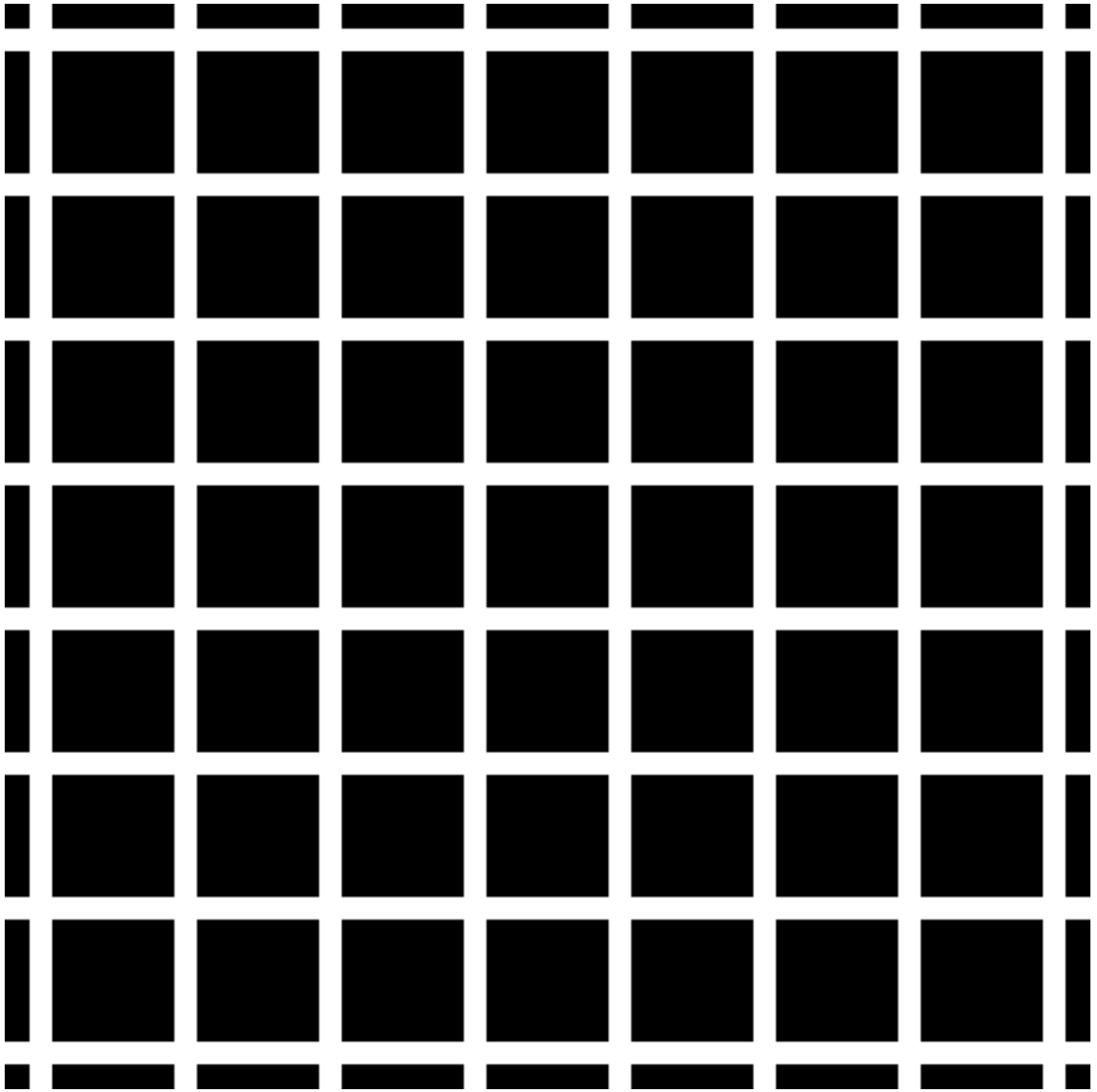
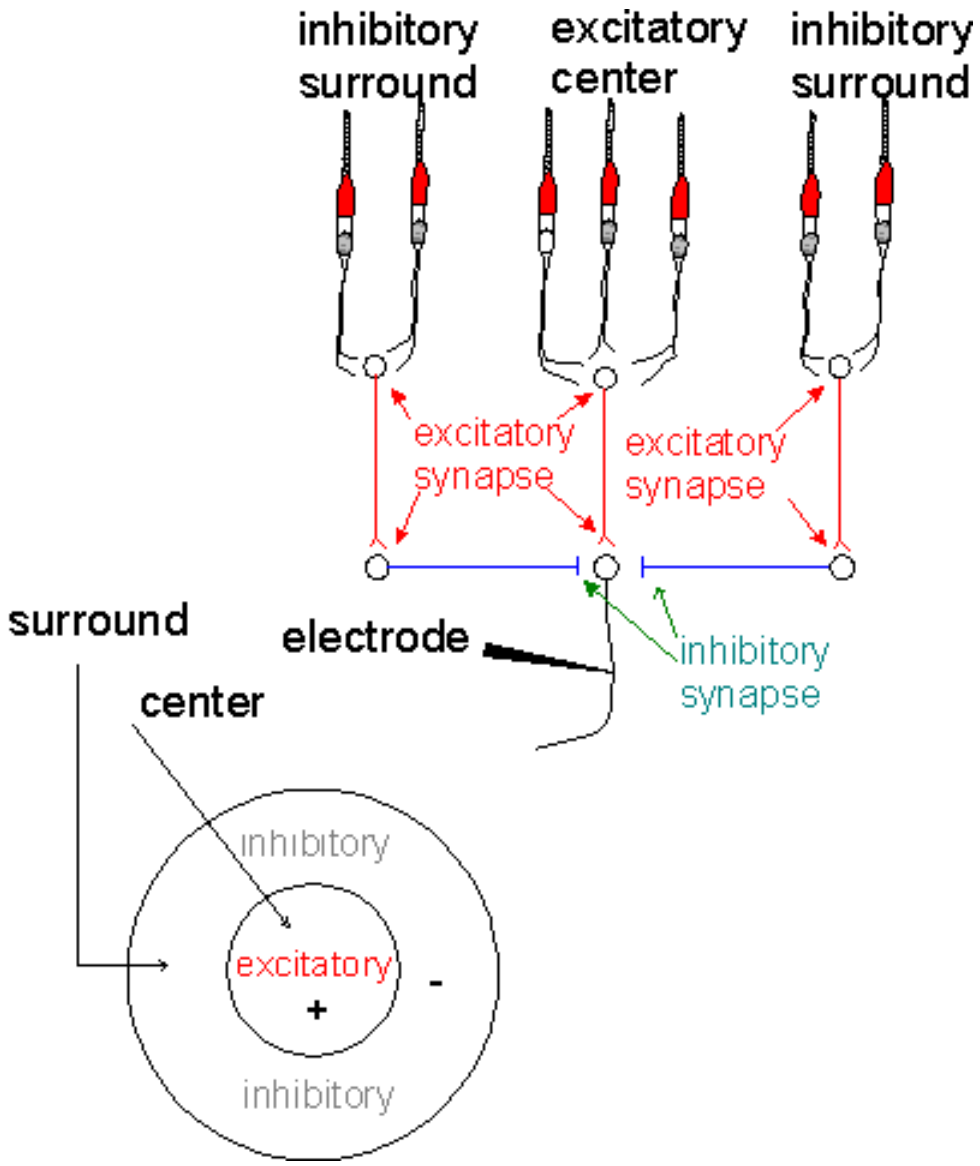
Lecture 4-1: Cognitive Psychology Overview III

