

Memory

In classical Greece, Mnemosyne — usually translated as “Memory” — was considered to be the mother of History, Music, Astronomy, and all the other Muses. Memory is fundamental to learning and knowledge, so we’ve placed our chapter of memory-enhancement techniques first. They include how to build memory on previously memorized environments (Hack 2, “Build a Memory Dungeon”), how to use technology to remember most efficiently (Hack 4, “Space Your Repetitions”), and how to draw old memories that you thought you had lost back to the surface (Hack 5, “Recall Long-Ago Events”).

Boosting your memory will help you both gather new information and track where you’ve been in your life, bringing your past with you into the future. Our goal is to help you hold onto all the intangible treasures your academic pursuits and life experience bring you.

Hack 1: Remember to Remember

Ever use a fancy mnemonic only to forget that you memorized anything at all? Prospective memory is remembering to do something in the future. Learn to cue your prospective memory in ways that go far beyond a string around your finger.

The traditional method to remind yourself that you need to remember something (and a staple of clip art collections) is a string tied around your finger, but

there are many ways you can improve your *prospective memory* – or remembering to remember. We'll explore two very different ways to cut that string while retaining its effectiveness, as well as how to harness the humble checklist and improve prospective memory in general.

In Action

The character Uncle Billy in the Frank Capra film *It's a Wonderful Life* is an example of someone using mnemonics (badly) for prospective memory. Not only does he have the stereotypical string tied around his finger, he seems to have dozens, and he can't tell them apart. It's no wonder that he forgets important things and gets flustered, and this drives the plot of the movie.

To avoid having dozens of identical strings tied to your fingers — metaphorically or literally — we've found there are two main paths to using physical memory cues to remember to remember: either *differentiate your cues* or *overload a single cue*.

Differentiating Cues

A memory cue, such as a string around your finger, is only one bit of information: It tells you either "Remember something!" (string on finger = 1) or "Nothing to remember here!" (no string = 0). Uncle Billy's problem is that he has a lot of strings on his fingers all shouting "Remember something!" — but none of them are telling him what it is he should remember.

The key is to associate each "string" with what it's supposed to make you remember, and to strengthen that association through repetition. For example, when Marty notices that the car is nearly out of gas, she puts a blank sticky note on the windshield over the dashboard. When she sees it in the morning, it reminds her to look at the dashboard, which indicates she is out of gas and needs to go to the gas station.

NOTE The sticky note on the dashboard is like a prospective memory hack you're probably familiar with: putting your briefcase or purse in front of your front door so you won't forget it in the morning. (This is the number one trick people are eager to share with Ron at parties when he tells them he writes books on memory.) What's interesting here is that Marty doesn't write a message on the sticky note, just as you probably don't write on your bag — the required information is conveyed by the proximity of the memory cue to what you're trying to remember.

Marty has formed this habit over years, so now it's almost automatic. In this way, she is able to eke more than one meager bit of information out of the memory cue. Over time she has developed several such standard cues for herself,

and now she has access to a whole armory of differentiated memory cues that not only remind her to remember something, but remind her *what to remember*.

Overloading a Cue

Ron takes the opposite approach. Rather than have multiple memory cues, each of which provides a small amount of information, he makes one cue represent many items of information. He calls this *overloading*, not in the sense that the cue is carrying more than it can bear, but as in some computer languages like Java, where the “+” sign might mean addition in an arithmetic context, but something different — concatenation — in a string context.

For example, Ron wears a wristwatch, and like most people, he usually wears it with its face on the outside of his wrist. However, because it’s uncomfortable to wear a watch with the face on the inside of his wrist, doing so can be an irritant that serves as a memory cue. Thus, when Ron wants to remember something, he rotates his watch so that it is on the inside of his wrist.

But that’s still only one bit of information. To overload the cue, Ron uses an old mnemonic device called a *link system* (www.ludism.org/mentat/LinkSystem). Because it can be indefinitely extended, it’s usually sufficient to capture any information he needs to save while he’s momentarily without his notebook or voice recorder.

Here’s how the link system works. Let’s say Ron has a list of three items to remember while he’s driving: He has to buy gas on the way home (like Marty), he heard a review on NPR about a book he wants to check out, and he just remembered he has a meeting at work when he arrives. To remember these three items, he tells himself a connected story about what he has to remember, starting with his watch as an “anchor”:

- First, he imagines that a gasoline pump nozzle explodes through the glass on the front of his watch, spraying gas everywhere.
- Second, for the book, which let’s say is *The Hidden Reality: Parallel Universes and the Deep Laws of the Cosmos* by Brian Greene and is about cosmology — the Big Bang, multiverses, string theory, and the like — he imagines that the gasoline all over his car is ignited by a spark within the cabin and causes a new Big Bang. But he wants to remember the title is *The Hidden Reality*, so he imagines that the Big Bang is sucked into his back pocket, where it forms a hidden “pocket universe.”
- Finally, he wants to remember the meeting, so he imagines that the people who will be at the meeting decide to hold it in the pocket universe in his pants.

Absurd? Yes. But you’ll remember a story like this because it’s absurd, and the next time Ron checks his watch (such as when he gets to work) and he’s

somewhere he can write or type, he too will remember he has a list of items “attached to” his watch. He will then transcribe them promptly to his catch (Hack 3, “Mix Up Your Facts”), performing any to-do items immediately if he can, such as getting to that meeting.

Checklists

In his 2009 book *The Checklist Manifesto*¹, physician Atul Gawande describes how adopting the simple technique of creating and filling out checklists is revolutionizing medical treatment. Like flying aircraft or spacecraft (aerospace has used checklists for years), medical procedures have become too complex to rely on human memory alone.

Thus, in 2001, Peter Pronovost at Johns Hopkins Hospital made a list of steps for doctors to take before an operation that can help prevent infections (known as *central line infections*) from use of a catheter pushed through a vein into the heart. Many of the steps were as simple and obvious as the doctors’ washing their hands with soap. Pronovost asked nurses in his unit to observe the doctors and check the steps on the list; in more than a third of the cases, the doctors skipped at least one of these simple steps.

