Imagine that the jungle is encompassed on all sides by towering mountains. There is only one entrance to the jungle, a small meadow that is reached by a narrow pass through the mountains.

In the jungle there are animals, millions of them. The animals represent all of the information in your memory. Imagine that every thought, mental picture, or perception you ever had is represented by an animal in this jungle. Every single event ever perceived by any of your five senses—sight, touch, hearing, smell, or taste—has also passed through the meadow and entered the jungle. Some of the thought animals, such as the color of your seventh-grade teacher’s favorite sweater, are well hidden. Other thoughts, such as your cell phone number or the position of the reverse gear in your car, are easier to find.

There are two rules of the memory jungle. Each thought animal must pass through the meadow at the entrance to the jungle. And once an animal enters the jungle, it never leaves.

The meadow represents short-term memory. You use this kind of memory when you look up a telephone number and hold it in your memory long enough to make a call. Short-term memory appears to have a limited capacity (the meadow is small) and disappears fast (animals pass through the meadow quickly).

The jungle itself represents long-term memory. This is the kind of memory that allows you to recall information from day to day, week to week, and year to year. Remember that thought animals never leave the long-term memory jungle. The following visualizations can help you recall useful concepts about memory.
Imagine what happens as a thought, in this case we’ll call it an elephant, bounds across short-term memory and into the jungle. The deer leaves a trail of broken twigs and hoof prints that you can follow. Brain research suggests that thoughts can wear paths in the memory. These paths are called neural traces. The more well-worn the neural trace, the easier it is to retrieve (find) the thought. In other words, the more often the elephant retraces the path, the clearer the path becomes. The more often you recall information, and the more often you put the same information into your memory, the easier it is to find. When you buy a new car, for example, the first few times you try to find reverse, you have to think for a moment. After you have found reverse gear every day for a week, the path is worn into your memory. After a year, the path is so well-worn that when you dream about driving your car backward, you even dream the correct motion for putting the gear in reverse.

Imagine releasing the elephant into the jungle, turning your back, and counting to 10. When you turn around, the elephant is gone. This is exactly what happens to most of the information you receive.

Generally, we can recall only 50 percent of the material we have just read. Within 24 hours, most of us can recall only about 20 percent. This means that 80 percent of the material has not been encoded and is wandering around, lost in the memory jungle.

The remedy is simple: Review quickly. Do not take your eyes off the thought animal as it crosses the short-term memory meadow, and review it soon after it enters the long-term memory jungle. Wear a path in your memory immediately.

The second picture you can use to your advantage is the picture of many animals gathering at a clearing—like thoughts gathering at a central location in the memory. It is easier to retrieve thoughts that are grouped together, just as it is easier to find a herd of animals than it is to find a single elephant.

Pieces of information are easier to recall if you can associate them with similar information. For example, you can more readily remember a particular player’s batting average if you can associate it with other baseball statistics.

The fourth picture is one with you in it. You are standing at the entrance to the short-term memory meadow, directing herds of thought animals as they file through the pass, across the meadow, and into your long-term memory. You are taking an active role in the learning process. You are paying attention. You are doing more than sitting on a rock and watching the animals file past into your brain. You have become part of the process, and in doing so, you have taken control of your memory.
20 Memory Techniques That Work

Experiment with these techniques to develop a flexible, custom-made memory system that fits your style of learning.

The 20 techniques are divided into four categories, each of which represents a general principle for improving memory. Briefly, the categories are:

Organize it. Organized information is easier to find.

Use your body. Learning is an active process; get all of your senses involved.

Use your brain. Work with your memory, not against it.

Recall it. This is easier when you use the other principles efficiently to notice and elaborate on incoming information.

The first three categories, which include techniques #1 through #16, are about storing information effectively. Most memory battles are won or lost here.

To get the most out of this article, first survey the following techniques by reading each heading. Then read the techniques. Next, skim them again, looking for the ones you like best. Mark those and use them.

Organize It

1 Be selective. There’s a difference between gaining understanding and drowning in information. During your stay in higher education, you will be exposed to thousands of facts and ideas. No one expects you to memorize all of them. To a large degree, the art of memory is the art of selecting what to remember in the first place.

As you dig into your textbooks and notes, make choices about what is most important to learn. Imagine that you are going to create a test on the material and consider the questions you would ask.

When reading, look for chapter previews, summaries, and review questions. Pay attention to anything printed in bold type. Also notice visual elements—tables, charts, graphs, and illustrations. All of these are clues pointing to what’s important. During lectures, notice what the instructor emphasizes. Anything that’s presented visually—on the board, on overheads, or with slides—is probably key.

2 Make it meaningful. One way to create meaning is to learn from the general to the specific. Before you begin your next reading assignment, skim it to locate the main idea. You can use the same techniques you learned in Exercise #1: “Textbook reconnaissance” on page 2. If you’re ever lost, step back and look at the big picture. The details might make more sense.

