

Why We Forget

By
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Why Do We Forget?

We all do it; fail to meet someone at an agreed upon time, misplace our car keys, or send belated birthday cards. We may stare blankly at a sheet of paper, hoping that the information, which we “know” is stored in our brain, somehow forges its way to our consciousness, so that we can correctly answer the question being posed to us. Or perhaps we answer the question, being positive that we know the correct answer, only to find out that we were wrong in our recollection.

Cases of amnesia are reported where patients can remember nothing prior to a particular point in time, yet they retain certain capabilities (musical, mathematical, etc.) Other patients, such as H.M. seemingly cannot transfer information into their long-term memory. He can meet the same person several times in a day, and yet not recall meeting them before. Yet he can learn things such as the Tower of Hanoi, and not be able to recall learning it. These are all examples of forgetting. Yet it can be argued that they are examples of different types of forgetting. This article explains the different psychological ways we forget, and thus, why we forget. Neurological and physiological reasons are not addressed. To better understand the following reasons for forgetting, a brief proposal as to the structure of a memory system must be presented.

Proposed Models of Memory

Freud and William James were on of the first to defend the idea of two types of memory. Primary memory is responsible for our subjective feeling of the present, and is linked to attention. Secondary memory is inactive; a passive memory which is activated and brought to consciousness. Skills and automatic processes were not considered part of memory.

Current models, supported by Alan Baddeley¹, G. J. Hitch, and Robert Logie² among others, explain memory as being possibly four systems: An iconic (extremely short-term visual) memory, echoic (extremely short-term aural) memory, working (short-term) memory, and long-term memory. Iconic and echoic are sometimes referred to as sensory memory. Each of these can play a role in forgetting. The role of iconic and echoic memory, however, is thought to be one which allows

¹ Baddeley, A., *Human Memory: Theory and Practice*, 1990 Boston: Allyn and Bacon

² Logie, R., *Visuo-Spatial Working Memory*, 1995, Hove(UK): Lawrence Erlbaum Associates

stimulus to be perceived long enough so that it can be processed by working memory. As such, this paper addresses memory failures in working memory and long-term memory.

Susan Loftus³ identifies four psychological reasons for forgetting: retrieval failure, interference, motivated forgetting, and memory never stored. Alan Baddeley⁴ in his 1990 book *Human Memory: Theory and practice* further discusses these. The following discussions support these notions.

Retrieval Failure

For years it has been believed that everything we learn is stored forever. Sigmund Freud, in his *Psychology of Everyday Life*⁵ states "...all impressions are preserved..." He believed that our memories become perhaps "collapsed" or "crystallized" over time. Later, in his *Introductory Lectures on Psychoanalysis*⁶, Freud further indicates that the information, over time, becomes "inaccessible and latent, having become part of the unconscious."

In the 1940s while operating on epileptic patients, Wilder Penfield discovered that when stimulating the brain with weak electrical current near the hippocampus, patients recalled experiences from their past lives. If such were the case, then storage failure would not be a reason for forgetting, but retrieval failure would. Later analyses of the cases by Penfield himself showed that in no instance were the experiences recalled actual experiences. They were simply comparable to dreams. The only conclusion to be drawn from this is that Penfield's method of brain stimulation does not retrieve memories. There still exists the possibility that some method of brain stimulation can.

R. Brown and D. McNeill's 1966 *The tip of the Tongue Phenomenon*⁷ paper studied retrieval failure. "Tip of the Tongue (TOT) state involves a failure to recall a word of which one has knowledge. The evidence of knowledge is either on eventually successful recall, or else an act of recognition that occurs, without additional

³ Loftus, S., *Memory, surprising new insights into how we remember and why we forget*, 1980, Reading MA: Addison-Wesley

⁴ Baddeley, A., *Human Memory: Theory and Practice*, 1990 Boston: Allyn and Bacon

⁵ Freud, S., *Psychology of Everyday Life*, 1960, London: Hogarth Press

⁶ Freud, S., *Introductory Lectures on Psychoanalysis*, 1967, New York: Liveright

⁷ Brown, R., & McNeill, D., (1966) The Tip of the Tongue Phenomenon, *Journal of Verbal Learning and Behavior*, **5**, 325-337

training, when recall has failed.” C. Brainerd et. al.⁸ refer to this as reminiscence. “Remembering something at a point in time (B) when at an earlier time (A) you could not. In addition, you have not had the opportunity in the intervening time to relearn the material.” In both cases, the information is available, yet perhaps not accessible. C. Brainerd et. al. discuss three memory states of information.