Pronovost then persuaded the hospital to allow nurses to stop doctors if they skipped one of the steps. He and his team followed the number of ten-day central line infections for a year. The rate went from 11 percent to zero, with similar results for the next 15 months. Gawande recounts how Pronovost’s team estimated that in slightly more than two years at Johns Hopkins, the checklist prevented 43 infections, saved 8 lives, and saved the hospital \$2 million dollars. Thus began the use of medical checklists at Johns Hopkins — and, as Pronovost taught others the technique, throughout the United States.

You can use checklists yourself to good effect. For example, as we’ve written elsewhere, Ron constantly used to leave the house without some item he needed and had to waste time doubling back to get it, or do without until he returned. But then he made a checklist of the 10 or so items he uses every day (medication, cell phone, and so on), and now he never leaves wherever he is without making sure he has these items. He also has a “PM checklist” for getting ready for bed, including such tasks as taking the dogs out one last time, turning off lights, and packing his 10 things to bring for the morning — nested checklists!

Don’t forget, checklists can be surprisingly effective when you use them for procedures and routines that you think you know well but want to ensure you do correctly, or things that you want to do more effectively. Just like the Johns Hopkins doctors, you can easily forget the things that seem obvious, simply because you’re comfortable with them. It may seem silly to write them down, but you may be surprised at the benefits in the long run.

NOTE If you find the checklist technique useful, try combining it with Hack 20, “Meet MET.”

Planning

Here's something else we know about prospective memory that you can use to improve your chances of remembering to remember: *planning helps*. Try actually planning to do your to-dos, mentally walking through the steps before it's time to do them. If you *expect* to do something, and make a *commitment* to do it, you will remember it better than if you just expect to have to memorize it. It's especially useful to keep an eye on your clock or calendar as well.^{2,3,4}

Other than planning, external mnemonics (such as those described above) are generally considered more effective than internal ones for prospective memory.

How It Works

There is still some question about whether prospective memory is qualitatively different from the usual, retrospective kind. For example, why is remembering a list of things you must do in the future significantly different from remembering a list of things you've already done?⁵ However, given the flurry of research on prospective memory since the mid-1980s, as well as all the advances in neuroscience, brain imaging, and so on since then, we will probably have some answers soon.

Meanwhile, it shouldn't be too problematic for the *Mindhacker* reader. If it turns out that prospective memory is just like any other kind, we already have a library of proven mnemonic techniques developed over thousands of years. These should help.

If, conversely, prospective memory is different from any other kind, we soon ought to have a list of techniques that will improve it uniquely, such as the *implementation intentions* or planning described earlier.

See Also

- Atul Gawande, "The Checklist," *New Yorker*, December 10, 2007. The article that led to the book mentioned above, *The Checklist Manifesto*. Available online (www.newyorker.com/reporting/2007/12/10/071210fa_fact_gawande).

Notes

1. Atul Gawande, *The Checklist Manifesto: How to Get Things Right* (New York: Metropolitan Books, 2010).
2. Daniel Siu, *Planning for Success: Mnemonics for Prospective Memory* (master's thesis, The University of British Columbia, 2004).
3. Robert Tobias, "Changing behavior by memory aids: a social psychological model of prospective memory and habit development tested with dynamic field data," *Psychological Review*, Vol. 116 No. 2 (2009): 408–438.

4. Peter M. Gollwitzer and Veronika Brandstatter, “Implementation Intentions and Effective Goal Pursuit,” *Journal of Personality and Social Psychology*, 73 (1997): 186–199.
5. Henry L. Roedinger III, “Prospective Memory and Episodic Memory,” *Prospective Memory: Theory and Applications* (Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers, 1996).

Hack 2: Build a Memory Dungeon

Paul L. Snyder

Memory palaces are one of the most ancient and reliable memory hacks, but it's not always easy to find a suitable real-life building for one. Today, role-playing games and video games offer rich, elaborate, and ready-made imaginary buildings and landscapes for use as “memory dungeons.”

The classical art of memory lays out a system for using your established knowledge of physical locations as a *memory palace*, a framework to store and order memory images. Many authors have described this technique, in which you create concrete mental images of things you want to remember, then place these images in a mental landscape you know well in memory, such as your home. The idea is to harness your kinesthetic memory of moving through the familiar space and your predilection to notice changes in familiar surroundings, so that as you imagine moving through the space, you see the images you created in your mind's eye, which triggers you to remember the related information.

Most sources discuss using this technique with real places (such as your neighborhood or the inside of your house), but the places that you use need not exist in the real world at all. One of the earliest texts discussing mnemotechnics, the *Rhetorica ad Herennium* (http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Rhetorica_ad_Herennium/home.html) suggests creating imaginary locations, but they do not need to be invented on your own. If you've spent a sizable amount of time playing video or role-playing games, you may have a ready source of prefabricated spaces available to you.

In Action

While you've been using video games, either to reduce your reaction time or just for fun, you've also been building up a supply of locales for your memory dungeon. Any number of games may provide suitable fodder, but some are better than others. Some games (such as *Doom*, *Quake*, or other first-person shooters) have multiple levels, not all of which will be ideal. A good choice of game will have a clear flow through its space; you should be able to choose a logical path that you can reproduce repeatedly without confusion. It's also better if the game space is visually varied, without many similar repeated areas or complicated mazes.

Unless you know the level very well, you may wish to refresh your memory of the level by playing through it several times. Disabling enemies so you can wander freely (if the game engine allows) will reduce distractions during this process.

When you have the layout of the level established clearly in your mind, pick a path through it. As you walk through this path in your mind, identify locations (called *loci* in the classical art) where you will place images. Pick out obvious locations (like corners) or distinctive features (like pillars or torches).