You can organize any list of items—even random ones—in a meaningful way to make them easier to remember. In his book Information Anxiety, Richard Saul Wurman proposes five principles for organizing any body of ideas, facts, or objects:

<table>
<thead>
<tr>
<th>Principle</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organize by time</td>
<td>Events in history or in a novel flow in chronological order.</td>
</tr>
<tr>
<td>Organize by location</td>
<td>Addresses for a large company’s regional offices are grouped by state and city.</td>
</tr>
<tr>
<td>Organize by category</td>
<td>Nonfiction library materials are organized by subject categories.</td>
</tr>
<tr>
<td>Organize by continuum</td>
<td>Products rated in Consumers Guide are grouped from highest in price to lowest in price, or highest in quality to lowest in quality.</td>
</tr>
<tr>
<td>Organize by alphabet</td>
<td>Entries in a book index are listed in ABC order.</td>
</tr>
</tbody>
</table>
Create associations. The data already encoded in your neural networks is arranged according to a scheme that makes sense to you. When you introduce new data, you can remember it more effectively if you associate it with similar or related data.

Think about your favorite courses. They probably relate to subjects that you already know something about. If you know a lot about the history of twentieth-century music, you'll find it easier to remember facts about music recorded since 2000. If you've already passed an advanced algebra course, you're primed to remember calculus formulas. And if you've enjoyed several novels by your favorite author, you've already cleared a memory path for another book from that writer.

Even when you're tackling a new subject, you can build a mental store of basic background information—the raw material for creating associations. Preview reading assignments, and complete those readings before you attend lectures. Before taking upper-level courses, master the prerequisites.

Use Your Body

4 Learn it once, actively. Action is a great memory enhancer. You can test this theory by studying your assignments with the same energy that you bring to the dance floor or the basketball court.

This technique illustrates the practical advantage of knowing about learning styles. In Chapter One, the article "Learning styles: Discovering how you learn" explains four aspects of learning: concrete experience, abstract conceptualization, active experimentation, and reflective observation. Many courses in higher education lean heavily toward abstract conceptualization, emphasizing lectures, papers, and textbook assignments. These courses might not give you the chance to act on ideas, to experiment with them and test them in situations outside the classroom.

You can create those opportunities yourself. For example, your introductory psychology book probably offers some theories about how people remember information. Choose one of those theories and test it on yourself. See if you can turn that theory into a new memory technique.

Your English teacher might tell you that one quality of effective writing is clear organization. To test this idea, examine the texts you come in contact with daily—newspapers, popular magazines, Web sites, and textbooks. Look for examples of clear organization and unclear organization. Then write Intention Statements about ways to organize your own writing more clearly.

Your sociology class might include a discussion about how groups of people resolve conflict. See if you can apply any of these ideas to resolving conflict in your own family. Then write Discovery Statements about your experiences.

The point behind each of these examples is the same: To remember an idea, go beyond thinking about it. Do something with it.

You can use simple, direct methods to infuse your learning with action. When you sit at your desk, sit up straight. Sit on the edge of your chair, as if you were about to spring out of it and sprint across the room.

Also experiment with standing up when you study. It's harder to fall asleep in this position. Some people insist that their brains work better when they stand.

Pace back and forth and gesture as you recite material out loud. Use your hands. Get your whole body involved in studying.

5 Relax. When you're relaxed, you absorb new information quickly and recall it with greater ease and accuracy. Students who can't recall information under the stress of a final exam can often recite the same facts later when they are relaxed.

Relaxing might seem to contradict the idea of active learning as explained in technique #4, but it doesn't. Being relaxed is not the same as being drowsy, zoned out, or asleep. Relaxation is a state of alertness, free of tension, during which your mind can play with new information, roll it around, create associations with it, and apply many of the other memory techniques. You can be active and relaxed.

6 Create pictures. Draw diagrams. Make cartoons. Use these images to connect facts and illustrate relationships. Associations within and among abstract concepts can be "seen" and recalled more easily when they are visualized. The key is to use your imagination.

For example, Boyle's law states that at a constant temperature, the volume of a confined ideal gas varies inversely with its pressure. Simply put, cutting the volume in half doubles the pressure. To remember this concept, you might picture someone "doubled over" using a bicycle pump. As she increases the pressure in the pump by decreasing the volume in the pump cylinder, she seems to be getting angrier. By the time she has doubled the pressure (and halved the volume) she is boiling ("Boyle-ing") mad.

Another reason to create pictures is that visual information is associated with a part of the brain that is different from the part that processes verbal information. When you create a picture of a concept, you are anchoring the information in a second part of your brain. This increases your chances of recalling that information.
To visualize abstract relationships effectively, create an action-oriented image, such as the person using the pump. Make the picture vivid, too. The person’s face could be bright red. And involve all of your senses. Imagine how the cold metal of the pump would feel and how the person would grunt as she struggled with it. (Most of us would have to struggle. It would take incredible strength to double the pressure in a bicycle pump, not to mention a darn sturdy pump.)

