Lecture 40 -- Learning I -- Hawkins

1. LEARNING HAS STAGES
RETROGRADE AMNESIA follows traumas to the brain. CONSOLIDATION PERIOD is that period of time during which new memories are labile and subject to disruption. The duration of the consolidation period varies as a function of the task.

2. LEARNING INVOLVES PHYSICAL CHANGES IN THE BRAIN. These changes are termed the engram. REVERBERATING CIRCUITS, in principle, can store engrams, but do not store long-term memories, which therefore require some form of physical change.

3. ENGRAMS CAN OCCUR IN MANY PLACES OF THE NERVOUS SYSTEM including the spinal cord. Therefore plasticity is a general property of neurons.

4. Nevertheless, SOME AREAS OF THE BRAIN ARE MORE IMPORTANT THAN OTHERS IN MEDIATING MEMORY PROCESSES.

5. DECLARATIVE (EXPLICIT) VS. REFLEXIVE (IMPLICIT) LEARNING is a critical distinction that determines the particular structures involved. Declarative memories involve conscious processes and can be expressed in words. They are the typical memory of specific facts or events. Reflexive memories (sometimes termed procedural) involve perceptual and motor skills that do not involve specific conscious recollection and are expressed in action rather than words.

6. HIPPOCAMPAL FORMATION is critical in the consolidation of declarative memories. The CEREBELLUM is involved in many reflexive memory tasks.

7. NEURAL NETWORKS with modifiable synaptic connections CAN PERFORM LEARNING TASKS, in particular, reflexive types of tasks such as pattern recognition. Those that use parallel circuitry (feed-forward networks) show generalization and graceful degradation (i.e., their performance slowly degrades when parts of the circuit are destroyed).

Relevant reading: chapter 62 in "Principles"