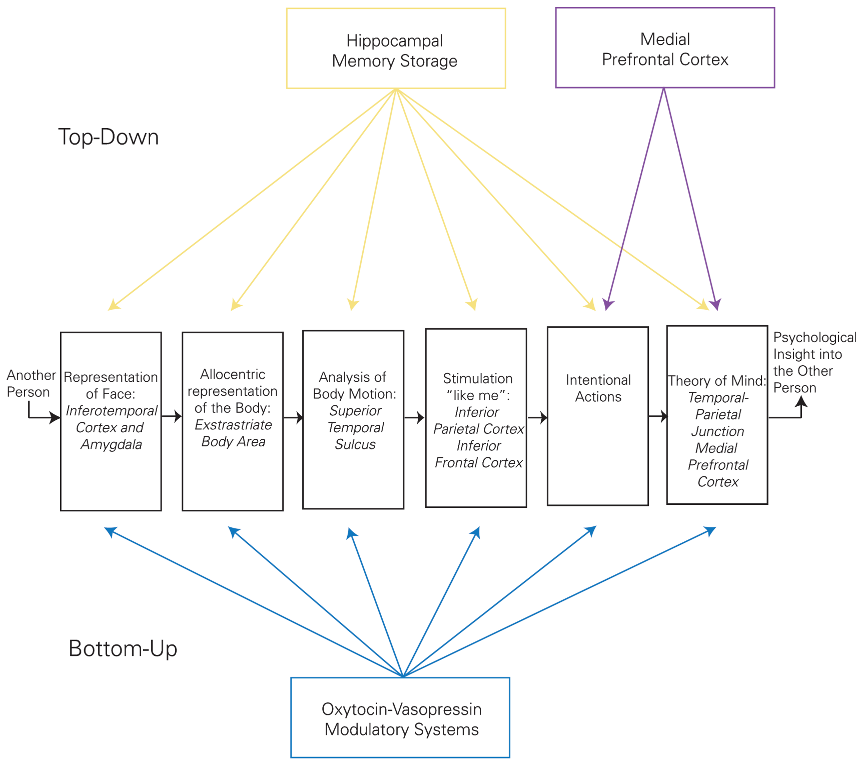


Figure 26-2. Bottom-Up and Top-Down modulation of the neural circuits involved in the beholder's share and in the social brain.

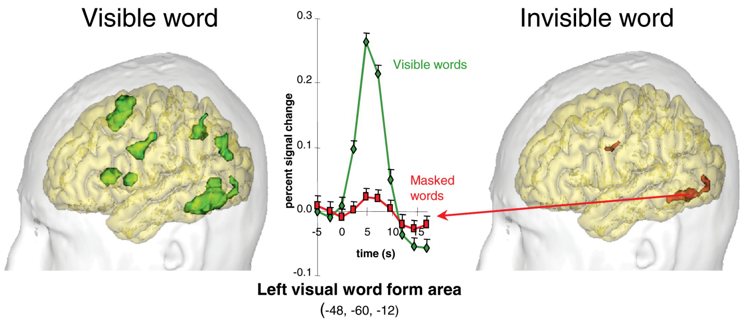


Figure 29-1. The brain on the left depicts the widespread neuronal activity in response to a consciously perceived written word. The brain on the right depicts the localized neuronal activity in response to an unconsciously perceived written word. In this case the word is surrounded by a *masking stimulus*—a set of unrelated stimuli presented immediately before and after the word—which renders the word illegible while preserving unconscious visual detection. This activates neurons in specialized areas of the left primary visual cortex and temporal lobe. In contrast, a word that is consciously perceived activates not only areas of the cortex involved in unconscious perception but also pyramidal cells in widely distributed areas of the inferior parietal, prefrontal, and cingulate cortices.