Recite and repeat. When you repeat something out loud, you anchor the concept in two different senses. First, you get the physical sensation in your throat, tongue, and lips when voicing the concept. Second, you hear it. The combined result is synergistic, just as it is when you create pictures. That is, the effect of using two different senses is greater than the sum of their individual effects.

The “out loud” part is important. Reciting silently in your head can be useful—in the library, for example—but it is not as effective as making noise. Your mind can trick itself into thinking it knows something when it doesn’t. Your ears are harder to fool.

The repetition part is important, too. Repetition is a common memory device because it works. Repetition blazes a trail through the pathways of your brain, making the information easier to find. Repeat a concept out loud until you know it, then say it five more times.

Recitation works best when you recite concepts in your own words. For example, if you want to remember that the acceleration of a falling body due to gravity at sea level equals 32 feet per second per second, you might say, “Gravity makes an object accelerate 32 feet per second faster for each second that it’s in the air at sea level.”

Putting it in your own words forces you to think about it.

Have some fun with this technique. Recite by writing a song about what you’re learning. Sing it in the shower. Use any style you want (“Country, jazz, rock, or rap—when you sing out loud, learning’s a snap!”).

Or imitate someone. Imagine your textbook being read by Bill Cosby, Madonna, or Clint Eastwood (“Go ahead, punk. Make my density equal mass over volume”).

Recite and repeat. It’s a technique you can use anywhere.

Write it down. This technique is obvious, yet easy to forget.

Writing a note to yourself helps you remember an idea, even if you never look at the note again.

You can extend this technique by writing down an idea not just once, but many times. Let go of the old image of being forced to write “I will not throw paper wads” 100 times on the chalkboard after school. When you choose to remember something, repetitive writing is a powerful tool.

Writing engages a different kind of memory than speaking. Writing prompts us to be more logical, coherent, and complete. Written reviews reveal gaps in knowledge that oral reviews miss, just as oral reviews reveal gaps that written reviews miss.

Another advantage of written reviews is that they more closely match the way you’re asked to remember materials in school. During your academic career, you’ll probably take far more written exams than oral exams. Writing can be an effective way to prepare for such tests.

Finally, writing is physical. Your arm, your hand, and your fingers join in. Remember, learning is an active process—you remember what you do.

Use Your Brain

Engage your emotions. One powerful way to enhance your memory is to make friends with your amygdala. This is an area of your brain that lights up with extra neural activity each time you feel a strong emotion. When a topic excites love, laughter, or fear, the amygdala sends a flurry of chemical messages that say, in effect: This information is important and useful. Don’t forget it.

You’re more likely to remember course material when you relate it to a goal—whether academic, personal, or career—that you feel strongly about. This is one reason why it pays to be specific about what you want. The more goals you have and the more clearly they are defined, the more channels you create for incoming information.

You can use this strategy even when a subject seems boring at first. If you’re not naturally interested in a topic, then create interest. Find a study partner in the class—if possible, someone you know and like—or form a study group. Also consider getting to know the instructor personally. When a course creates a bridge to human relationships, you engage the content in a more emotional way.

Overlearn. One way to fight mental fuzziness is to learn more than you need to know about a
subject simply to pass a test. You can pick a subject apart, examine it, add to it, and go over it until it becomes second nature.

This technique is especially effective for problem solving. Do the assigned problems, and then do more problems. Find another textbook and work similar problems. Then make up your own problems and solve them. When you pretest yourself in this way, the potential rewards are speed, accuracy, and greater confidence at exam time.

11 Escape the short-term memory trap. Short-term memory is different from the kind of memory you’ll need during exam week. For example, most of us can look at an unfamiliar seven-digit phone number once and remember it long enough to dial it. See if you can recall that number the next day.

Short-term memory can fade after a few minutes, and it rarely lasts more than several hours. A short review within minutes or hours of a study session can move material from short-term memory into long-term memory. That quick minireview can save you hours of study time when exams roll around.

12 Use your times of peak energy. Study your most difficult subjects during the times when your energy peaks. Many people can concentrate more effectively during daylight hours. The early morning hours can be especially productive, even for those who hate to get up with the sun. Observe the peaks and valleys in your energy flow during the day and adjust study times accordingly. Perhaps you will experience surges in memory power during the late afternoon or evening.

13 Distribute learning. As an alternative to marathon study sessions, experiment with shorter, spaced-out sessions. You might find that you can get far more done in three two-hour sessions than in one six-hour session.

For example, when you are studying for your American history exam, study for an hour or two and then wash the dishes. While you are washing the dishes, part of your mind will be reviewing what you studied. Return to American history for a while, then call a friend. Even when you are deep in conversation, part of your mind will be reviewing history.

You can get more done if you take regular breaks. You can even use the breaks as mini-rewards. After a productive study session, give yourself permission to log on and check your e-mail, listen to a song, or play 10 minutes of hide-and-seek with your kids.

