

VISUAL PERCEPTION OF MOTION

- 1) Distinction between object motion and our motion

- 2) Two types of motion:
 - a) General movement of “something”

 - b) Specific motion of an identified or defined object

- 3) Notes:
 - a) Perception of movement is a product of the nervous system

 - b) Perception of movement involves more than just the retina

 - c) Perception of movement involves an interplay of more than one sensory system

 - d) Perception of movement requires heuristics, best-guesses, and inexact processes

4) Creating the perception of movement

a) Real movement

b) Apparent movement

c) Induced movement

d) Movement aftereffect

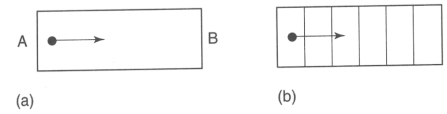


Figure 8.5

The context in which movement occurs affects movement perception. It is easier to detect movement in (b) than in (a) because of the structure provided by the vertical lines in (b).

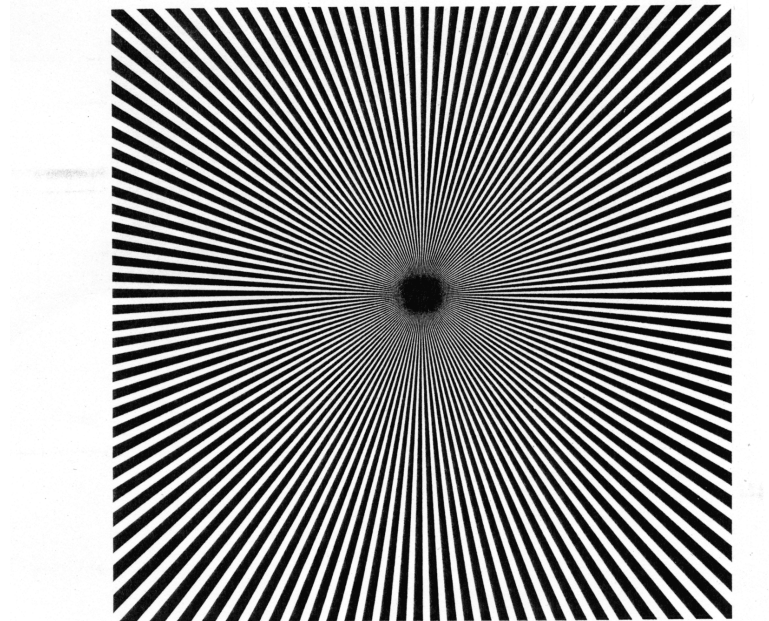


figure 8.15 An example of a geometric pattern that produces afterimages in which motion can be perceived. If the center of the pattern is fixated for approximately 20 sec and then the afterimage is projected on a plain white surface, rotary motion is usually perceived. (Source: From D. M. MacKay, Ways of looking at perception, in W. Wathen-Dunn (Ed.), *Models for the perception of visual form*, Cambridge, Mass.: MIT Press, 1967. By permission of the MIT Press.)

5) Detecting movement

a) Neural feature detectors & movement perception

i) Complex and end-stopped cells

ii) Detection circuit

iii) Medial temporal (MT) cortex in dorsal (upward) path

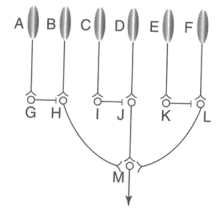


Figure 8.14
A neural circuit in which a neuron (M) responds to the movement of a stimulus across the receptors from right to left. The neuron does not, however, respond to movement from left to right

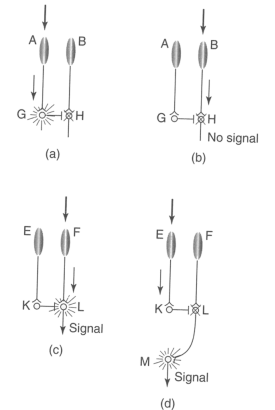


Figure 8.15
What happens as a light moves across the receptors of Figure 8.14. (a and b) Movement of a light from left to right; (c and d) movement from right to left.

b) Corollary discharge theory

i) Three types of signals accounted for

(1) Motor signal

(2) Corollary discharge signal (CDS)

(3) Image movement signal (IMS)

If afferent and efferent directions are both present, they cancel each other out

If only one or the other arrives, there must be movement

Table 8.1

Four ways that the corollary discharge can cause the perception of movement when there is no movement on the retina

Condition	Image Movement Signal?	Corollary Discharge Signal?	Perceive Movement?
1. Move eyes while viewing afterimage in the dark (Figure 8.20a).	NO, afterimage always stays on same place on retina.	YES, signal is sent to the eye muscle to move eyes.	YES
2. Push on eyeball while looking at a spot to keep eyes stationary (Figure 8.20b).	NO, the eye remains stationary, since subject is holding fixation on a spot.	YES, signal sent to muscle to keep eye stationary.	YES
3. Move eyes to follow a target (Figure 8.20c).	NO, target stays on fovea at all times.	YES, signal sent to eye muscle to move eye	YES
4. Paralyze eye muscles and try to move eye (Figure 8.20d).	NO, the eye doesn't move because it is paralyzed.	YES, signal sent to eye muscle to attempt to move eye.	YES

c) Optic flow field

- i) How signals move relative to each other in the visual field (or “optical array”)
- ii) Moving objects cause parts of the optic-array to disappear (be deleted) or reappear (accreted)

iii) Results in perception of the occluding object as moving relative to the occluded object

iv) Global optic flow

- (1) Occurs when all elements move in unison (or nearly so)

d) Perceptual organization

i) Gestalt principles

- (1) Help pull parts of the view together to help detect relative displacements, hence movement

ii) Biological movement

- (1) Some evidence for neurons (in MT) that respond best to biological (or even species-specific) movement

iii) Kinetic depth effect

- (1) Projection of 3D object onto 2D surface
- (2) Stationary image looks like 2D object
- (3) Movement gives 3D aspect

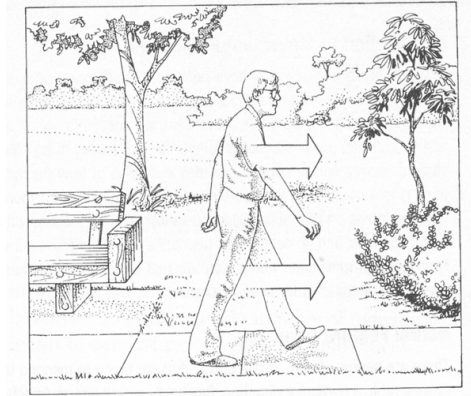


Figure 8.23

Local movement: A person moving from left to right past a stationary observer who is looking at a spot straight ahead. In this situation, the person moves across the observer's field of view, as indicated by the arrows, but the background remains stationary.

6) Heuristics and theories

a) Movements continue in same direction (both linear and rotational)

i) Inertia or good continuation

b) Occlusion heuristic

i) Moving object with tend to occlude the background

ii) When occluded, the object still exists

7) Meaning and movement

a) Object's meaning influences movement perception

b) Knowledge of the body/physics is applied