NOTE As an alternative, you could also use a strategy like the Nook and Cranny Method (www.ludism.org/mentat/NookAndCrannyMethod) to select a consistent pattern of locations in each room.

As you move through the route in your mind, create memory images for each item you are trying to remember and place them in successive locations. The images should incorporate multiple *hooks* to make the image as memorable as possible: exaggeration, sexual suggestiveness, humor (even bad jokes), and strong emotional associations all serve to add “stickiness.” Memory images need not relate to the game or its content; often, objects and people who are out of place are easier to remember.

Eventually, you may wish to clear out an area of your memory dungeon to store new images. It’s a good idea to do this intentionally, rather than hoping images will fade on their own. You could blow up your images with imagined dynamite, but many games offer a more exotic selection of implements of destruction.

In Real Life

For testing this hack, I chose a level that I’ve played many hundreds of times over the years, and remember better than some houses that I’ve lived in: the first mission of the original *Doom*. Figure 2-1 shows the layout of this level.

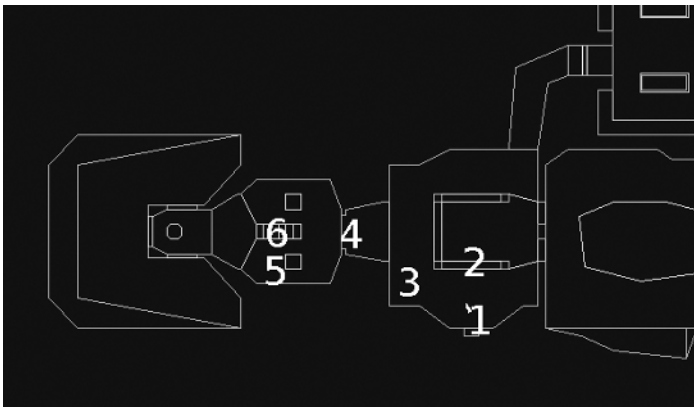


Figure 2-1: Doom level layout

While *Doom* was originally shareware, id Software released it as open source in 1997. You can install one of the many free versions of *Doom*. The version called *PrBoom* (<http://prboom.sourceforge.net>), for example, is licensed under the GNU General Public License and runs on Linux, Mac OS X, and Windows.

INSTALLING AND RUNNING PRBOOM

On Ubuntu Linux, *PrBoom* can be easily installed by running the following:

```
% sudo aptitude install prboom
```

You will also need the level data files for the first episode of *Doom*:

```
% sudo aptitude install doom-wad-shareware
```

For most versions of *Doom*, you can remove the distractions of being ambushed by demons using the `-nomonsters` command-line option, and you can jump to a specific level: `-warp <episode> <mission>`

On Ubuntu, with *PrBoom* and the data files installed, you can freely explore the first level with this command:

```
% prboom -iwad /usr/share/games/doom/doom1.wad -warp e1m1 -nomonsters
```

In this example, I chose to use the first two rooms of this level to remember the Julio-Claudian emperors of Rome. Here's how I did it:



Figure 2-2: Position 1

1. **Julius Caesar:** A man is leaning on the entry door to the level, wearing a laurel crown and the uniform of a Central American generalissimo. He is drinking an Orange Julius. (I want to remember that Caesar was

a dictator, not the first emperor.) See Figure 2-2 for an image of this location.

2. **Augustus:** A giant calendar is hung between the two pillars in front of the entrance, with a pin-up picture of a gentleman of Roman physique known as “Mr. August.” See Figure 2-3 for an image of this location.
3. **Tiberius:** In the corner to the left, where a health vial usually sits, is a giant beer bottle with a garish necktie tied around it (“Tie-beer”).