- Review of Perception and Attention
- Mental Models
  - Cognitive theory
  - Example: Gentner & Gentner Models of Electricity
  - Example: Bennett: Models of the Telephone Network
  - Applications

Hermann Grid Illusion

- Explanation by Lateral Inhibition
  - Receptive Fields – Lateral inhibition
  - Mediated by horizontal cells in retina – action continues in brain
  - More light falls on cell's neighbors at intersection of squares
  - More stimulation of neighbors means more lateral inhibition
  - Thus, the cell at the intersection fires less, and hence, the area looks less bright (white)
- The size of the receptive field determines the effect
  - Smaller receptive fields in center of vision than periphery
  - Distance of viewing alters or removes the effect
  - Spillman's Illusion – used to measure size of fields
- Scintillating grid is derivative of classic Hermann Grid
  - Related to eye movements and attention (separate from eye (foveal) position!) – VanRullen & Dong (2003)




inhibitory
surround
excitatory
center
inhibitory
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inhibitory
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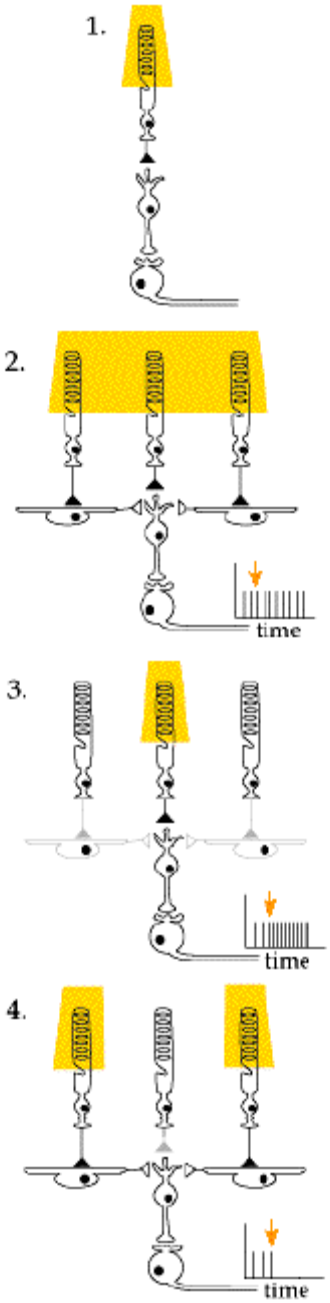
+
-
inhibitory


1.
2.
time
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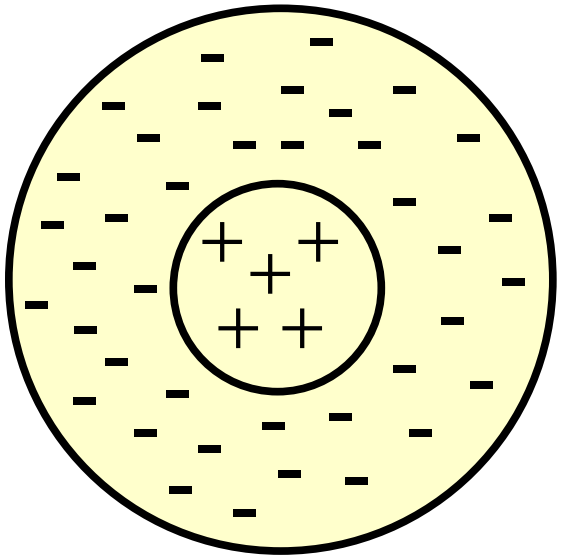
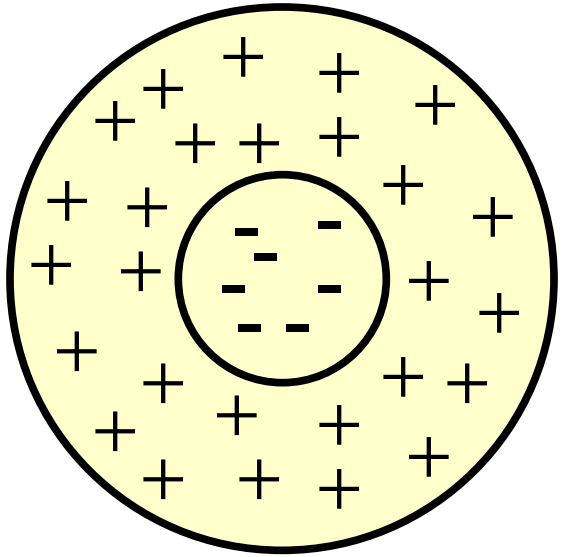
time
4.
time

