GENERAL KNOWLEDGE AND SEMANTIC MEMORY
CHAPTER 8

- **Background on Semantic Memory**
  - **semantic memory** includes encyclopedic knowledge, lexical or language knowledge, conceptual knowledge
  - **category**
  - **concept**
  - semantic memory allows us to:
    - code objects
    - make inferences
    - decide which objects are similar

EARLY THEORIES OF LEARNING & MEMORY:
HOW IS KNOWLEDGE ACQUIRED, STORED, & RETRIEVED?

- **Epistemology**
- **They asked questions like:**

- These questions date back to at least the **early Greeks** (Plato & Aristotle)

- **Plato (427-347 BC)**
  - **Nativism**
  - **Rationalism**
  - **Structural Mind**

- **Aristotle (384-322 BC)**
Considered to be the 1st associationist.

- Empiricism

- Aristotle (384-322 BC)
  - Laws of Association
    - Law of similarity
    - Law of contiguity
    - Law of contrast
    - Law of frequency

DEFINITIONS

- Memory Models

- Semantic Memory

- Category:

- Concept:
FEATURE COMPARISON MODEL

- Concepts are stored in memory according to a list of necessary features & attributes (characteristics).

Sentence Verification Technique

- Procedure
  - show simple sentences & ask if "T" or "F"
  - consult stored semantic knowledge
  - answer "true" or "false"
  - measure response latencies

FEATURE COMPARISON MODEL

- 1 OR 2-Stage Decision Process

  - Stage 1

  - Stage 2

Typicality effect

- carrot = vegetable→fast
- rutabaga = vegetable→slower

Defining Features

- defining features of a robin = animate, feathers, red breast

Characteristic Features

- characteristic features of robin = flies, perches in trees, not domesticated, and small in size.

Problems With Feature Comparison Model
**Prototype Theories**

Eleanor Rosch (1973)

- **Major Assumption**: Categories are organized around prototypes.

- Members of a category differ in their degree of prototypicality.
  - apple vs. tomato (fruit)
  - robin vs. penguin (bird)

- All members of a category are not created equal.

- Categories have a graded structure.

**Evidence for & Characteristics of Prototypes**

- **Prototypes are supplied as examples of a category:**
  - Norms

  - **typicality effect**

- **Prototypes serve as reference points:**
  - Universality in people's categorization of "primary" colors.

- **Prototypes are judged more quickly after priming:**
CONCEPTUAL HIERARCHIES IN PROTOTYPE THEORY

- **Superordinate**

- **Basic Level**

- **Subordinate Level**

- *We seem to favor the basic level:*

- **Experts use subordinate categories differently than novices**
  - Johnson and Mervis (1997)

**Evaluation of Theory**

- One advantage of prototype approach is that is can account for our ability to form concepts for groups that are loosely structured -- only have a family resemblance:
  - **Family Resemblance:**

  - **Games:**

  - **Rosh & Mervis, 1975:**

**Prototype Models Must Account For:**
NETWORK MODELS

- **Network model**: proposes a net-like organization of concepts in memory, with many interconnections.

- **Examples of Network Models**:
  - Collin's & Loftus Spreading Activation Model (1975)
  - Anderson's Act Theory
  - PDP's

- **Collins & Loftus (1975)**:
  - Memory is a network of nodes (concepts) and links (associations/relations).
  - The meaning of a particular concept, such as dog, depends on the concepts to which it is connected.
  - links vary in strength
  - **Activation**: related concepts are more accessible for other types of processing.

- **Spread of Activation**

**Sentence Verification Task**: How does this model explain our ability to answer these questions?

- "A Mcintosh is a fruit."
  - **Nodes**: Mcintosh & fruit will be activated.
  - The activation at each of these nodes will spread.
  - Apple will receive some activation from different directions (both Mcintosh & Fruit)
  - **Intersection**
  - If an intersection cannot be found (e.g., "An apple is a mammal")
Spreading Activation and the Typicality Effect

- typicality effect:

SAM: SEARCH OF ASSOCIATIVE MEMORY

- Raaijmakers & Shiffrin (1981)
  - Memory is assumed to consist of a large number of interconnected feature sets called ____________________________.

- These images contain information about
  - The ____________________________ in which the learning occurred
  - The item, _____________________________.
  - The ______________ to other images presented along with it

Remembering Involves

SAM: SEARCH OF ASSOCIATIVE MEMORY

- probe set =

  - This probe results in various images being activated to varying degrees as a function of their connections to the probe.
  - Rehearsal: the longer an item is retained in STM, _____________________________.

Model’s Account of Memory Effects

- primacy effect -
- **encoding specificity effects**

- **context effects**

- **interference effects**

**PARALLEL DISTRIBUTED PROCESSING MODEL**

- **PDP McClelland & Rumelhart (1986)**: Also called connectionism and neural networks.

**Brain Analogy:**

- Memory is assumed to consist of a large set of interconnected units, each of which can take on some activation value.

- Each unit does not represent a concept (e.g., apple, cow). Instead, concepts are represented as a pattern of activation over the network.

- “We should conceive of memory in terms of each new event changing the knowledge that can be used to respond to a situation . . . prior experiences affect our remembering not simply by being retrieved and inspected, but by changing our whole knowledge base that is used to answer all queries.”

**Spontaneous Generalizations:**

**Default Assignments:**
General Characteristics of PDP Models

- A network contains basic neuron-like units or nodes,

- The connections between these neuron-like units are weighted,

- When a unit reaches a critical level of activation,

- Cognitive processes are based on parallel operations, rather than serial operations.

- The term distributed processing suggests that knowledge

- Every new event changes the strength of connections among relevant units.

- Graceful Degradation:

  - Tip-of-the-tongue phenomenon

Evaluation Of Theory

- Consistent with neurobiological design of brain and neuron.

- Can provide a good account for memory over successive trials, but can't account for memory of a single episode.

- Trouble explaining rapid forgetting of old info when new info is learned (interference).

- Can explain tasks that utilize parallel processing ________________________________, but not serial tasks ________________________________

- PDD Explains: _____________________________________________________
ANDERSON’S ACT THEORY
Read you textbook – will not cover in lecture.

- John Anderson of Carnegie Mellon

- ACT = Adaptive Control of Thought

- Anderson believes mind is unitary, all higher cognitive processes are different products of same underlying system.

- Working Memory =

  - In the **Declarative Network**:  
    - **Proposition**:  
      - Phrase "white cat" is NOT a proposition cannot judge true or false.
      - **some propositions**:  
        - Susan gave a cat to Maria.
        - The cat was white.
        - Maria is the president of the club.
      - These 3 props can appear by themselves, but can also be combined into a sentence.
        - Susan gave a white cat to Maria, who is the president of the club.

- **NETWORK FOR SENTENCE**
  - each proposition = node, and the network represents important relations in 3 props
  - notice also that props are abstract, not exact words
  - each prop can be represented by a network
  - each concept can be represented by a network
Major Assumptions of Anderson’s Spreading Activation Model:

- activation divides up.

- activation summates

- activation varies in strength

- activation takes place in the separate working memory buffer