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Are There 256 Different Kinds of Memory?

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An academic Festschrift, as every reader of this volume knows, is a book honoring a respected scholar or scientist. It is usually published to celebrate an important landmark in the honoree's life. In our case the honored academic is Henry L. (Roddy) Roediger, III, a brilliant cognitive psychologist, mentor and teacher, friend and colleague. And the landmark, as far as I know, was the discovery in 2004 by Roddy's colleagues at Purdue, primarily Jim Nairne, that they had had the good fortune of having had a truly remarkable colleague in their very midst when Roddy was a faculty member there. The discovery resulted in Roddy's being nominated for and awarded an honorary doctor's degree by Purdue, followed by a scientific conference to celebrate his achievements, and now this volume to record it for posterity.

Wikipedia, the source of infinite knowledge and wisdom in our day and age, offering an explication of the term, declares that "A Festschrift can be anything from a slim volume to a work in several volumes. It often includes important contributions to scholarship of science." Please note that the operative word in this pithy definition is "often." Often means "not always." An appropriate elaborative emendation of Wikipedia's definition would say that a Festschrift frequently enough also serves as a convenient place in which those who are invited to contribute find a permanent resting place for their otherwise unpublishable or at least difficult to publish papers.

My contribution to Roddy's Festschrift, I suspect, belongs in this latter category. Having spent a lifetime watching journal editors, referees, reviewers, and all kinds of other experts, I am reasonably certain that I could not have gotten the present piece into a respectable journal. It has few strengths and many faults; it does not follow the standard procedures; above all it is not clear what the point of the paper is. Therefore, I am deeply grateful to Roddy for having done well enough in his career to have earned himself a Festschrift. And I very much appreciate that Jim Nairne who organized the conference and is editing the present volume invited me to be a part of it. It allows me to publish this paper, which otherwise would probably not have seen the light of day.

I do feel a bit embarrassed for pulling what some might regard as a stunt on my esteemed friend and colleague. I know full well that Roddy deserves better than having his (first) *Festschrift* serve as a dumping ground for others' failed ambitions. But he knows that science is a risky business, and every now and then you run into a bum deal or situation. My minor excuse is that some people very close to Roddy encouraged me to publish this paper and that Roddy himself suggested the title. Perhaps even more relevant is the fact that the topic of the paper is not totally unrelated to Roddy's own interests. This fact should please Jim Nairne in his role as editor of the *Festschrift*. When he issued instructions to the writers as to their precise mission, he made it exceedingly plain that their papers had to have a clear bearing on Roddy's own contributions to our science. The same fact also kept me from committing a sin to which *Festschrift* writers frequently fall prey and which an astute observer of the ways of scholars and scientists has put succinctly as follows: "All too often, the *festschrift* consists of a disparate and uneven collection of papers on a range of subjects that . . . only vaguely intersect with the interests of the individual whose work is being honored by the volume" (David Nunan, Cambridge Journals Online, doi: 10.1017/S0272263199223078).

My paper does intersect with Roddy's interests. Indeed, it could be thought of as a commentary on, or at least a footnote to, a long important dissertation (chapter) that Roddy and two of his pupils wrote for the venerable *Stevens' Handbook of Experimental Psychology* (Roediger, Marsh, & Lee, 2002) on "Kinds of Memory."¹ Before writing that chapter on varieties of memory, Roddy had already achieved critical fame as an expert on a particular kind of "kinds of memory" known as "memory systems." He discovered not only the now widely acclaimed "female reproductive system" (Roediger, 1993, see also 2003) but also the smallest human memory system known to science, namely the "red fruit memory" system (Roediger, 1990.)

Thus, the topic of "kinds of memory" has an established position among Roddy's widespread interests. Even if it is not one of his truly great scholarly passions—it cannot compete with cueing inhibition, or implicit memory, or false memory, or testing effects (see Nairne, chapter 1, this volume)—Roddy's connection with the problem area is clear, and I am safe to proceed with my story.