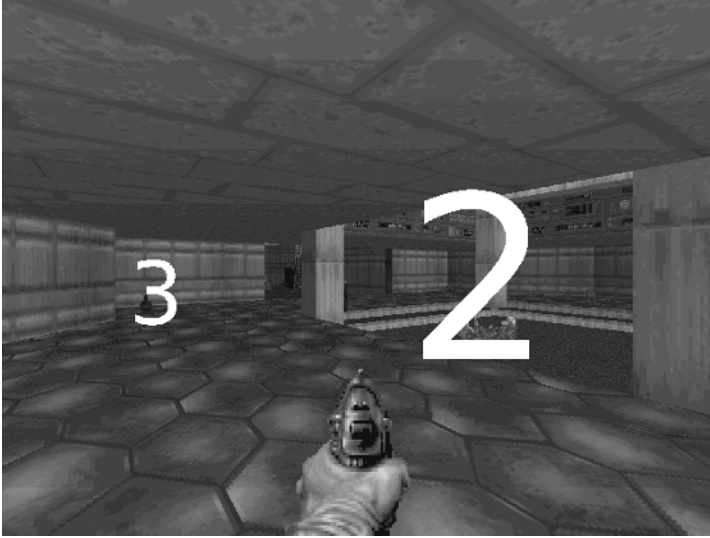


Figure 2-3: Positions 2 and 3

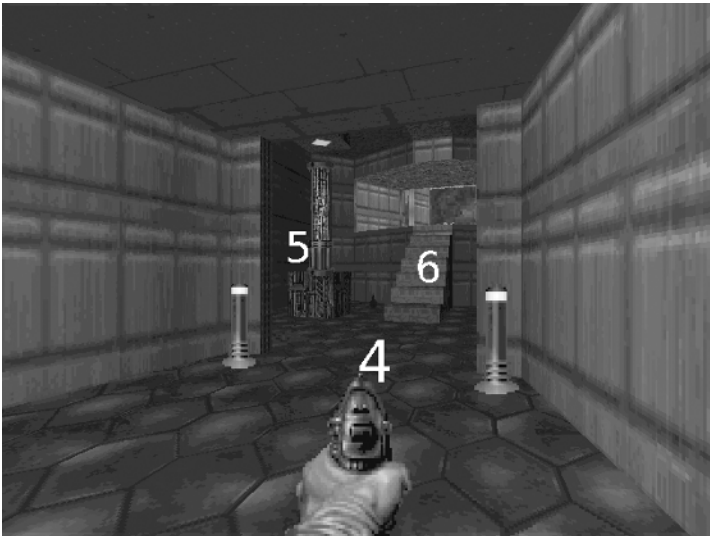


Figure 2-4: Positions 4, 5, and 6

4. **Caligula:** A giant combat boot sits between the two lights in the archway, blocking the passage. (“Caligula” means “little boot” in Latin.) See Figure 2-4 for an image of this location.
5. **Claudius:** A man is hiding behind the pillar to the left as you enter the side chamber, holding a pumpkin. (The Praetorian Guard supposedly found Claudius hiding behind a curtain after the assassination of Caligula. A satire was written about him called *The Pumpkinification of Claudius*.)
6. **Nero:** A man in a toga is sitting on the stairs, playing a burning lyre (fiddling while Rome burns, except fiddles hadn’t been invented yet).

Additional mnemonics can be layered onto each image to store more information, such as the years of each emperor’s reign. We might decide on a convention to record dates, such as an additional feature at the top for the first year of the reign, and another at the bottom for the last. Tiberius, for example, became emperor in 14 C.E. and died in 37 C.E. We could add this to our image by imagining the beer bottle being capped with a tire (“tire” being the pegword for 14 in the Major System), rather than a bottlecap and sitting on top of a Macintosh laptop (“mac” being the Major System mnemonic pegword for 37).

NOTE For more information on the Major System, see www.ludism.org/mentat/MajorSystem.

Hack 3: Mix Up Your Facts

Expand your vocabulary and knowledge of general facts with Google, a voice recorder, and an MP3 player set on shuffle.

This hack will teach you how to use the shuffle mode of your MP3 player to learn many different kinds of fact, from vocabulary words to entire encyclopedia entries. This technique can not only help you study for a class, but also help you consolidate what you glean from your independent reading as well. You are in control of what to learn, when to review it, and when to stop reviewing individual items.

Logophile Donald Sauter developed the original version of this hack back in the 1980s with cassette tapes. Adapting to modern technology has brought some refinements that cassettes couldn’t offer, such as using shuffle mode and the capability to edit the mix of facts quickly and easily. As audio technology continues to improve, this hack may too.

How It Works

Learning facts by listening to a recording of your own voice can work very well. Ron tends to learn more by reading and writing, but has, at times, studied subjects like American history by obtaining an outline of a class’s curriculum

and recording a tape of it. All he had to do was listen to the tape twice while lying down in a dark, quiet room, and he routinely aced the tests.

Of course, he actually made *three* trips through the material, twice by listening to the outline and once by reading it. If you prepare the outline of the material you're learning yourself, that adds another iteration, and enables you to learn by teaching since you're essentially preparing to teach yourself (Hack 9, "Learn by Teaching"). Finally, using shuffle mode mimics flash cards, enabling you to learn each piece of information independently, instead of as part of a long rote series of facts.

This hack works partly because the web is the biggest unabridged dictionary and encyclopedia in the known universe (among many other wonderful things) but that merely speeds the process. It worked well enough for Donald Sauter when he developed this system with a highlighter, a paper American Heritage Dictionary, a one-volume 1950 encyclopedia, and a cassette tape recorder, starting in 1987 (www.reocities.com/donaldsauter/word-power.htm). Sauter's own explanation for the hack's effectiveness is as follows:

What's nice about this "highlight and tape-record" self-education system is that what you study is precisely what you need to know, when you need it. There's no uncertainty as to whether it will be of value or not; it's immediately useful in understanding what you are currently reading. You can extract just the necessary essence of the new subject, or you might find yourself pulled into it and exploring it far beyond what you needed to make sense of the writer's passage.

In a way, this approach knocks down the wall between fiction and nonfiction. I often find myself putting a story on hold to read complete articles on a topic that the author brought up or briefly alluded to. Like my dictionary, my encyclopedia has highlighted passages sprinkled throughout. If there were a contest to see who reads a story the fastest, I'd lose by a country mile — but so what? It takes me longer, but I cover more territory. I certainly don't claim this method is for everyone, but I know that for me it's far more enjoyable, exciting and satisfying. Consider trying something like it yourself, and if not for yourself, with your child.

In Action

This section explains in detail the following six steps you must take to make a vocabulary audio file:

1. **Consult:** Suppose you're looking up a vocabulary word like *apocopes*. Type **define:apocopes** into Google. Be sure to use a colon after the word "define" so that Google returns a special definition page for the word, aggregated from various online dictionaries and other sources. If you omit the colon, Google will just return a regular list of web pages that contain the words *define* and *apocopes*. Try it and see. You may not need to use a

general dictionary if you have a specialized glossary to use, such as the Infinite Jest wiki (<http://infinitejest.wallacewiki.com/>) — but we didn't know about it until we started writing up this hack.

Choose the definition that makes the most sense. Make sure you also learn how the word is pronounced when you look it up.

If you're looking up a historical figure, a country, a date, or the like, you may want to try typing it into Wikipedia instead. You may also want to use your mouse cursor to highlight the parts of the encyclopedia entry you're going to record.

2. **Record:** Start the sound recording software on your computer or smartphone. Ron uses the Sound Recorder application on his Ubuntu netbook. It's best to record the sound file as an MP3 or another format your audio player of choice can recognize, so you don't have to convert it later. However, it doesn't need to have particularly good sound quality, because you're only recording your own voice. Thus, you can probably use a low bit rate and keep the files small.
3. **Speak and spell:** When your sound recorder has started recording, speak the word or name aloud, then spell it carefully, being sure to note any accents or diacritical marks, or any other special features. In our example, we'll just say the word "apocopes."
4. **Contextualize:** Provide your word with some context. First, read the name or title of the source of your word — for example, "*Infinite Jest*, page 57." You don't need to be overly detailed here (e.g., you don't need the ISBN number), just a way to find your word again in its original habitat.