Distributing your learning is a brain-friendly thing to do. You cannot absorb new information and ideas during all of your waking hours. If you overload your brain, it will find a way to shut down for a rest—whether you plan for it or not. By taking periodic breaks while studying, you allow information to sink in. During these breaks, your brain is taking the time to literally rewire itself by growing new connections between cells. Psychologists call this process consolidation.

There is an exception to this idea of allowing time for consolidation. When you are so engrossed in a textbook that you cannot put it down, when you are consumed by an idea for a term paper and cannot think of anything else—keep going. The master student within you has taken over. Enjoy the ride.

14 Be aware of attitudes. People who think history is boring tend to have trouble remembering dates and historical events. People who believe math is difficult often have a hard time recalling mathematical equations and formulas. All of us can forget information that contradicts our opinions.

If you think a subject is boring, remind yourself that everything is related to everything else. Look for connections that relate to your own interests.

For example, consider a person who is fanatical about cars. She can rebuild a motor in a weekend and has a good time doing so. From this apparently specialized interest, she can explore a wide realm of knowledge. She can relate the workings of an engine to principles of physics, math, and chemistry. Computerized parts in newer cars can lead her to the study of data processing. She can research how the automobile industry has changed our cities and helped create suburbs, a topic that includes urban planning, sociology, business, economics, psychology, and history.

Being aware of attitudes is not the same as fighting them or struggling to give them up. Acknowledge them. Notice them. Simple awareness can deflate an attitude that is blocking your memory.

15 Give your “secret brain” a chance. Sometimes the way you combine studying with other activities can affect how well you remember information. The trick is to avoid what psychologists call retroactive inhibition, something that happens when a new or unrelated activity interferes with previous learning. Say that you’ve just left your evening psychology class, which included a fascinating lecture on Sigmund Freud’s theory of dreams. When you arrive home, you decide to sneak in a few pages of that mystery novel you’ve wanted to finish. After you find out who poisoned the butler, you settle in for a well-deserved rest. In this scenario, the key concepts of the psychology lecture are pushed aside by the gripping drama of the whodunit. Consider another scenario instead. You have arranged to car-pool with a
classmate, and on the way home, you talk about the lecture. The discussion ignites into a debate as you and your friend take opposite stands on a principle of Freud's theory. Later, just before going to sleep, you mull over the conversation. While you sleep, your brain can now process the key points of the lecture—something that will come in handy for the mid-term exam.

16 **Combine techniques.** All of these memory techniques work even better in combination. Choose two or three techniques to use on a particular assignment and experiment for yourself. For example, after you take a few minutes to get an overview of a reading assignment, you could draw a quick picture or diagram to represent the main point. Or you could overlearn a chemistry equation by singing a jingle about it all the way to work. If you have an attitude that calculus is difficult, you could acknowledge that. Then you could distribute your study time in short, easy-to-handle sessions. Combining memory techniques involves using sight, sound, and touch when you study. The effect is synergistic.

**Recall It**

17 **Remember something else.** When you are stuck and can't remember something that you're sure you know, remember something else that is related to it.

If you can't remember your great-aunt's name, remember your great-uncle's name. During an economics exam, if you can't remember anything about the aggregate demand curve, recall what you do know about the aggregate supply curve. If you cannot recall specific facts, remember the example that the instructor used during her lecture. Information is encoded in the same area of the brain as similar information. You can unblock your recall by stimulating that area of your memory.

You can take this technique one step further with a process that psychologists call elaboration. The key is to ask questions that prompt you to create more associations. For example, when you meet someone new, ask yourself: What are the distinctive features of this person's face? Does she remind me of someone else?

A brainstorm is a good memory jog. If you are stumped when taking a test, start writing down lots of answers to related questions, and—pop!—the answer you need is likely to appear.

18 **Notice when you do remember.** Everyone has a different memory style. Some people are best at recalling information they've read. Others have an easier time remembering what they've heard, seen, or done.

To develop your memory, notice when you recall information easily and ask yourself what memory techniques you're using naturally. Also notice when it's difficult to recall information. Be a reporter. Get the facts and then adjust your learning techniques. And remember to congratulate yourself when you remember.

19 **Use it before you lose it.** Even information encoded in long-term memory becomes difficult to recall when we don't use it regularly. The pathways to the information become faint with disuse. For example, you can probably remember your current phone number. What was your phone number 10 years ago?

This points to a powerful memory technique. To remember something, access it a lot. Read it, write it, speak it, listen to it, apply it—find some way to make contact with the material regularly. Each time you do so, you widen the neural pathway to the material and make it easier to recall the next time.

Another way to make contact with the material is to teach it. Teaching demands mastery. When you explain the function of the pancreas to a fellow student, you discover quickly whether you really understand it yourself.

Study groups are especially effective because they put you on stage. The friendly pressure of knowing that you'll teach the group helps focus your attention.