The thumbnail sketch of the story I tell in this paper is as follows: In the old days, there was only one kind of memory. To study memory meant to study that one kind. Then things changed, and among other changes there appeared on the scene different kinds of memory. Although Roddy, in his formative years, had misgivings about multiplicity of memory of any kind, like other good scientists he reconsidered, relented, and reformed. As frequently happens with religious and ideological converts, Roddy also went too far in his tolerance of newfangled ideas, and on his own, voluntarily, without any external pressure, although with the help of two young people, wrote that aforementioned long paper entitled "Kinds of Memory" (Roediger et al., 2002). The paper was thorough, thoughtful, and scholarly, and, as the title suggests, it explicitly admitted to there being in existence many different kinds of memory. So far so good. But the otherwise great paper was marred by an error. My contribution to Roddy's *Festschrift* is to proffer a correction of that error.

ONE LEARNING, ONE MEMORY

Everybody knows (well, all wise people like our honoree Roddy know) that life was simpler in the old days. It was simpler in science, too. There were fewer problems, fewer uncertainties, and fewer ideas. Scientists' ignorance was remarkably limited. As late as 1977, everything that scientists did not know could be presented in two thin volumes, judging by available evidence (Duncan & Smith, 1977). It was not even unknown for a thinker to declare that all important problems in science were solved.

Life was similarly simpler in the field of the psychology of memory. The field was established by Ebbinghaus' (1885) ground-breaking magnum opus entitled "On Memory," although by our current standards there was actually rather little memory in it. Instead, the book described many experiments on what later came to be called verbal learning. As time went by, verbal learning became very popular in North America. It also greatly simplified the life of anyone interested in memory, because it offered few challenges and required little original thought.

In the field of verbal learning, there was only one kind of learning ("verbal learning"). It was studied only in the laboratory (named the "verbal learning laboratory"). Its study relied on one basic method ("list learning"). Subjects' performance was judged by either "trials to criterion" or "proportion correct." The data were interpreted (when it was deemed necessary to interpret them, which was not always the case) in terms of a single concept ("association") that had only a single property ("strength"). Most people of Roddy's age or older know all about these "old days," and younger ones can find out more about them by reading history (e.g., Bower, 2000; Cofer, 1979).² A telling sign of the overarching power of verbal learning was the fact that memory was not talked about. In what at the time was the psychology student's bible of retention and use of knowledge and skills acquired through learning, "Psychology of Human Learning" by McGeoch and Irion (1952), the term "memory" occurred only in the expression "memory span." It looked as if memory as such did not exist in the psychologists' world.

Eventually, as everybody knows, the verbal learning movement was freed from its self-imposed fetters by cognitively oriented psychologists. Memory was welcomed back from its exile and allowed a place at the center of the stage of cognitive psychology. But as frequently happens in revolutions, some old bad habits were retained by the revolutionaries. In the case of the reborn memory one such bad habit was to think that there was only one kind of memory. Thus, instead of being ruled by one learning (mainstream) psychological thinking was ruled by one memory.

In this unitary-memory attitude students of memory took their cue from their once banished forebears. Ebbinghaus' (1885), in his otherwise innovative work, had not displayed any awareness of different kinds of memory. At the beginning of his magnum opus he did talk about different ways in which memory manifests itself, but memory itself was undivided. Memory was memory. Richard Semon (1904), an unappreciated giant of the memory world of the time, had many

profoundly insightful ideas about memory that went beyond Ebbinghaus' work, but he was in excellent agreement with Ebbinghaus in the matter of the concept of memory. Memory was memory. (For a fascinating story of Semon's life and work on memory see Schacter, 2001). Nor was there any hint offered about different kinds of memory in Frederic Bartlett's (1932) classic book "Remembering," which in many other ways represented the polar opposite of Ebbinghaus. Just about the only hint about different "kinds" of memory was found in William James's "Principles of Psychology" (James, 1890), but few psychologists knew about it.

MORE THAN ONE?

The world has changed greatly over the last century. The science of memory is no exception: It too has seen many changes including those having to do with the very concept of memory and, accordingly, the scope and the nature of memory research. Among other things, memory has split into numerous fragments.