Next, read the sentence in which your word appears, or the relevant part, if it's a long sentence. For example, from *Infinite Jest*, "the way menacing criminals speak in popular entertainment — d's for th's, various apocopes, and so on."

5. **Define:** Read the definition of the word into your voice recorder. If you are reading the secondary or tertiary meaning of the word, be sure to also note whether it's archaic, foreign, or anything else notable. Because Google aggregates several sources of definitions, it's a good idea to note the source of your definition too, such as WordNet.

In this case, Ron read, "Definition, *apocope*: abbreviation of a word by omitting the final sound or sounds; 'the British get pud from pudding by apocope.' *WordNet*."

6. **Save:** Stop recording. Our audio file now says,

Apocopes. a-p-o-c-o-p-e-s. Infinite Jest, page 57. “. . . the way menacing criminals speak in popular entertainment — d’s for th’s, various apocopes, and so on.”
Definition, apocope: abbreviation of a word by omitting the final sound or sounds; “the British get pud from pudding by apocope.” From WordNet.

Save the audio file you just made, using the word you’re defining as the filename, such as `apocope.mp3`, which uses the singular of the word for the filename, or `apocopes.mp3`, which uses the plural because that’s how the word appeared in the book.

After you run through these six steps a few times with some vocabulary words, they’ll become habit; after recording a few dozen words, you’ll have enough to start reviewing them.

Reviewing your vocabulary files is simple. Load them into an MP3 player and put them on shuffle. Shuffle mode is one advantage that MP3s have over Sauter’s original method of recording vocabulary words on cassette tape. Having words or other pieces of information come up randomly keeps you alert and makes you learn each piece separately, as you would with flash cards. Conversely, having them as one long piece, as they would be on a cassette, makes it easier to tune out and miss sections, or only learn each word in its new context on the tape.

Another advantage of MP3 files is that you can easily tweak and edit your vocabulary mix. If you find that you’ve learned certain words thoroughly, take them out of the mix. However, don’t delete them. Each file represents a valuable minute or two of your time, and that can add up. In a couple of months, you can look at the names of the files you saved; if there are any you no longer remember, you can drop them back into your mix. You can also trade them with a friend who’s reading or studying the same material.

It wouldn’t be hard to improve on this hack with spaced repetition (Hack 4, “Space Your Repetitions”). Of course, ordinary audio playback, shuffled or not, is preferable to interactive presentation when driving or doing anything else that requires sustained attention.

In Real Life

You may find that there are certain environments in which you can’t use this hack immediately. Maybe you’re reading in a quiet place, like a library or office, or maybe you’re somewhere without Internet access. In such a situation, you can note the word you need to define and where you read it in your *catch*, which is basically a notebook you always carry in which to record spontaneous ideas. You may even come to prefer this method, because you can “batch process” 10 or 20 words at a time later, when it’s convenient.

Alternatively, you can note your words on an index card that can double as a bookmark. When Ron was reading *Infinite Jest* by David Foster Wallace along

with the Infinite Summer project (<http://infinitesummer.org>), the book had so many unfamiliar words that he noted them with their page numbers on an index card that he was using as one of his bookmarks. (As everyone who has read *Infinite Jest* knows, you need at least two bookmarks for it, one for the body and one for the endnotes.) Eventually, he got tired of writing words down and just underlined them in the text, which is always an option if you own the book you're reading (Hack 7, "Write in Your Books").

When you're back in a private environment with Internet access, harvest the words you've collected by recording a vocabulary file for each of them.

Ron has even found himself using this hack while driving — not just listening to his vocab mix, but noting words for later recording. Last night, for example, while driving home from work, he was listening to an audio version of Kim Stanley Robinson's science fiction novel *Red Mars* when he heard the word "massif" used in connection with a Martian hill. He had heard the word before and knew how it was spelled, so he committed it to his mental "mnemonic catch," which is basically a number-shape system (www.ludism.org/mentat/NumberShapeSystem). When he got home, he jotted it down in his paper catch. He looked it up by Googling **define:massif**, and the second definition Google returned was the one he wanted. He found the original sentence in his e-book version of *Red Mars*. Finally, he recorded the word, context, and definition. Here's what his MP3 file for *massif*, which is exactly 45 seconds long, says:

Massif. m-a-s-s-i-f. Red Mars/Green Mars e-book, page 148. "We drive around to one of the tongues of ice that drop to the sand. They're like ramps up to the central massif, and once there, we drive right to the pole!" Definition: massif, noun. A large mountain mass or compact group of connected mountains forming an independent portion of a range. From Answers.com.

Hack 4: Space Your Repetitions

M. W. Fogleman

Discover open-source flashcard software that makes memorization easy and astonishingly powerful by means of algorithms that optimize your review sessions for maximum efficiency.

Our memory is simultaneously magnificent and pathetic. It is capable of incredible feats, and yet it never works quite like we wish it would. Ideally, we would be able to remember everything instantly, but we are not computers. We can hack our memory with tools like memory palaces, but such techniques require effort and dedication. Most of us give up, and outsource our memory to smartphones, cloud-enabled computers, or plain old pen and paper.

There is a compromise between easy-but-impotent digital outsourcing and extraordinary-but-laborious mental techniques. Psychologists have long known that a learning technique called *spaced repetition*, which efficiently organizes information for memorization and retention, can be used to achieve near-perfect recall. Nonetheless, the technique only began to catch on with the rise of personal computers, which can organize and track the mechanics of the technique easily. One of the first software programs to combine an efficient algorithm for spaced repetition with a user interface was SuperMemo, a proprietary Windows-only program that is still available. In the last few years, however, several free, open-source alternatives have recently appeared. If you use a flashcard deck made in one of these programs every day, you can guarantee near-perfect long-term retention.

How It Works

SuperMemo and its descendants are highly efficient for two reasons. First, you are actively reviewing the material with virtual flashcards instead of passively reading a textbook. Second, these programs use an algorithm based on spaced repetition that intelligently decides which information should be reviewed at a given time, based on your responses about each card's difficulty and how long it takes to respond to each card.

