CHAPTER FOUR

The Cognitive Approach I: History, Vision, and Attention
Why a Cognitive Revolution?

- Inadequate behaviorist accounts of language acquisition. Reinforcement cannot explain rapid learning of vocabulary and syntax.
- New tools for measuring brain activity.
- The rise of the computer as a metaphor for mind and the adoption of the information-processing perspective.
Neisser (1967) one of its early proponents.
The study of human knowledge representation and use.
Employs experimentation, modeling, and computer simulation.
Represents mental activity using a *process model*, a diagram with boxes and arrows that indicate information processing between successive stages.
Modularity of Mind

- Mind consists of functionally independent *modules* (Fodor, 1983).
- Modules are hardwired, domain-specific, fast, automatic, stimulus driven, and informationally-encapsulated.
Perception

- The process by which we gather and interpret information about the outside world via the senses.
Pattern Recognition

- The ability to identify objects in the environment.
- One of the main functions of perception.
- There are many theories of how it takes place.
Template Matching Theory

- An image generated from a stimulus is matched to an internal representation called a template.
The Pandemonium Model of Feature Detection
Feature Integration Theory

- Used to explain *visual search*, in which we attempt to locate a target object hidden among distractors.
- During the *preattentive stage*, features pop out effortlessly. Attention is not required. Search occurs in parallel.
- During the *focused attention stage* features are combined together to create object representations. Attention is required. Search is serial.
Visual Search

Parallel search

Serial search

![Graph showing reaction time vs. number of distractors for parallel search and serial search](image)
Attention

A form of mental activity or energy that can be distributed to different tasks.

Attention is:

1. Selective
2. Divisible
3. Shiftable
4. Sustainable
Theories of Attention

- *Bottleneck theories* explain the narrowing of attention that enters conscious awareness.
- *Capacity theories* explain how attention is distributed to different informational sources.
The Filter Model

- Broadbent’s (1958) filter model of attention.
- Information is selected on the basis of physical characteristics.
- The selected information is allowed to pass to later stages where it undergoes further processing.
- Unselected information is blocked completely.
- An example of an *early selection model*.
The Attenuation Model

- Formulated by Treisman (1964).
- Unattended message is not blocked completely but attenuated.
- The likelihood of information getting through is determined by its threshold.
The Deutch-Norman Selection Model

- Attributed to Deutch and Deutch (1963) and Norman (1968).
- Selection happens later in the attentional processing sequence.
- It is therefore an example of a *late selection model*.
- Selection is based on the semantic content of the message, its meaning.
The Multimode Model of Attention

- Allows for selection to take place early or late.
- The filter is “moveable” and can take place at various stages of processing based on the observer’s needs.
- Selection can be based on physical or semantic characteristics.
The Capacity Model of Attention

- Attention is a limited resource.
- Arousal level determines capacity.
- Where attention goes is determined by enduring dispositions and momentary intentions.
Marr (1982) specifies the steps a computer would go through to recognize an object.

1. Image is transformed into a *raw primal sketch* with a distribution of intensity values.
2. The *2 1/2-D sketch* contains groups of features, surfaces, and layout.
3. The *3-D sketch* is a three-dimensional interpretation complete with linked object parts.