

## Exam 2 Study Guide

### Evolved Function of Multiple Memory systems

#### 1) Evolutionary Functions of Memory

- Recognition & Context Setting
  - People, places, things, predators
  - Example: Status Hierarchies
  - Example: Vampire bats and the memory needed for cooperation
- Prediction (based on what happened already)
  - Reward availability (like food, mates)
  - Food toxicity (Garcia Effect) & other avoidance learning mechanisms
  - Predictive cues to presence and intrusion by predators
  - Challenging for status and mates
- Spatial mapping and Foraging (how to return somewhere)
- Skill Learning (aka automating tasks) through repetition
  - Example: Running, throwing, sewing, carving, speaking

#### 2) Evidence Supporting the Multiple Memory Systems View

- The Debate: Is memory a singular, unitary system or multiple systems?
  - The Answer: Memory and learning mechanisms are multiple adaptive specializations shaped by selection to solve specific problems in the environment.
- Functional Incompatibility
  - This specialized nature prohibits some memory systems from solving problems they were not specialized to solve
  - Adaptations that serve one function can not solve other functions because they are too specialized
- Functional Incompatibility in Bird Memory Systems
  - Songs must be learned because they enable organisms to attract mates and defend breeding territories
    - What gets in: Only songs of conspecifics are copied
      - Swamp sparrows won't learn from closely-related song sparrows
    - When it gets in: Song learning only occurs in critical periods of development (2-10 weeks, depending on species)
    - How it gets retained (and for how long)
      - No songs produced until roughly 1 year old (next breeding season, months later, without initial practice)
      - Songs of other territorial birds can be recognized without replacing sung songs
- Functionally Incompatible: Song Learning Mechanisms and Foraging Mechanisms

- Chickadees
  - May store several hundred food items per day over a wide range
  - Never reuse sites
  - Re-collect food several days later
- Differs from Song Learning:
  - What gets in: No restrictions on what kinds of locales can be mapped and learned (as opposed to very specific songs)
  - Sensitive Periods: No special memory for locales mapped earlier in life: new learning is constant over lifespan
  - Retention and Unlearning: Where as songs resist decay for months and years, food cache “maps” decay after as much as one unsuccessful revisiting. There is incredible turnover.
- Conclusion
  - Because the two memory systems seem to have very different rules for what gets retained, for how long, and when, they should be considered separate memory systems
  - We see the same multiple memory system architecture in humans
- Memory Systems I & II in Humans
  - Gradual & Incremental Learning (Implicit/Procedural; System I)
    - Recollection of specific events is not required:
      - Learning to type, play piano, juggle
      - Learning and Remembering language
      - Mirror drawing in amnesics
      - Pattern learning and recognition (chess players, the card game “Mao”)
      - Habits and addiction cues
    - Goal is to automate behaviors and responses across a wide variety of nonspecific circumstances
      - Thus, specific cues about time, place, context SHOULD be ignored during this kind of learning
  - Rapid, One-shot Learning (Declarative, Episodic: System II)
    - Goal is to differentiate and remember contextual details that uniquely mark that experience of knowledge
      - Episodic memory for 9/11
      - Autobiographical memory for a fight with you significant other
      - Semantic memory for the state capitals
    - Enables finely-tuned predictions and experience simulations when planning behavior

## Short-term Memory

- 1) Span of Short-Term Memory: STM is the term for short-term storage of information with no manipulation or organizational element

- Time span (without rehearsal)
  - Short term memory seems to last roughly 12 seconds without rehearsal
  - Duration: How long does short term memory last?
  - The Brown-Peterson Technique:
    - I will read you 3 letters to remember, then a number
    - Once you hear the number, count backwards by 3's from that number
    - Stop counting when I say "Recall"
    - When I say "Recall" write the letters down
    - This technique showed that our memory is fragile for material stored for just a few seconds
- Holding information in Short Term Memory
  - We hold info in STM through Maintenance Rehearsal:
    - The process of continually attending to and mentally 'repeating' information to keep it in short term memory
    - If we are unable to rehearse new information, we have very poor memory for it (it decays)
    - Also, as new information interferes with working memory rehearsal, info is rapidly lost (Example: the primacy-recency effect)
- Capacity (With rehearsal)
  - Capacity: How much can we store at one time?
  - Originally tested by Waugh & Norman using the digit-span test
  - Digit span
    - Hear the string of number
    - Write them down
    - We add a number each time and test when capacity is maxed out
- Chunking: Small units can be combined into larger meaningful units
- Chunk: Strongly associated collection of elements

2) Working Memory: refers to the structures and processes used for temporarily storing and manipulating information

- Executive control system - planning, initiating, and integrating information - high cognitive abilities
  - Example: Doing mental math in your head...like what is  $24 \times 12$ ?
- Two subordinate systems that carry out Maintenance Rehearsal:
  - Articulatory or phonological loop- rehearses verbal information - auditory and semantic coding
  - Visual-spatial sketchpad - maintains images and spatial representations - visual coding