“State U is a preliminary *unstored* state such that it cannot be retrieved (i.e., recall probability is 0).

State S is an intermediate *stored* state such that it cannot always be retrieved (i.e., recall probability is $0 < p < 1$)

State R is a terminal *stored and retrievable* state such that it can always be retrieved (i.e., recall probability is 1).”

State U is concerned with memory never stored, and will be mentioned later. State S and R indicate that information is stored. However, State S is of concern here, since it indicates that retrieval of information in this state is unreliable. But why? This might best be explained by the idea of memory traces. These are “pathways” to stored knowledge, or information in our long-term memory.

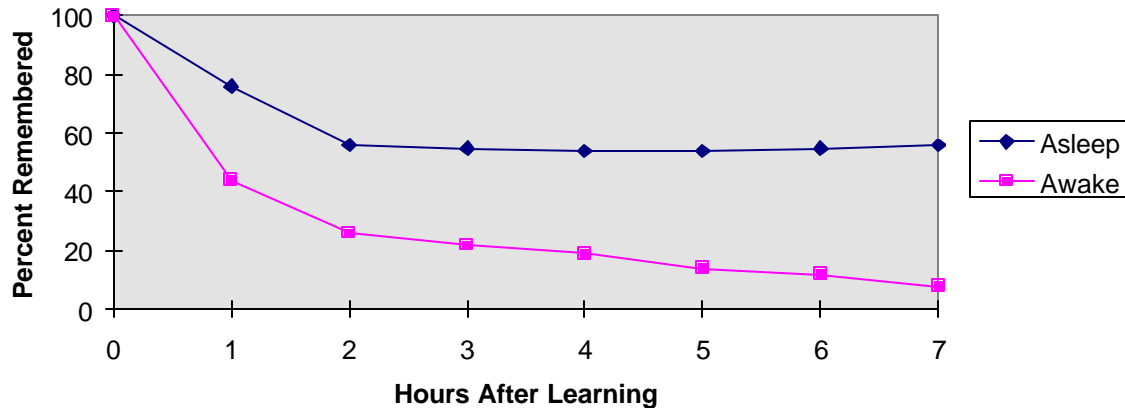
Two theories to explain why information is no longer retrievable are trace disintegration and trace decay. The aforementioned indicates that the pathway simply vanishes over time. Yet experiments show that relearning something is typically faster than learning it⁹. This supports the idea of trace decay, and that cues can help to recover these decaying traces. Retrieval relearning is the method by which the means of accessing a memory trace is relearned. Hence relearning something is faster, since the trace already exists.

⁸ Brainerd, C., Reyna, V., Howe, M., & Kingma, J., (1990) *The Development of Forgetting and Reminiscence, Monographs of the Society for Research in Child Development*, **55**, (3-4)

⁹ Nelson, T., Fehling, M. & Moore-Glascock, J. (1979) The nature of semantic savings for items forgotten from long-term memory. *Journal of Experimental Psychology: General*, **108**, 225-250

Interference

A classic experiment investigating the role of interference in forgetting¹⁰ was conducted by on only two subjects. Both subjects were taught 10 nonsense syllables to a level of one perfect recitation. After learning it, one slept while the other one performed routine or normal activities. As the chart shows, the one who slept retained more information, longer.