20 **Adopt the attitude that you never forget.** You might not believe that an idea or a thought never leaves your memory. That's OK. In fact, it doesn't matter whether you agree with the idea or not. It can work for you anyway.

Test the concept. Instead of saying, "I don't remember," you can say, "It will come to me." The latter statement implies that the information you want is encoded in your brain and that you can retrieve it—just not right now.

People who use the flip side of this technique often get the opposite results. "I never remember anything," they say over and over again. "I've always had a poor memory. I'm such a scatterbrain." That kind of negative talk is self-fulfilling.

Instead, use positive affirmations that support you in developing your memory: "I recall information easily and accurately." "At any time I choose, I will be able to recall key facts and ideas." "My memory serves me well." Or even "I never forget!"
Pay Attention to Your Attention

Many of the memory glitches of everyday life result from simple absent-mindedness and a failure to concentrate. Often, the results are minor inconveniences, such as misplacing an umbrella or entering a room and forgetting why. Sometimes, though, the consequences are serious—missing an important meeting, forgetting to answer key questions on a final exam, or running a stop sign and causing an accident.

When you notice your mind heading off on an unscheduled vacation, use any of the following techniques to return to the here and now.

Reduce Interference. Turn down the music—or turn it off—when you study. Find a quiet place that is free from distractions. If there’s a party at your house, go to the library. If you like to snack, don’t tempted yourself by studying next to the refrigerator. Two hours of studying in front of the television might be worth 10 minutes of studying where it is quiet. If you have two hours in which to study and watch television, it’s probably better to study for an hour and then watch television for an hour. Doing one activity at a time increases your ability to remember.

Think out loud. You can also train your attention by noticing unconscious actions and making them conscious. An example is the sequence of actions you might take before you leave home for the day—grabbing your keys, turning off lights, and locking the front door. If you go through this series in a robotic trance of semimission, you might get to campus and wonder, Did I remember to lock the door? You can eliminate such worries by saying to yourself before you leave home: “Now I am turning out the lights...Now I am checking the stove...Now I am turning the lock.” Instead of coasting through large portions of your life on automatic pilot, you’ll wake up and pay attention.

Bring your attention to your body—or your body to attention. In any given moment, your mind can be in two or more places at once. Your body, however, is always parked in one spot and dwells contentedly in the present moment. To focus your attention instantly, simply return to your body. Notice simple sensations—the air passing in and out of your nostrils, or your clothes gently resting on your skin. Then redirect your attention to the task at hand. Another option is to bring your body to a state of attention. Stand erect or sit with a straight spine on the edge of your chair. Visualize yourself on a tennis court, poised to return a serve. Repeat this process whenever your mind drifts.

Use a concentration cheat sheet. Each time that your attention wanders during a class or meeting, make a tick mark in the margins of your note paper. Creating a visible record of your distractions is one way to reduce them. Also, the physical act of writing re-engages your attention.

Note: This technique works only if you release any self-judgment about how often your mind wanders. At first, you might end up with row after row of tick marks. That’s OK. With time and consistent practice, they will decrease.

Doing one activity at a time increases your ability to remember.

Deal with distraction. One source of distraction is an urgent task that constantly resurfaces in your mind. Perhaps there is an important phone call to make, an errand to run, or a pressing problem to solve. When time and circumstances allow, deal with the distraction by taking care of the matter now.

If that’s not feasible, write a detailed Intention Statement that describes exactly what you will do to handle the distraction. With your intention safely recorded in writing, you can now zero in on studying, working, or whatever else is most important in the present moment.

Know when to get help. A condition called attention deficit/hyperactivity disorder (ADHD) interferes with the ability to concentrate. People with ADHD consistently experience negative consequences—missed due dates, low grades, poor work performance, strained relationships with friends and family, and more—as a result of being unable to focus their attention.

If you find that none of the above techniques helps you take charge of your attention, then meet with an academic advisor or counselor and ask for help. ADHD can be reliably diagnosed and treated. ☛
Set a trap for your memory

When you want to remind yourself to do something, link this activity to another event you know will take place. The key is to “trap” your memory by picking events that are certain to occur.

Say that you’re walking to class and suddenly remember that your accounting assignment is due tomorrow. Switch your watch to the opposite wrist. Now you’re “trapped.” Every time you glance at your wrist and remember that you have switched your watch, it becomes a reminder that you were supposed to remember something else. (You can do the same with a ring.)

If you empty your pockets every night, put an unusual item in your pocket in the morning to remind yourself to do something before you go to bed. For example, to remember to call your younger sister on her birthday, pick an object from the playpen—a teething toy, perhaps—and put it in your pocket. When you empty your pocket that evening and find the teething toy, you’re more likely to make the call.