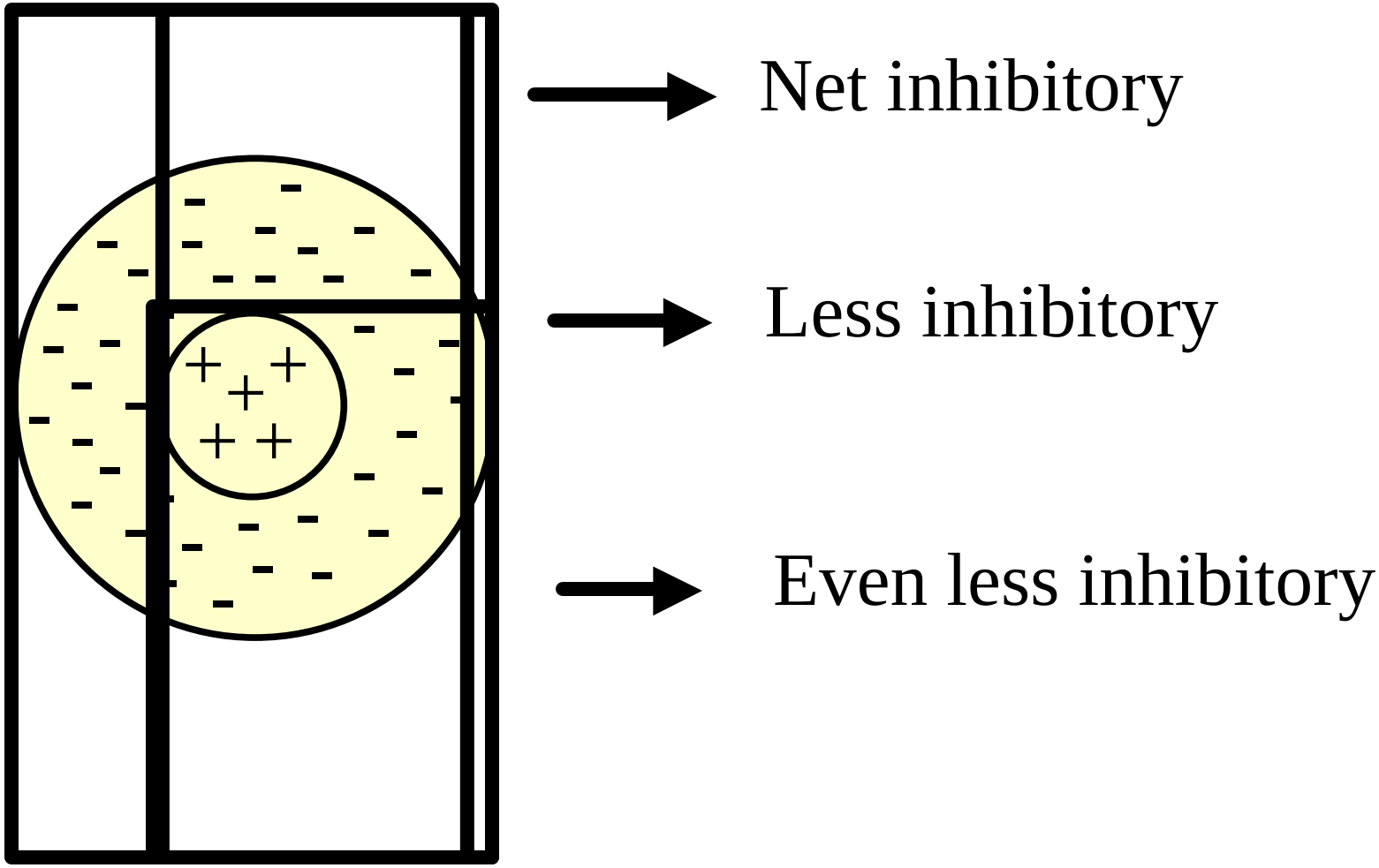
2 main types of receptive fields

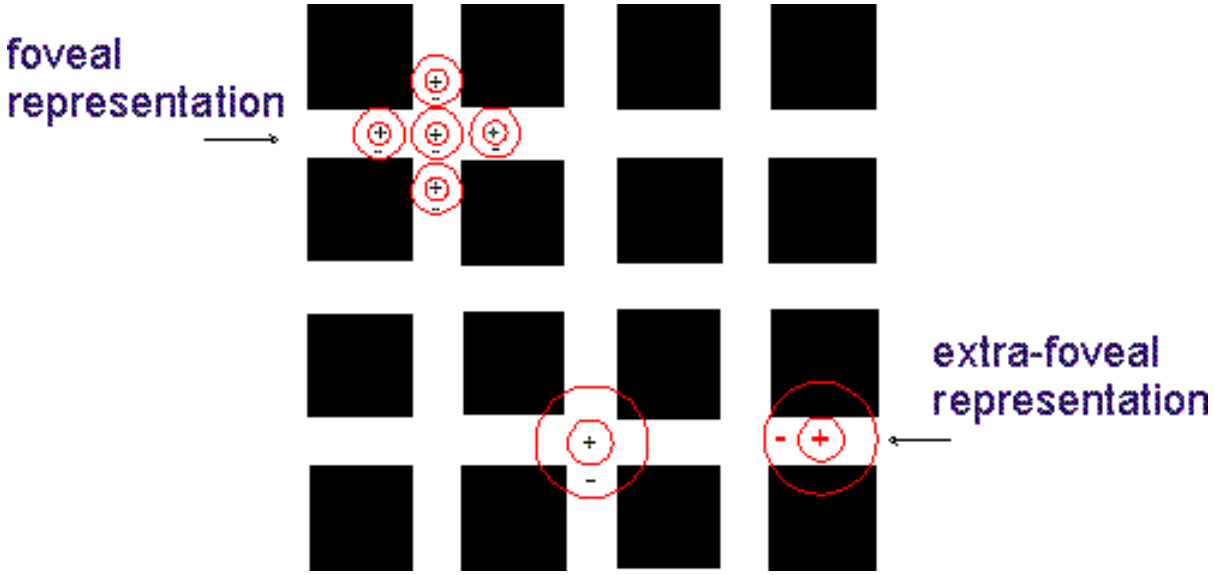


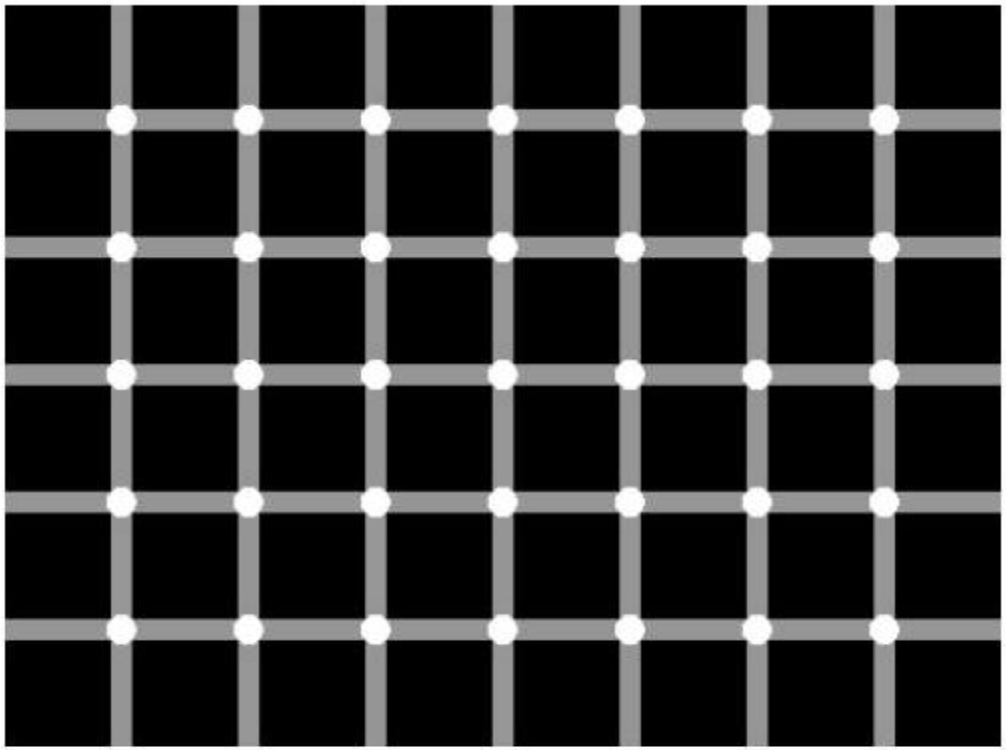


“on” center, “off” surround	“off” center, “on” surround

This configuration makes them most sensitive to edges:




foveal
representation
extra-foveal
representation



Count the black dots! :o)

Review – Gibson

- Perception → Relationships in the environment
- Gibson (1979) The Ecological Approach to Visual Perception

Figure 7.4

The outflow of the optic array from the focus of expansion on the horizon.