When psychologists of the younger generation, who rebelled against the behaviorist ways of their elders, embraced mind as their new love, and began to celebrate the event loudly, memory was invited to the party, too. Actually, memory was let in through the back door, as it were. Some of the young revolutionaries discovered William James (1890). They adopted his views of psychology as a science of the mind (Miller, 1962) and took seriously his distinction between two kinds of memory, one "primary" and the other "secondary" (Waugh & Norman, 1965). Aided and abetted by innovative experimental work by John Brown in England (1958) and Lloyd and Peggy Peterson in the US (Peterson & Peterson, 1959), and against the noble but eventually ineffectual rearguard action by traditionalists (Keppel & Underwood, 1962), this younger generation cleanly separated "short-term" memory from "long-term" memory. This action was the beginning of memory's fate like that of Humpty Dumpty: what started as a nice round whole became many pieces. The pieces have come to have many names, but collectively, and at the most general level of classification, we can refer to them as "kinds of memory." The term "memory" itself has become just an umbrella term covering all the different kinds, and one-time dreams of psychologists of coming up with a comprehensive "theory of memory" have become as irrelevant as psychological theories about umbrellas.

By the time that Roediger and his two collaborators (Roediger et al., 2002) took stock of the situation regarding "kinds of memory," there was so much relevant material that they had a real ball. Their approach was thorough and scholarly. They first surveyed the grounds and reasons for distinguishing types of memory. They discussed many different kinds of distinctions that had found their way into the psychologists' vocabulary. They presented their own veritable collection of kinds or types of memory: declarative, procedural, explicit, implicit, conscious, unconscious, voluntary, involuntary, retrospective, prospective, code-specific, sensory, iconic, echoic, working, long-term, episodic, autobiographical, semantic, as well as some others. Their conclusion was thoughtfully

wise: “[T]he single term memory does not do justice to the underlying concepts it represents.”

HOW MANY?

The Roediger et al. (2002) paper, admirable in many ways, had a flaw (all right, because it is a *Festschrift*, let us call it a minor flaw). The flaw is not easy to find. Therefore it makes a suitable test to amuse the reader of this piece who has stuck it out to this point. So, try it.

Here are the first three sentences of the Roediger et al. (2002) paper:

Memory is a single term, but refers to a multitude of human capacities. There are many different kinds of memory. Philosophers have analyzed memory for 2,000 years; psychologists have studied the topic experimentally for 115 years; and neuroscientists have examined the neural bases of memory for the past 70 years.

The flaw is contained in this text. Where? Do you see it? I give you a hint: The flaw is hidden between (sic!) the second and the third sentences. See it? Not yet? I give you another hint: It is something that is missing there. What is it? If you got it, congratulations! If not, here is a final chance to redeem yourself: The missing thing, the flaw, is the information that is provided in the present paper, as well as in the heading of this section of the paper. Got it now? Good! But do not get too cocky—you were mightily primed.

So, the missing part, the flaw (sorry, the minor flaw), is the answer to the implicit question of “how many?” After Roddy and his co-authors noted that, “There are many different kinds of memory,” they should have told the reader how many. Readers of papers of the kind that we are talking about like data, and they like quantitative data. The mention of merely “many different kinds” leaves many a reader deeply disappointed. Roddy and his friends should have known it, and should have taken steps not to bring such disappointment into the hearts of their readers. That is why I call it a flaw in the paper.

Well, as it happens, I have been searching for varieties of memory for some time now. It is, at least was, a sort of a hobby of mine. Whenever I come across yet another “kind of memory,” I enter its name into my master list creatively labeled “kinds of memory.” I kept adding name after name of kind of memory, the list kept growing and growing, and I was running out of space in my computer. I then decided to declare the list closed. Life is too short for everything one is tempted to do, hobbies included. A happy consequence of this decision was that I am now in the position to share with Roddy, his colleagues, and indeed the rest of the curious world the answer to that question of “How many?” The missing number, believe it or not, is 256! In the remainder of this paper, I name all 256, and then tackle the question that most readers are likely to ask: “Big deal! So what?” In answering that question I offer some practical suggestions as to how the list of 256 kinds of memory can be put to good scientific, educational, recreational, and perhaps even to commercial use.