Variables such a time of day and the activity performed were not controlled. When they were¹¹, the results were not as dramatic, but they were still there. There exists the issue that it was not the lack of interference that resulted in better performance, but perhaps the normal neuronal activity in the brain during sleep (such as the release of growth factor) played the key role. Current theories in interference assume that "forgetting reflects the disruption of the memory trace by other traces, with the degree of interference depending on the similarity of the two mutually interfering memory traces."¹²

Two types of interference are commonly discussed. Proactive interference is when new learning is disrupted by old information. An example of this would be giving out your old telephone number after you have moved, instead of your new

¹⁰ Jenkins, J., & Dallenbach, K., (1924), Oblivescense During Sleep and Waking, American Journal of Psychology, **35**, 605-612

¹¹ Ekstrand, B., (1972) To sleep, perchance to dream. In C.P. Duncan, L. Sechrest, & A.W. Melton (Eds.), *Human memory: Festschrift in honor of Benton J. Underwood*, pp. 59-82. New York: Appleton-Century-Crofts

¹² Baddeley, A. (1990), *Human memory: theory and practice*, Boston: Allyn and Bacon

one. Retroactive interference is when new learning disrupts old information. Elizabeth Loftus studied this¹³ in 1980.

Subjects were shown films of traffic accidents. Later, they were subtly given new and erroneous information about what they saw. Later, subjects would say they remember actually seeing what was mentioned in the erroneous information. D. Riccio et. al.¹⁴ suggest that "Forgetting of attributes is typically reflected in a loss of discriminability among perceptually distinguishable events; memory representations appear to become broader and more homogeneous." Thus, subjects may forget attributes, and replace them with new (erroneous) ones supplied.

Berkian and Bowers¹⁵ showed that if the subjects are taken through the incident in the order it occurred, they do not show the false reporting which happened with Loftus during her unstructured questioning.

Prospective memory¹⁶ deals with remembering *when* something is to be done. Retrospective memory deals with *what* should be done. The degree to which a prospective memory item is remembered is dependent upon several things: the importance of the item, the amount of embarrassment one might feel if it is forgotten, and the proximity of the time of the event to other events normally performed in your daily routine.

Motivated Forgetting

As mentioned earlier in the discussion of prospective memory, we may forget things because we are not motivated to remember them. We can, however, forget things because we are motivated to forget them. People may block out terrible and traumatic events from their past, because of the pain associated with them. Loftus¹⁷ recounts the case of Dr. R.J. who lost her memory with no evidence

¹³ Loftus, E., & Loftus, G., (1980), On the permanence of stored information in the human brain. *American Psychologist*, **35**, 409-420

¹⁴ Riccio, D., Rabinowitz, V., & Axelrod, S., (1994), Forgetting of Stimulus Attributes, *American Psychologist*, **49**, (11), 912-926

¹⁵ Berkian, D., & Bowers, J., (1983), Eyewitness testimony: Were we misled? *Journal of Experimental Psychology: Human Learning and Memory*, **9**, 139-145

¹⁶ Meacham, J., & Singer, J. (1977), Incentive effects in prospective memory. *Journal of Psychology*, **97**, 191-197

¹⁷ Loftus, S., *Memory, surprising new insights into how we remember and why we forget*, 1980, Reading MA: Addison-Wesley

of physical injury. As an amnesiac, she was quite happy. As her memory returned, she recalled the traumatic year that ended in the death of her mother and the breakup of her marriage. Motivated forgetting had given her peace of mind. Once she remembered, she was no longer happy. Loftus quotes (quite aptly) Christina Rossetti in *Remember*. "Better by far you should forget and smile, than that you should remember and be sad."

Memory Never Stored

Consider the experiment conducted by Nickerson and Adams¹⁸ where subjects were asked to draw the head of a penny from memory. Only one subject could recall all eight "critical" features, presumably because the subject was an active penny collector. So why did they do so poorly? What is it about a penny that we need to know, in order to determine that it is a penny? The color and size are the two most obvious attributes. We only remember attributes necessary for discrimination.

Summary

Almost all of the information that we can forget is due to one or more of four reasons:

1. Retrieval failure -- failure to retrieve information due to inaccessibility. This could be because of decaying memory trace.
2. Interference -- Types of interference include Proactive Interference and Retroactive Interference
3. Motivated forgetting -- Forgetting something traumatic because of the pain and sorrow felt
4. Memory never stored -- simply discarding details because they are not needed for discrimination.

¹⁸ Nickerson, R. & Adams, M., (1979), Long-term Memory for a Common Object, *Cognitive Psychology*, **11**, 287-307

This may not make it easier to deal with the effects of forgetting something, but as you run through the airport to meet someone whose flight arrived an hour ago, you can at least understand why you forget the flight.