This is what a human flier would see looking ahead in the direction of locomotion. There is a gradient of increasing rate of flow downward from the horizon. (From *The Perception of the Visual World* by James Jerome Gibson and used with the agreement of the reprint publisher, Greenwood Press, Inc.)

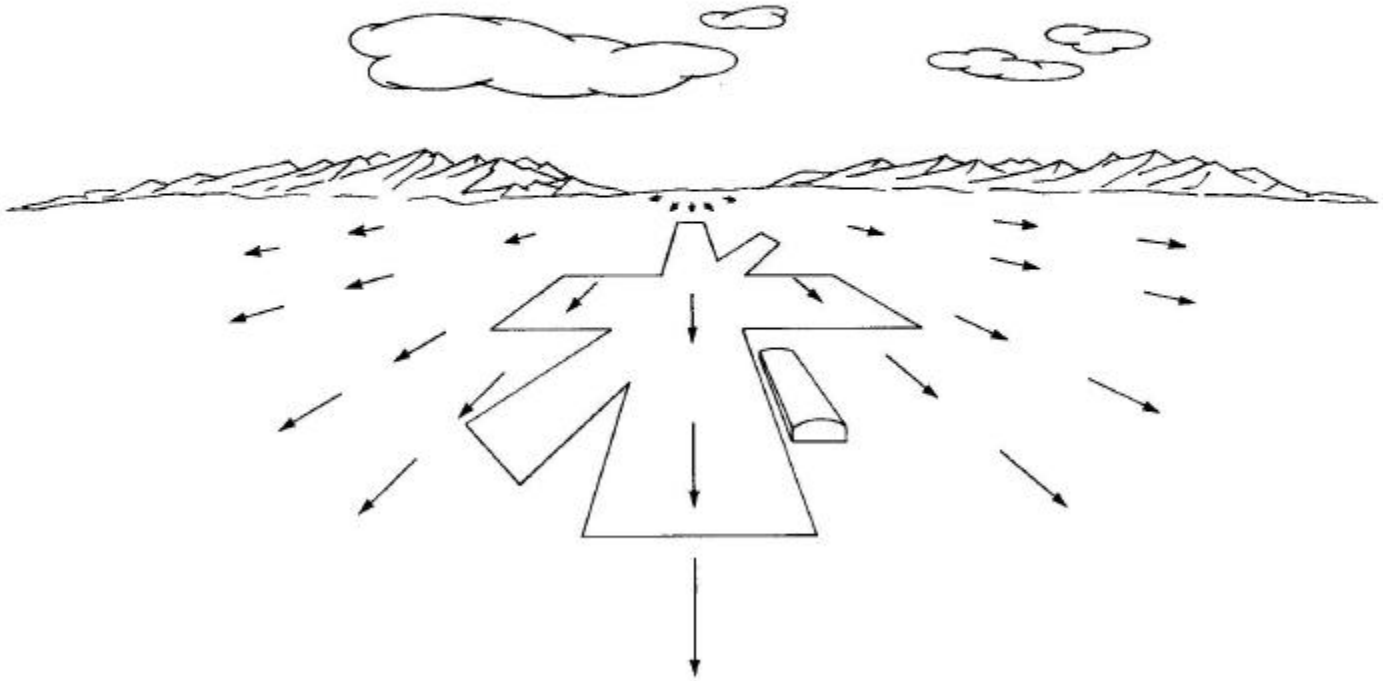


Figure 7.5

The flow of the optic array to the right of the direction of locomotion.

This is what the flier would see if he looked 90° to the right, that is, if he sampled the ambient array to the right. (From *The Perception of the Visual World* by James Jerome Gibson and used with the agreement of the reprint publisher, Greenwood Press, Inc.)