Spaced repetition was first discovered by the German psychologist Hermann Ebbinghaus in 1885. You may remember diluted versions of his findings from your teachers: instead of cramming, start studying early, because you're more likely to remember the material in the long run. Scientists and psychologists have gradually expanded this principle into a more exact science of predicting when you are going to forget a piece of knowledge. Using this information, the algorithms of the flashcard programs judge when you're likely to forget each word or fact, and test you just before you do. Being tested on the material you want to memorize just before you are likely to forget it strengthens your memory, and you'll spend less time doing so. If you mark a card as easy when you first see it, the program will give it to you again in a week or so; at that point, if you still mark it as easy, it might give it to you in two weeks, and then a month, and so on. Why waste your time reviewing simple concepts that you don't need to review frequently when you could be memorizing harder concepts?

In Action

While there are several spaced-repetition programs available, I prefer Anki, as it is free, open source, and actively developed. Its proprietary grandfather, SuperMemo, costs \$50; the older, open-source Mnemosyne has not been updated since 2010. Additionally, Anki has many flashcard decks you can choose, and

it's available on almost every desktop and mobile platform, complemented by an online synchronization and review service. To begin, download Anki from <http://ankisrs.net> and install it on your preferred platform. If you have a smartphone or tablet, I recommend maintaining your deck on your desktop and synchronizing it with your mobile device.

As an example for this hack, I will demonstrate how you can use Anki and a pre-made deck to learn advanced English vocabulary. Open Anki and click the Download button at the bottom of the screen. A new window will pop up with an enormous list of all the available decks and a search bar. We'll be using a deck called "5000 Collegiate Words (SAT Vocabulary)," which is currently the second most popular deck on Anki. Find it and click OK at the bottom of the screen. Anki will open this deck by default, and you can begin reviewing by pressing Review. The basic review screen for any deck is modeled after a flashcard: One side is the question, and one side is the answer, as shown in Figure 4-1. The first word in the deck is "abase," which I do not know, so I click Show Answer.

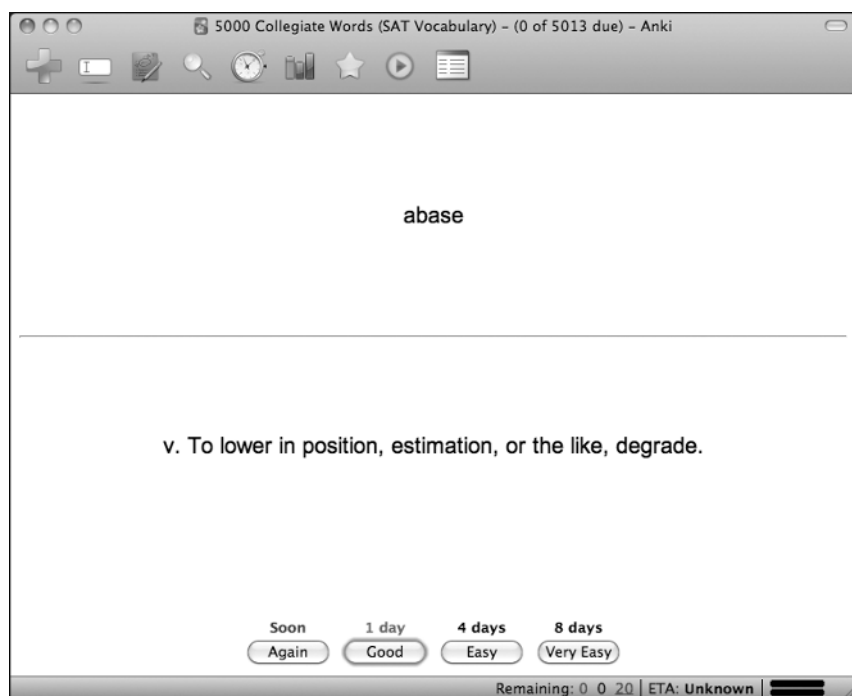


Figure 4-1: Anki in action

When it shows me the answer, I commit it to memory because I did not know it, and then I select one of the difficulty options. There are four options: Again, Good, Easy, and Very Easy. If, like me, you didn't know what the word "abase"

meant, you click Again, and Anki will show it to you soon, most likely toward the end of your review session. If you knew what the word meant, you decide how hard it was for you to remember its definition, and click the corresponding level of ease or difficulty. Anki uses this response to judge the optimal time to show you the card again.

After you've figured out how Anki works, you need to make a few decisions about the kind of information you want to memorize and how you want to organize it. In addition to supporting basic text input, Anki is also able to use multimedia, as well as the LaTeX markup language for mathematical and scientific symbols, so you can use it to memorize almost anything. Some common usages are memorizing vocabulary, learning foreign languages, or preparing for a test.

Another choice you need to consider is whether you will make your own flashcard deck or use a pre-made deck. If you're memorizing something personal (the faces and names of your business partners) or obscure (varieties of flora and fauna near the Congo River), you will have to make your own deck, but in many cases you will be able to find pre-made decks in Anki's vast online database. These pre-made decks are best used in combination with some form of learning outside of Anki, such as taking a course or reading a textbook. There is one notable advantage to making your own deck: Although it can be arduous, the process of making the flashcards will further help you to learn, understand, and retain the information. If you do decide to make your own deck, I recommend exploring Anki's repertoire of features, many of which can make your job less difficult, and memorization more powerful. One final point worth considering is whether you should use one deck with many kinds of information or multiple decks with separate purposes (such as different languages, but not individual lessons from a textbook, as Anki has a tagging system for that kind of information). I prefer to have multiple decks, but you may find that having one deck is easier and more powerful.

