Summary of the Presentation

Memory is the storehouse for everything we know and everything we've experienced. Memory is the capacity to register, retain, and remember information. Memory makes it possible for you to apply your knowledge and skills to new situations, recall past memories, solve problems, and make plans for the future.

The information-processing model explains the way we organize, interpret, and respond to information. The three basic processes of memory are acquisition, retention, and retrieval.

The levels-of-processing theory (or semantic theory) suggests that the ability to retain information in memory depends upon the depth of the processing.

According to the Atkinson-Shiffrin model, there are three different memory systems: sensory memory, short-term memory (STM), and long-term memory (LTM). There are two types of long-term memory: declarative memory and procedural memory.

There are several special types of memory. Flashbulb memory is an extremely vivid memory formed when you witness or hear about a surprising or unexpected event that's very emotionally charged. Eidetic memory is the ability to retain a vivid image for several minutes after seeing it.

Psychologists have identified three main ways to measure memory: recall, recognition, and reconstruction.

Memory storage and recall relies on the central nervous system, and the brain in particular. The case of H.M. was one of the first to indicate that the hippocampus was involved in forming memories.

Long-term potentiation (LTP) is the process by which long-term memories are formed through the strengthening of connections between neurons. When learning takes place, specific protein synthesis takes place in the nervous system; long-term memory depends on this synthesis. As you learn to play tennis, for example, the repeated practice builds neural pathways that make it easier to get the ball over the net.

The endocrine system also plays a role in forming memories. When you are emotionally aroused, the adrenal glands release adrenaline and noradrenaline into the bloodstream. These hormones alert your brain to "pay attention and remember!"
Extension of the Presentation

Retrieval Cues

A stimulus that provides a trigger to get an item out of memory is called a retrieval cue. A retrieval cue is a type of priming; it's a stimulus that awakens associations and "activates a strand" in your memory that leads to a specific piece of memory. A retrieval cue can be anything that reminds you of something, including an image, song, or smell.

Causes of Forgetting

Forgetting is the inability to recall something that you could recall previously. Failure to remember something is generally due to encoding failure; for some reason, the information was never encoded into long-term memory.

Some forgetting is caused by the inability to access information in long-term memory. This is what happens when you experience the tip-of-the-tongue (TOT) phenomenon. Have you ever tried to recall a name or a word but just couldn't, even though it was "on the tip of your tongue"? This is the TOT phenomenon, and it's an example of retrieval failure.

According to the decay theory of forgetting, all learning will decay if it isn't used. For example, much of what you learn during the school year will fade over the summer vacation. Decay theory assumes that memories deteriorate as time passes.

There is substantial evidence that forgetting is less rapid if you go to sleep immediately after a learning/relearning session. This supports the interference theory, in which forgetting is caused primarily by interference from new knowledge that pushes out old knowledge before it can be encoded into long-term memory.

There are two types of interference: proactive and retroactive.

Proactive interference occurs when information or experience already stored in long-term memory hinders your ability to remember new information. For example, let's say you learn to drive in a car with a stick shift. Then, several months later, you get a job parking cars at a downtown hotel. Now you find yourself looking for the clutch whenever you drive a car with an automatic transmission. This is an example of proactive interference because prior knowledge interferes with your ability to retrieve new information (in this case, driving a car with an automatic transmission).

Retroactive inference occurs when new learning or experience interferes with the ability to recall previously stored information. For example, someone taking an Intro French class after taking five years of Spanish might find that she can't recall Spanish words anymore; her new French vocabulary is blocking (or interrupting) the retrieval of Spanish vocabulary.

The serial position effect is an example of both proactive and retroactive interference. You may have noticed that it's easier to remember the words at the beginning and the end of a list than it is to remember the words in the middle. This is because the words in the middle of the list are exposed to retroactive and proactive interference.

In some cases you may fail to retrieve information because of conscious (suppression) or unconscious (repression) desires to forget unpleasant or traumatic memories. The event is still stored in long-term memory, but you are motivated to forget the information (motivated forgetting).
Encoding Specificity Principle

Successful retrieval often depends on a match between the way information is encoded and the way it's retrieved; this is known as the encoding specificity principle. There are three important research findings related to this principle: contextual retrieval, mood congruence, and state-dependent retrieval.

Tulving and Thompson suggest that the physical setting in which a person learns information is encoded along with the information and becomes part of the memory trace (contextual retrieval). Therefore, if a portion (or all) of the original context is absent, retrieval is more likely to be unsuccessful. On the other hand, if at least part of the original context is reinstated, it may serve as a retrieval cue, and may facilitate the recall of information. (Have you ever "retraced your steps" to find something? This is an example of contextual retrieval.)

The research also indicates that mood congruence helps when trying to retrieve a memory. In other words, if you wanted to improve your performance on an exam, your mood at exam time should match the mood you were in when you studied the subject matter. So if you tend to become anxious when you're taking a test but less anxious when you study beforehand, you may want to try to decrease your anxiety when you take your test by taking deep breaths. Also, you may want to increase your anxiety a little while you're studying by reminding yourself of the importance of getting a good grade on your exam. Mood congruence does have limits. For example, chronic stress, anxiety, and depression also affect memory and may reduce the ability to retrieve information.

The third finding indicates that you tend to recall information better if you are in the same internal state as when the information was encoded. This is what psychologists refer to as the state-dependent memory effect. So if you drink coffee while you study for an exam, it may improve your performance if you also drink coffee before you take that exam.

Cognitive-Based Methods for Improving Memory

Long-term memories most often start out as short-term memories, which then become encoded through use or rehearsal. The semantic theory (or levels-of-processing theory) states that encoding occurs because the brain connects the new knowledge to knowledge that's already stored in long-term memory. Many methods of improving memory are designed around helping people hold information in short-term memory and working with it to form meaningful connections.

Short-term memory can only hold about five to nine pieces of information. However, large amounts of information can be chunked, making it easier for short-term memory to handle. For example, phone numbers can be broken into separate three- or four-digit numbers; short-term memory stores these as two "chunks" of information instead of seven separate numbers.

Mnemonic devices (or mnemonics) are ways to help build meaningful relationships with knowledge that's already in long-term memory. The method of loci uses visualization. For example, a speech can be memorized as an imaginary trip down a familiar street, with familiar objects serving as reminders of what to say. A similar method uses strings of letters or a story to memorize something. For instance, the colors of the rainbow can be memorized by remembering the name "Roy G. Biv" (red, orange, yellow, green, blue, indigo, violet).
In the **peg system**, you first memorize a scheme such as "one is sun, two is glue," and so on. Then you associate the words with names or objects. For example, if you had a sequential list of names to memorize, you could visualize the first person on the list under the sun, the second covered with glue, and so on.

### Ways to Aid Retrieval: Improving Memory

1. Rehearse frequently (overlearning).
2. Schedule distributed practice.
3. Practice deep processing to facilitate transfer-appropriate processing.
4. Organize information.
5. Recite, recite, and recite again.
6. Use verbal mnemonics such as acrostics, acronyms, rhymes, and narratives to make abstract information more meaningful.
7. Use visual mnemonics such as the method of loci.

### Additional Key Terms

The following terms and concepts are closely related to what's taught in this presentation and may be included on the Exam. If you aren't familiar with any of them, look them up in a textbook or another available resource.

- Memory construction
- Loftus, E. (studied eyewitness recall and confabulation)
- Misinformation effect
- Retrograde amnesia
- Recency effect
- Semantic network theory
- Spacing effect
- Luria, A. (scientist who tested eidetic memory)