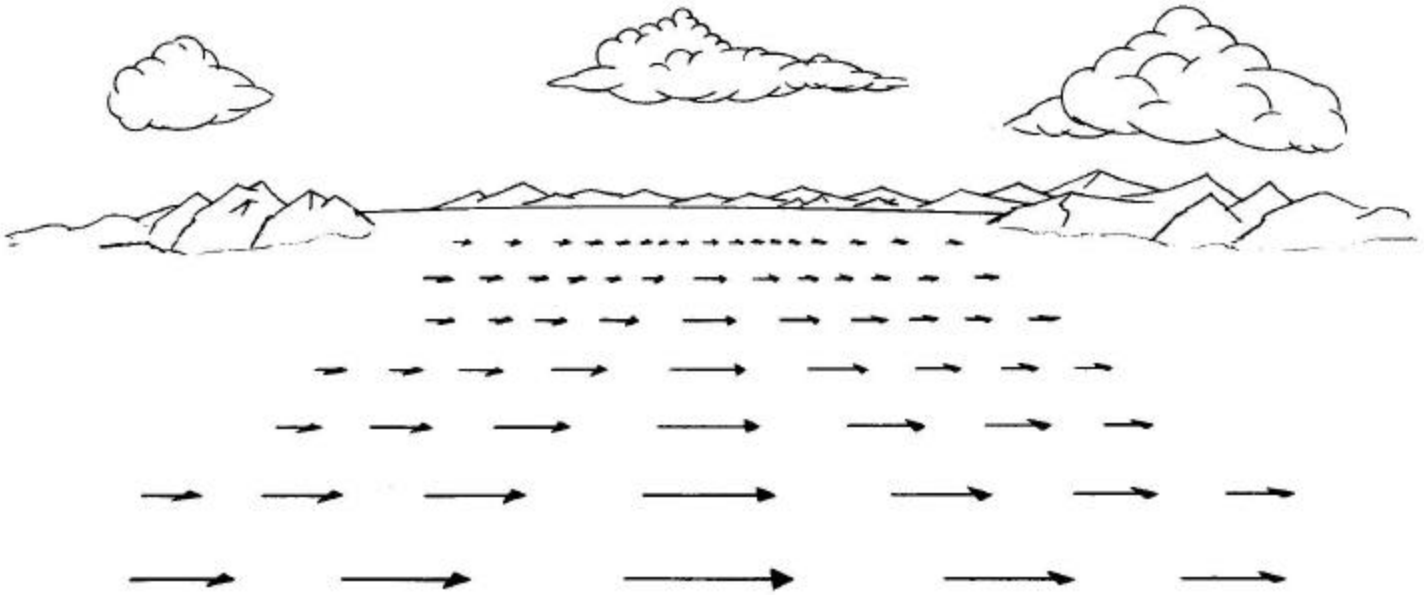
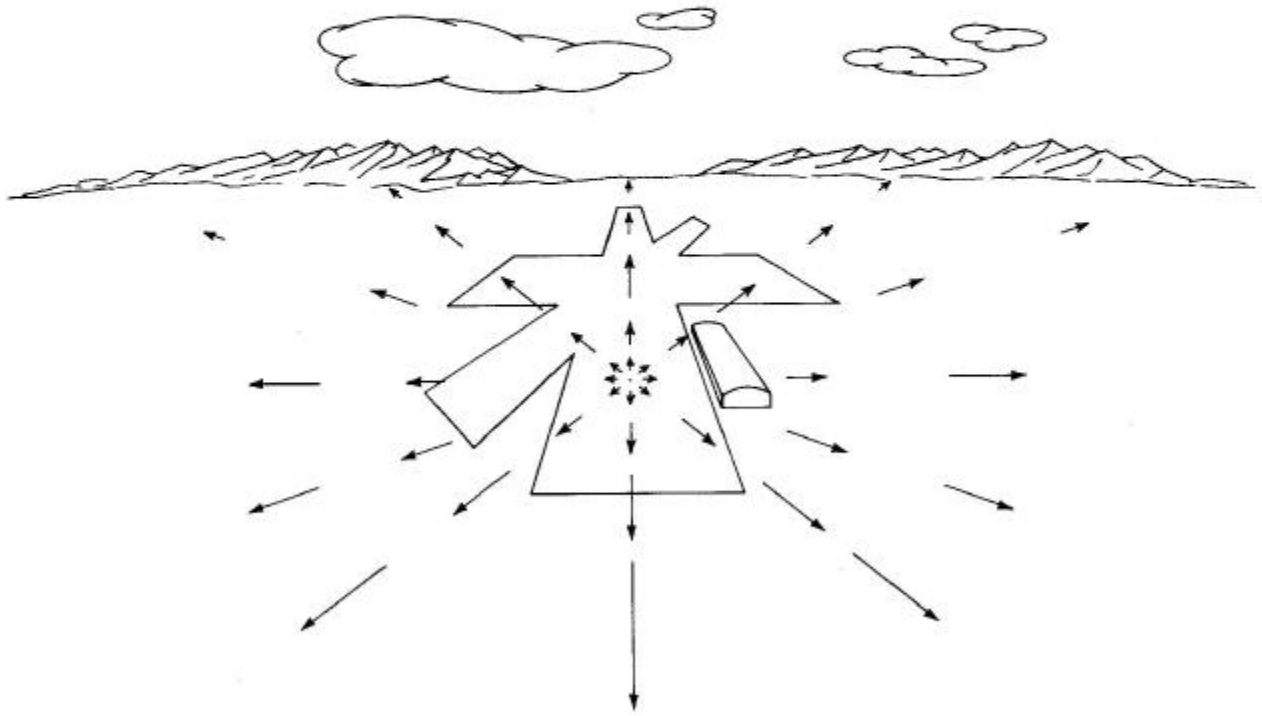