WHAT ARE THEY?

The 256 kinds of memory are duly listed in the Appendix of this paper. (If you do not believe that there are 256 entries in the Appendix, feel free to count them.)

How did the items in the list get in? After all, the term "kind of memory" is vague, fuzzy, polysemous, impressionistic, and not precisely definable. This fact created a certain difficulty for me in my undertaking of producing a definite inventory of currently existing kinds of memory. But the problem was not insurmountable. We psychologists are resourceful when it comes to solving fuzzy problems, because most problems in our field are fuzzy. They are best treated flexibly and with imagination.

In the present instance I relied on an old crafty device called "operational definition." Younger readers who have grown up in the happy-go-lucky, currently fashionable world of "exploratory science," may not be familiar with operational definitions, although they should be, even if it is true that operational definitions have acquired a somewhat unsavory repute (Green, 1992). Briefly, an operational definition describes concrete operations that an impartial observer of nature—yes, they did believe in the existence of impartial observers in the old days—performs to create or construct the to-be-defined entity. The construction, that is the description of how you "got there," defines what it is that you wanted to define. A famous operational definition of intelligence is, "Intelligence is what tests test." (This is inspired by a famous paper by one of my own professors—Boring, 1923.) The ultimate perfection here would be not what intelligence tests test, but what an intelligence test tests, and there are these versions of the definition in existence, too. You cannot get much craftier than that! And it does simplify life.

The great advantage of operational definitions is that no one can argue with you when you use them. At least they are not allowed to, according to theory. Operational definitions are totally objective, and scientists are supposed to love objectivity. If someone does disagree with your operational definition, you simply turn off your hearing aid.

After this preamble, I trust, you are ready for the precise operational definition of "kind of memory." Here it is: A kind of memory is the noun "memory" preceded by an appropriate adjectival modifier. For example, event memory, iconic memory, olfactory memory, recognition memory, short-term, and verbal memory are examples of "kinds" of memory. (As the astute reader observes, some of the memory qualifiers here are not adjectives but nouns, and some indeed are rather extended phrases. Grammarians would frown on such practice, of course, but scientists are practical people and as such they usually do not get terribly excited about how grammarians treat their beloved subject matter.)

Note that because of my clever use of the given operational definition you cannot argue about an entry's presence in the list. That is, you cannot ask whether an entry X in the Appendix refers to a true, real, or valid kind of memory, or whether it rightly belongs there. It is true, real, and valid by virtue of its presence in the list. With operational definitions you cannot lose!

To remind the reader: The way the different kinds of memory found their way into the list was simple. Every time I saw a kind, as defined, in a scholarly article or book, and remembered the project, and had an implement handy to make a note of it, and did not lose the note, the kind ended up as a member of the list. Anyone who wishes to replicate the study can either use the same method, or an improved one. At any rate, we now have the list of 256 names of kinds of memory and can try to figure out what to do with it.

WHAT CAN WE DO WITH 256 KINDS OF MEMORY?

At this point in the proceedings the inevitable “so what?” question would undoubtedly crop up. So there is this list of 256 kinds of memory. So what? What is the list good for? What can you do with it? Who would want to bother about it in any form or fashion? Is it more than an idle exercise, a trivial sort of amusement?

The easiest question here is the one about what it is good for. I have already answered that question—the list was, still is, good for me in that it gave me something to publish in Roddy’s *Festschrift*. Without it there would have been the *Festschrift*, but I would not have been in it. That would have been sad.

As to the other skeptical queries, I know that some of you would simply want to, and will, ignore the list altogether. This happens all the time in a developing science such as ours in which new ideas and findings crop up that practitioners do not like, and there are many reasons for that. (How many? I can think of four, but they are outside the purview of this paper.) Anyhow, it is reasonable to expect that ignoring the list in the Appendix would be the preferred action by many if not most people who ever become aware of its existence.