Everyday rituals that are seldom neglected, such as feeding a pet, listening to the weather report, and unlacing shoes, provide opportunities for setting traps. For example, tie a triple knot in your shoelace as a reminder to set the alarm for your early morning study group meeting. You can even use imaginary traps. To remember to write a check for the phone bill, picture your phone hanging on the front door. In your mind, create the feeling of reaching for the doorknob and grabbing the phone instead. When you get home and reach to open the front door, the image is apt to return to you.

Link two activities together, and make the association unusual.

Keep your brain fit for life

Your brain is an organ that needs regular care and exercise. Higher education gives you plenty of chances to exercise that organ. Don’t let those benefits fade after you leave school. Starting now, adopt habits to keep your brain lean and fit for life.

Seek out new experiences. If you sit at a desk most of the workday, take a dance class. If you seldom travel, start reading maps of new locations and plan a cross-country trip. Seek out museums, theaters, concerts, and other cultural events. Even after you graduate, consider learning another language or taking up a musical instrument. Your brain thrives on novelty. Build it into your life.

Shaking up your routines might involve some initial discomfort. Hang in there. Remind yourself that new experiences give your brain a workout just like sit-ups condition your abs.

Take care of your health. Exercising regularly, staying tobacco-free, and getting plenty of sleep can reduce your risk of cancer, heart disease, stroke, and other conditions that interfere with memory. Eating well also helps. A diet rich in fruits and vegetables boosts your supply of antioxidants—natural chemicals that nourish your brain.

Drink alcohol moderately, if at all. A common definition of moderate consumption for people of legal drinking age is no more than one drink per day for women and no more than two drinks per day for men. Heavier drinking can affect memory. In fact, long-term alcoholics tend to develop conditions that impair memory. One is Korsakoff’s syndrome, a disorder that causes people to forget incidents immediately after they happen.

For more suggestions on maintaining health, see Chapter Eleven.

Engage life fully. Research sponsored by the MacArthur Foundation indicates that engagement with life acts as a strong predictor of successful aging. Researchers define engagement as maintaining close relationships with friends and family, and staying productive in paid or volunteer work. Both loving and working help keep your brain fit to handle a lifetime of memories.
It’s pronounced *ne-mon*ˈık*. The word refers to tricks that can increase your ability to recall everything from grocery lists to speeches.

**Mnemonic Devices**

Some entertainers use mnemonic devices to perform “impossible” feats of memory, such as recalling the names of everyone in a large audience after hearing them just once. Waiters use mnemonics to take orders from several tables without the aid of pad and pencil. Using mnemonic devices, speakers can go for hours without looking at their notes. The possibilities for students are endless.

There is a catch. Mnemonic devices have three serious limitations.

First, they don’t always help you understand or digest material. Instead of encouraging critical thinking skills, mnemonics rely only on rote memorization.

Second, the mnemonic device itself is sometimes complicated to learn and time-consuming to develop. It might take more energy to create such a device than to memorize something by using a more traditional memory technique, such as repetition.

Third, mnemonic devices can be forgotten. Recalling a mnemonic device might be as hard as recalling the material itself.

In spite of their limitations, mnemonic devices can be powerful. There are five general categories: new words, creative sentences, rhymes and songs, the loci system, and the peg system.

**New words**

Acronyms are words created from the initial letters of a series of words. Examples include NASA (National
Aeronautics and Space Administration), radar (radio detecting and ranging), scuba (self-contained underwater breathing apparatus), and laser (light amplification by stimulated emission of radiation). You can make up your own acronyms to recall series of facts. A common mnemonic acronym is Roy G. Biv, which has helped thousands of students remember the colors of the visible spectrum (red, orange, yellow, green, blue, indigo, and violet). IPMIS helps biology students remember the stages of cell division (interphase, prophase, metaphase, anaphase, and telophase).

Creative sentences

Acrostics are sentences that help you remember a series of letters that stand for something. For example, the first letters of the words in the sentence “Every good boy does fine” (E, G, B, D, and F) are the music notes of the lines of the treble clef staff.

Rhymes and songs

Madison Avenue advertising executives spend billions of dollars a year on commercials designed to burn their messages into your memory. Coca-Cola's song, "It's the Real Thing," practically stands for Coca-Cola, despite the fact that the soda contains artificial ingredients.

Rhymes have been used for centuries to teach children basic facts: “In fourteen hundred and ninety-two, Columbus sailed the ocean blue” or “Thirty days hath September.”

The loci system

The word loci is the plural of locus, a synonym for place or location. Use this system to create visual associations with familiar locations. Unusual associations are the easiest to remember.

Example 1

The loci system is an old one. Ancient Greek orators used it to remember long speeches. For example, if an orator's position was that road taxes must be raised to pay for school equipment, his loci visualizations might have looked like the following.

First, as he walks in the door of his house, he imagines a large porpoise jumping through a hoop. This reminds him to begin by telling the audience the purpose of his speech.

Next, he visualizes his living room floor covered with paving stones, forming a road leading into the kitchen. In the kitchen, he pictures dozens of school children sitting on the floor because they have no desks.