While spaced repetition programs like Anki make your studying efficient to an almost transhuman degree, you still have to study. I recommend setting aside a specific block of time to study each day. It's okay to miss a day once in a while, but it's best to keep as regular a schedule as you can. How much time you want to spend using Anki depends on why you are using it. If you just want to pass a test, you can spend 10 or 20 minutes a day for a month beforehand and you will almost certainly ace it, but if you want to become fluent in a foreign language, you can spend more time per day and you will be able to retain more information. Of course, you can always decide to spend more or less time studying with Anki. You'll soon realize how powerful spaced repetition is, and you might just want to tackle more than you thought you could.

In Real Life

I first used Anki to memorize Ancient Greek vocabulary, paradigms, and grammatical concepts for my language courses at St. John's College. While I could have studied my textbook rigorously, I realized that Anki would enable me to spend more time learning the material properly for the first time and less time reviewing that material. I did have to spend some time making my own Ancient Greek deck, which was tailored to the idiosyncratic textbook that the language courses at St. John's use, but in that process I reviewed the textbook very thoroughly in order to decide which parts were important and worth memorizing. Additionally, I made my deck freely available to others, so that it will continue to be a resource to the college community for some time. Most important, I accomplished my mission and became more than adequate at Ancient Greek. Since then, I have also used Anki for memorizing music intervals, poetry, and English vocabulary.

A friend of mine is learning Mandarin Chinese with Anki, using a plugin with several Chinese-specific features. Each character is color-coded for the tone that it is pronounced with. Clicking on a character opens a link to its entry in a Chinese dictionary in his browser, and pressing a button plays a recording of its pronunciation. Similar plugins are available for Japanese and German.

See Also

- Anki has excellent documentation, including a series of introductory videos, a user manual, and a FAQ: <http://ankisrs.net/docs/>.
- Wired published an article about Piotr Wozniak, author of SuperMemo, and spaced repetition: www.wired.com/medtech/health/magazine/16-05/ff_wozniak.

Hack 5: Recall Long-Ago Events

You can improve your recall of life events with journaling, footwork, and other exercises. Remember more about your life than you ever thought you could!

In recent years, neuroscientists have begun studying a group of people who have more-or-less perfect autobiographical memory: They seldom forget anything that has ever happened to them (www.cbsnews.com/stories/2010/12/16/60minutes/main7156877.shtml). These people usually have an enlarged temporal lobe, which is associated with storing new memories, and an enormously enlarged caudate nucleus, which is associated with forming skills and habits, and with obsessive-compulsive disorder. When asked how much bigger the caudate

nucleus was in these subjects, one researcher explained that the equivalent in height would be to be ten feet tall.

Unless you meet this description — and there are only a few people who are presently known to — you will probably never have perfect recollection of your entire life. However, you can recall directly, and reconstruct, much more about your past life than you think you can, through a combination of rumination, note taking, and detective work. This hack will show you how.

In Action

The following sections look at six different techniques you can use to enhance your autobiographical memory and reconstruct distant events, even if you never remember every detail.

Priming

To recall an event, thinking about related facts can help, even if they're only very loosely related. This is called *priming*. Thus, if you're trying to remember what you gave your spouse as a birthday present five years ago, you might naturally think about what your spouse's interests were at the time, or who was at the party. However, try to remember also how your favorite sports team was doing that year, who was living next door to you, and what jobs the party guests had. Even facts that don't seem to relate to the event can help, because they reconstruct more of the context, and because you can never be sure what, exactly, your brain will connect to the original event. In effect, you're googling your brain, metaphorically typing in haphazard keywords to get at just the search results you want. The curious thing is, it works.

Googling

Don't just google your brain — google the world. Search the Internet and other reference sources for facts about the period in question, and use them to remind yourself about what happened. This technique is especially useful if you have a Gmail account or other service that permanently archives all of your e-mail and enables you to search it.

Journaling

Of course, an e-mail archive like Gmail's only records facts about your world inadvertently. This is useful in its own way, but a journal is a purpose-built record of your world that records what you're sure you want to remember. Keeping a journal will prepare a record of your daily activities for when you want to recall

them in the future, and it hones your observational skills so that the events of the day remain sharp in your memory. Ron has kept a journal since 1982, and he has found it invaluable.

If you want to improve your autobiographical memory but don't have time to recount the entire day's events in a diary or blog, merely jotting a few keywords about the day has been shown to have a significant impact on recall. (See the "How It Works" section.)

Scott Hagwood is a four-time U.S. National Memory Champion. His book *Memory Power* is one of the few books by mnemonists to address recalling past events, rather than just trying to stuff your brain with more data. Hagwood suggests that to enhance your recall, you ask yourself questions such as the following when you journal:

- What did I do today?
- What phone conversations did I have?
- Was major time spent on minor things and activities?
- How much stress am I under, on a scale of 1 to 5?¹

Friends and Family

Talking to friends and family about the events you're trying to remember can be a big help. They will almost certainly remember some things you forgot, and they can corroborate things you remembered. They can also interview you, even asking the same questions you would ask yourself; it's often easier to remember facts in answer to a question from someone else, especially if you start telling a story.

Ratcheting

As you recall more and more information with the preceding techniques, leverage the bits and pieces of information you've recalled to pull up more. Feed the techniques and sources into one another: if you got a critical date and time from your e-mail, go look up that date in your journal. If you turn up a valuable clue in your journal, use the clue to remember more information with the priming technique, and so on.

Timelines

When you have gathered as much information as you can, draw a timeline of the period you're trying to remember — whether it's a day, a year, or your whole life. Mark out the period in the appropriate units; if you're trying to remember a weekend, that would be days and hours; if your life, probably years and months.

Fill out the timeline and try to get the order of events correct: Did that happen Friday or Saturday night? Was this the summer before or after my junior year? Putting events in order can solidify memories that are vague, and even bring up further details sparked when you see events next to each other. It can be surprising to see how memories snap into place and focus this way.