Then there are those who will not quite ignore the list but will wonder whether they should take it seriously. Can anyone be serious when he talks about 256 kinds of memory, or is he just kidding others to see how they react? Is someone going to write, some time, somewhere, something like, “scientists have now discovered 256 kinds of memory”? Or is someone going to say, “psychological science of memory is running amuck; witness the silly claim of . . .”?

For those who are still reading this epistle at this point, and are still wondering what is going to happen next, I do have some concrete suggestions on how one might use the list for scientific, educational, recreational, and perhaps even commercial purposes. The items below serve only as examples, the actual possibilities are many more, limited only by your imagination. Again, however, it is up to you to decide whether you want to take them seriously or not.

Possible scientific uses include:

- (1) Examining the list for errors of omission or commission. If you find any, email or phone Roddy and let him know. He can start a new list. This one is closed, as I mentioned, but there is no law against a new, better list.
- (2) Determining the scientific relevance of the number 256. How important do you think is this figure? If someone argued with you and maintained that the true number is 283, or 251, or 200, or 135, or whatever, how would

you react? This is your problem, esteemed reader, because the list in the Appendix is closed, finished, done. But if someone asked me, I would say that although I would not argue about the figure 256, I like it. I like it very much, because it is such a nice number. Besides, in the binary number system it would be recorded as 100,000,000, and that is even nicer. Nevertheless it is probably wise not to take 256 too literally. It does not carry the same connotation as would expressions such as "256 shopping days left to Christmas" or "256 dollars that IRS thinks you owe them." You cannot go far wrong if you think of the figure 256 as just a convenient placeholder symbol for something like the expression "many more than anyone who has not spent hours in deep thought about, and scoured all sorts of believable and unbelievable sources, is likely to come up with when asked about the number of kinds of memory." In this sense, although on a somewhat more modest scale, "256" is not unlike "google," which, as we know now, means something like a "rather large number, much larger than anyone could have imagined." Anyhow, in my opinion, 256 does not hold much promise as a source of a kind of hot scientific controversy that many of our friends and colleagues live for.

- (3) Figuring out whether there is a way of organizing the data in the Appendix more meaningfully than I have done (listing the items alphabetically). Again, I will leave the problem to you, but I myself think the answer, indeed the question itself, is uninteresting because the answer is, "Of course it can, in a very large number of ways, and this is why the outcome is no more revealing or useful than any particular order of a well-shuffled deck of 52 playing cards." But, if you think otherwise, go ahead and prove the proposition wrong.
- (4) As a final example, consider the question of what *kinds* of kinds of memory are those listed in the Appendix. They make a motley collection. Could we say that some of them are more important or fundamental or crucial or central, or whatever, for the "Science of Memory," and on what criteria (Roediger, Dudai, & Fitzpatrick, in press)? Although this problem, like all others here are not for me but for the readers and future generations of memorists to solve, let me give you a hint about one possible method of classifying memories in the Appendix, one that would please Roddy. As many of you know, and as Jim Nairne reminds us again in (chapter 1, this volume), Roddy and his colleagues have intensively studied, and made important contributions to the exploration of "false memory," a "hot" issue in contemporary memory research (Roediger & McDermott, 1995, 2000). The essence of the phenomenon is that normal, healthy, intelligent learners who are exposed to a list of common words are highly likely to consciously recollect having seen or heard words in the study list that in fact were not presented in that list. If you are a memory expert, I invite you to scan the entries in the Appendix, and decide what kinds of memory could be false, or in what kinds of memory one might expect to find that "false memory" can or could be demonstrated. If you decide that "false memory" is associated with some but not all kinds of memory, would you still say that false

memory is an interesting phenomenon of “memory,” or an interesting property of “memory”? And if it is not phenomenon of “memory,” what is it a phenomenon of?