Now it’s the day of the big speech. The Greek politician is nervous. He is perspiring, and his toga sticks to his body. He stands up to give his speech, and his mind goes blank. Then he starts thinking to himself:

I am so nervous that I can hardly remember my name. But no problem—I can remember the rooms in my house. Let’s see, I’m walking in the front door and—wow! I see the porpoise. That reminds me to talk about the purpose of my speech. And then there’s that road leading to the kitchen. Say, what are all those kids doing there on the floor? Oh, yeah, now I remember—they have no desks! We need to raise taxes on roads to pay for their desks and the other stuff they need in classrooms.

Example 2

The loci system can also be based on parts of your body. When studying biology, for instance, use the loci system to memorize the order of structures of living things.

Start with your toes, the lowest points of your body. Associate them with the lowest structure of living things—atoms.

The top of your head is the highest point on your body. So associate it with the highest order of living things—biosystems, or groups of species.
Then associate the intermediate structures with points on your body between your head and toes.

- Link *molecules* to your feet.
- Link *cells* to your ankles.
- Link *tissues* with your knees.
- Link *organs* with your waist.
- Link *organ systems* with your chest.
- Link *organisms* with your neck.

### The peg system

This technique employs key words that are paired with numbers. Each word forms a “peg” on which you can “hang” mental associations. To use this system effectively, learn the following peg words and their associated numbers well:

- *bun* goes with 1
- *shoe* goes with 2
- *tree* goes with 3
- *door* goes with 4
- *hive* goes with 5
- *sticks* goes with 6
- *heaven* goes with 7
- *gate* goes with 8
- *wine* goes with 9
- *hen* goes with 10

Believe it or not, you can use the peg system to remember the Bill of Rights (the first ten amendments to the United States Constitution). For example, amendment number *four* is about protection from unlawful search and seizure. Imagine people knocking at your door who are demanding to search your home. This amendment means that you do not have to open your door unless those people have a proper search warrant.

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*I didn't realize how useful the mnemonic devices were until I used them. They have actually helped me out in all my classes. I have especially used them in my medical terminology class. I especially like using the creative sentences. That one worked the best for me!*

—COURTNEY MEYER
How Sensory Storage Works

Information received from the sense organs is transmitted through the nervous system to the brain, which accepts and interprets it. The information stays briefly in the nervous system while the brain interprets it; this lingering is known as sensory storage.

How does your mind handle the barrage of information conveyed by your senses? Thanks to what is known as selective attention, your brain automatically sorts out the more important signals from the trivial ones. Trivial signals, such as insignificant noises around you, are ignored or discarded. Through skills of concentration and attention, you can train yourself to ignore other, more distracting signals, such as a dog barking or people talking in the background.

Although your sensory storage accepts all information, data are kept there only briefly, usually less than a few seconds. Then the information either fades or decays or is replaced with incoming new stimuli. The function of sensory storage, then, is to retain information long enough for you to selectively attend to it and send it to your short-term memory.

How Short-Term Memory Works

Short-term memory holds the information that was sent from your sensory storage system. It is used to store information you wish to retain for only a few seconds. A telephone number, for example, is stored in your short-term memory until you dial it. A lecturer’s words are retained until you can record them in your notes. Most researchers agree that short-term memory lasts much less than a minute—perhaps 20 seconds or less. Information can be maintained longer if you practice or rehearse the information (repeating a phone number, for example). When you are introduced to someone, then, you will not be able to remember the person’s name unless you repeat or rehearse it at the time of the introduction. New incoming information will otherwise force it out of your short-term memory.

Your short-term memory is limited in capacity as well as in time span. Research conducted by the psychologist George Miller suggests that we have room in our short-term memories to store from five to nine bits (pieces or sets) of information at a time—that is, an average of seven. If you try to store more than this, earlier items are bumped out. The size of each bit, however, is not limited to a single item. You can group items together to form a longer bit or piece. Known as the Number Seven Theory, this finding is useful in both daily life and academic situations.* When you read a textbook chapter or listen to a lecture, for example, your short-term memory is unable to retain each piece of information you receive.
Learning: The Transfer from Short- to Long-Term Memory

To retain information beyond the brief moment you acquire it, you must transfer it to long-term memory for permanent storage. There are several ways to store information in long-term memory: rote learning, elaborative rehearsal, and recoding.

Rote Learning
Rote learning involves repeating information in the form in which you acquired it in sensory storage. Learning the spelling of a word, memorizing the exact definition of a word, and repeating a formula until you can remember it are examples. Material learned through this means is often learned in a fixed order. Rote learning usually doesn’t work well for storing large quantities of information. If you learn by rote, you are operating at the knowledge level of thinking.

Elaborative Rehearsal
Rehearsal involves much more than simple repetition or practice. Elaborative rehearsal is a thinking process. It involves connecting new material with material already learned, asking questions, and making associations. It is a process of making the information meaningful and fitting it into an established category or relating it to existing memory stores. This form of rehearsal is discussed in more detail later. When you use elaboration, you are functioning at the comprehension and application levels of thinking.