A timeline of your life can be quite useful. In researching this hack, Ron came across a timeline he had created of a roughly ten-year period from volume 1 of his journal, when he was 16, to just after he married Marty, at 25. It was so valuable to him in helping him set that portion of his life in mental order, both when he wrote it and later when he recovered it from his files, that he intends to expand it to cover his entire life, with shorter, denser, more detailed timelines for more interesting events, such as the one described in the “In Real Life” section below.

How It Works

With the act of priming, you’re trying to find an alternate pathway to the desired information in your brain. By thinking of random related facts or memories, you’re setting out on multiple pathways at once. With luck, one of them will connect to your target memory. The more pathways you try, the greater your chance of reaching your goal, or something near it.^{2,3}

The keyword technique in journaling has been explored experimentally. Psychologist Willem Wagenaar recorded 2,400 events from his daily life over a period of six years, with short notes describing four features of the event: “*what* the event was, *who* was involved, and *where* and *when* it happened.” Years later, Wagenaar tried to recall the other three features of an event based on only one of them. For example, given where an event happened, he asked when it was, what happened, and who was there. He concluded that “*what*” was the best memory cue, followed by “*who*”, “*where*”, and “*when*”, in that order. He also noted, “Although the number of irretrievable events can rise to about 20%, there is some evidence that in fact none of these events was completely forgotten.”⁴

In Real Life

In search of an event from his own life that he could use as an example of reconstructing long-forgotten memories, Ron was reminded of being a “Nifty Guest” (a rung below Guest of Honor) at Penguicon in Michigan several years ago. (Penguicon is an annual convention that brilliantly focuses on the geek trifecta of science fiction, gaming, and free/open-source software.)

Ron still thinks he had the most fun at Penguicon of any con he’s ever been to, so he had some very pleasant memories already. Nevertheless, some specific details had been eluding him.

- What was the name of the all-white, 3D board game he played with his friends Clark and Matt?
- What was the book on “serious games” and policymaking recommended to him by the fans of Ron’s previous book, whom he met while waiting in line for the Brazilian barbecue?
- What was the name of the friendly open-source hacker group into whose room party he stumbled on his way out of the hotel?

Ron began by searching for “penguicon” in his Gmail account. This brought up about 200 message threads, but he didn’t look any further back than 2006, when his first book came out, because this was one of the reasons he was a guest at the con. He found a mention of a live-action chess variant he had participated in at the con called ChessLARP, so he opened that thread and found a mention of the Penguicon wiki, where he was able to determine that the Penguicon he had attended was Penguicon 5.0, from 20 to 22 April 2007, in Troy, Michigan. Ron was able to obtain the event schedule for the con from the Penguicon archives, and the gaming schedule from the Internet Archive Wayback Machine (<http://web.archive.org/>).

Ron then searched Gmail for “april 22 ticket” and immediately found his itinerary for the trip to Michigan, reminding him that his friend (and convention committee member) Matt had taken the trouble to pick him up at the airport at 5:30 in the morning before the hotel opened, let him crash at Matt’s own apartment, then drive Ron to the hotel around 11:00. He was grateful to Matt for his hospitality, so this remains one of his fondest memories of the trip. It’s all too easy to forget favors others have done us, so remembering things we ought to be grateful for is another advantage of this technique.

Memories of the con began flooding back, and Ron began jotting notes. He had a detailed memory of meeting Howard Tayler, creator of one of Ron’s favorite webcomics, *Schlock Mercenary* (www.schlockmercenary.com/), and asking Tayler a sincere but probably intrusive question about how Tayler reconciled his transhumanism with his Mormonism. (Tayler said, “I’ll tell you later,” and proceeded to sign books for other fans for about an hour, after which he gave Ron a somewhat nonsensical answer that probably amounted to a polite “Go away kid, you bother me.”)

And so on. After reminiscing for a bit, Ron dug up his Moleskine notebook for April 2007 and found what amounted to a timeline of the con’s events, as he recorded them over three days. He might have done this in the first place, but all that googling was necessary to obtain the correct notebook to look in, since he has dozens of them. It was also good for a couple of hours of constructive rumination that clothed his bare memories of the con experience. He was able to answer two of the three questions he had asked himself:

- The book was *Policy Games for Strategic Management: Pathways into the Unknown*, by Richard Duke and Jac L. A. Geurts. Ron found one Amazon

review, which seemed to hold Professor Richard Duke in as high an esteem as Ron remembered his interlocutor did. Unfortunately, the book was scarce and expensive. Too bad.

- The peculiar, all-white 3D board game was Santorini (www.boardgamegeek.com/boardgame/9963/santorini), which Ron discovered was highly regarded by abstract gamers and due for a reprint in Spring 2011, as he was writing this hack. What luck!

As for the local hacker group that opened their room party to Ron, who knows? He can recall they were a LUG (Linux user's group), or something like one. There were two or three men and one woman; they wore T-shirts, and adorned the hotel room wall, with their group's logo. The real culprit here in Ron's memory block is probably the alcohol he shared with the party. Perhaps if Ron decided to have a couple of drinks right now, he could remember a bit more about the occasion, but "state-dependent memory"⁵ is a hack for another day, and probably another sort of book.

Notes

1. Scott Hagwood, *Memory Power: You Can Develop a Great Memory — America's Grand Master Shows You How* (New York: Free Press, 2006).
2. Endel Tulving, *Elements of Episodic Memory* (Oxford [Oxfordshire]: Clarendon Press, 1983).
3. L. E. James and D. M. Burke, "Phonological priming effects on word retrieval and tip-of-the-tongue experiences in younger and older adults," *Journal of Experimental Psychology: Learning, Memory and Language*, 26 (6) (2000): 1378–1391.
4. Willem A. Wagenaar, "My Memory: A Study of Autobiographical Memory over Six Years," *Cognitive Psychology* 18 (1986): 225–252.
5. Memory Disorders Project, "Memory Loss and the Brain: Glossary: State-Dependent Memory," Rutgers University, accessed May 10, 2011, www.memorylossonline.com/glossary/statedependentmemory.html.

