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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