How Long-Term Memory Works
Long-term memory is a relatively permanent store of information. Unlike short-term memory, long-term memory is nearly unlimited in both span (length) and capacity (size). It contains hundreds of thousands of facts, details, impressions, and experiences that you have accumulated throughout your life.

Once information is stored in your long-term memory, you recall it through a process known as retrieval. Academic tasks that require you to retrieve knowledge include math or science problems, quizzes and exams, and papers. Retrieval is tied to storage. The manner in which information is stored in your memory affects its availability and how easily you can retrieve it. For example, suppose you have studied a topic but find that on an exam you are unable to remember much about it. There are several possible explanations: (1) You never completely learned (stored) the information in the first place, (2) you did not study (store) the information in the right way, (3) you are not asking the right questions or using the right means to retrieve it, or (4) you have forgotten it. Later in this chapter, you will learn principles that will enable you to store information effectively.
Strategies for Improving Encoding

The following suggestions will help you to improve encoding, the process of taking in information.

Exclude Competing Stimuli
Deliberately exclude everything that does not relate to what you want to encode. For instance, if you are reading, do not sit where there are other competing visual stimuli, such as television.

Use Various Sensory Modes
Use as many senses as possible to take in information. When listening to a lecture, for example, pay attention to visual clues the lecturer provides as well as to what he or she says.

Carefully and Specifically Define Your Purpose
As you filter incoming information, know clearly and specifically what types of information you need. If you are reading reference material for a research paper, you may need to pay attention to facts and statistics. If you are reading material to prepare for a class discussion, however, you might focus on controversial issues.

Use Prereading
Since encoding involves accepting an incoming message, it is helpful to anticipate both the content and structure of that message. Prereading, which is discussed in Chapter 5, provides this preliminary information.

Strategies for Improving Storage

Use the following suggestions to improve how efficiently you store information.

Use Immediate Review
After working on a chapter for several hours (with frequent breaks) it is tempting, when you finish, to close the book and move on to something else. To quit, however, without taking five to ten minutes to review what you have read is a serious mistake. Since you have already invested several hours of time and effort, it is worthwhile to spend a few more minutes insuring that investment. Reviewing immediately following reading is an effective way of storing information and facilitating retrieval. Review of your notes immediately following a lecture is also effective. To review a chapter you have just read, reread each chapter heading and then reread the summary.

Use Periodic Review
Periodic review means returning to and quickly reviewing previously learned material on a regular basis. Suppose you have learned the material in the first three chapters of your criminology text during the first two weeks of the course. Unless you review that material, you are likely to forget it and have to relearn it by the time your final exam is given. You might establish a periodic review schedule in which you quickly review these chapters every three weeks or so.
Use Mnemonic Devices

Mnemonics are memory tricks, or aids, that you can devise to help you remember information. Mnemonics include rhymes, anagrams, words, nonsense words, sentences, and mental pictures that aid in the recall of facts. Do you remember this rhyme? “Thirty days hath September, / April, June, and November. / All the rest have thirty-one / except February, alone, / which has twenty-eight days clear / and twenty-nine in each leap year.” The rhyme is an example of a mnemonic device. It is a quick and easy way of remembering the number of days in each month of the year. You may have learned to recall the colors of the rainbow by remembering the name Roy G. Biv; each letter in this name stands for one of the colors that make up the spectrum: Red, Orange, Yellow, Green, Blue, Indigo, Violet. Mnemonic devices are useful when you are trying to learn information that has no organization of its own. You will find them useful in reviewing texts and lecture notes as you prepare for exams.

Use Numerous Sensory Channels to Store Information

Many students regard reading and studying as only a visual means of taking in information. You can learn better, however, if you use sight, sound, and touch, as well. If you can incorporate writing, listening, drawing or diagramming, and recitation or discussion into your study habits, storage will be more effective.

Organize Information

Remembering a large number of individual facts or pieces of information is often a difficult, frustrating task. Organize or reduce information into groups or chunks. Instead of overloading your memory with numerous individual facts, learn organized, meaningful sets of information that are stored as one chunk.

To organize information, keep the following suggestions in mind:

- Discover how the material you are studying is connected. Search for some organizing principle.
- Look for similarities and differences.
- Look for sequences and for obvious divisions or breaking points within the sequences.

Use Elaboration

Mere repetition of material is seldom an effective storage strategy. Studying a chapter by rereading it, for instance, would not be effective. Instead you must think about, or elaborate, upon the material—ask questions, make associations and inferences, think of practical applications, and create mental images.

Connect New Learning with Previous Learning

Isolated, unrelated pieces of information are difficult to store and also difficult to retrieve. If, however, you can link new learning to already stored information, it will be easier to store and retrieve since you have an established memory slot in which to hold it. For example, an economics student associated the factors influencing the supply and demand curves with practical instances from his family's retail florist business.