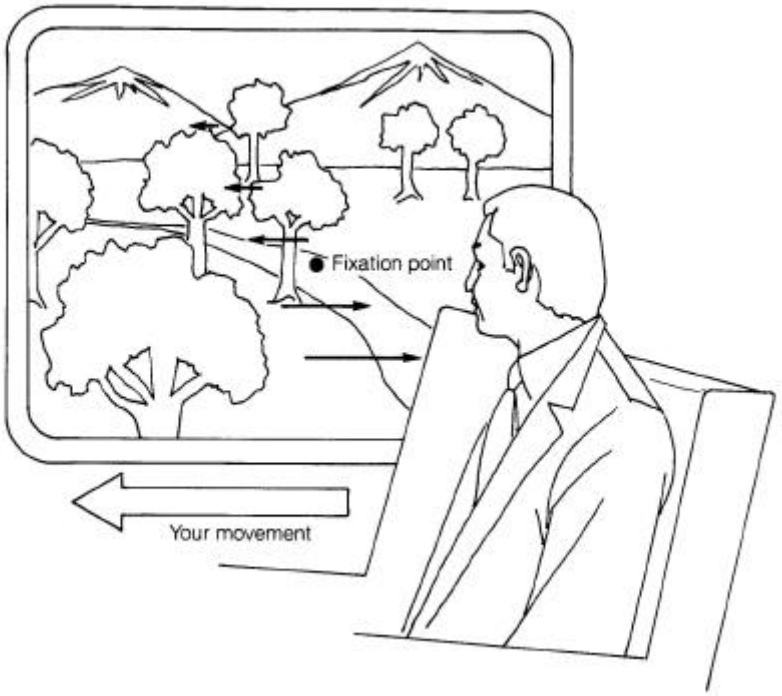
Figure 7.6

The outflow of the optic array in a landing glide.

This is what the flier would see if he aimed down at the landing field. In these three drawings (Figures 7.4–7.6) the shapes are supposed to depict the underlying invariant structure of the optic array, and the vectors are supposed to depict the changing perspective structure of the array. Note that all flow vanishes at two limits: the horizon and the point of aim. (From *The Perception of the Visual World* by James Jerome Gibson and used with the agreement of the reprint publisher, Greenwood Press, Inc.)



Motion Parallax



Review – Gestalt Principles

- Google distortions through application of Gestalt Laws
- http://lrs.ed.uiuc.edu/j-levin/gp/