Educational uses of the list in the Appendix include: (i) Testing those students’ specific interests who come to you and tell you that they are thinking of “getting into memory.” You can show them the list and ask which of the 256 kinds of memory did they have in mind for study, or which subset of the total. (ii) Testing those students’ strength of motivation who come to you and tell you that they are thinking of “specializing in memory.” You can show them the list and ask them whether they really are willing to spend the time necessary to become familiar with the 256 different kinds of memory, as at least some people would expect them to do if they were to become specialists in memory. The exact form of the prospective memorist’s response, together with their reaction time, would allow you to help make an informed career decision for them.

Recreational uses of the list include various games, to be played in parlour or pubs, when a group of experts is present:

- (1) In the list of 256 “kinds,” you ask the experts, how many are names of “memory systems”? When they point to declarative memory, episodic memory, working memory, and some other legitimate entry, you pat them on the back. But when they make false claims, you cluck your tongue. For instance—taking a random example—when they claim that “implicit memory” in the list refers to a memory system, you know that they are not as knowledgeable as they think they are, and you inform them of the fact. If they protest, you inform them that they are not supposed to argue with authorities and ask them to phone or email Dan Schacter and ask him.
- (2) In the list, how many kinds of memory are dead? Yes, dead. There are dead kinds of memory, and your experts’ job is to spot them. This game, when played after the systems game, is also a test of priming, because primeable experts ought to be able to tell you that “implicit memory” is not only the right answer to the question of “which items in the list” are *not* systems, but also the right answer to the question about dead kinds. If you are confused, phone or email Dan Willingham, and he will tell you what I have in mind when I talk about dead kinds of memory. But, are there other dead kinds in the list? If your players have obvious difficulty, you are permitted to give them a hint: There is indeed another “kind” that was officially pronounced dead, and whose obituary was published by Roddy Roediger’s PhD dissertation supervisor at Yale.
- (3) If you find an expert who passes both the systems and dead memories tests satisfactorily, you allow them to proceed to the real acid test: Can they find an item in the list of 256 that is not only a kind of memory (which all are, of course, by definition) but that is also science. A science? Are you kidding, they ask. No, you tell them, you are not, and you have proof.³
- (4) For the lesser experts among the readers (those who can solve easy but not difficult Sudoku puzzles, say) another fun game can be suggested: What is

the biggest matryoshka you can make out of the different kinds of memory in the Appendix? As most readers know, matryoshka refers to a set of Russian dolls in which one fits inside the other. When they make the dolls out of wood, the world's record number of embedded matryoshkas is over 70. Now, as it happens, there exist in this world also "memory matryoshkas," virtual arrangements in which one kind of memory is embedded within another. The fact is not widely advertised—it might make another good PhD final exam question—but it is true. These are expressed in statements that, when carefully analyzed, assert that "memory is in memory is in memory." Memory matryoshkas of size 2 are easy to find the Appendix: For instance, iconic memory is embedded within sensory memory, and semantic memory is embedded within declarative memory. Now, can you find matryoshkas of size 3? Size 4? (If you find a matryoshka of size 4, please do send it to Roddy Roediger with your good wishes.)

- (5) Once you identify ("discover"?) one or more memory matryoshkas in the list, you will be in a position to think great thoughts about your subject matter, which you possibly could not have done without the discovery. You can ask and try to answer the question: Does the fact that we can have one (kind of) memory within another (kind of) memory that is within another (kind of) memory make memory a truly unique biological capacity? Or should we just try to clean up the terminological mess? How many other behavioral or cognitive processes do you know that include themselves? How about one kind of running that is embedded in another kind? One kind of breathing embedded in another kind? One kind of color vision embedded in another?⁴

Finally, to conclude the paper, I am happy to tell the patient reader that the rules for commercial use of the copyrighted information in the Appendix are being worked out. The results will be made available, for a hefty fee, on the Internet. The proceeds will go toward the establishment of the "Club of 256."

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NOTES

1. Roddy tells me the story of how he had agreed to write the chapter on one condition: The title of the chapter should be "Varieties of Memory" rather than "Kinds of Memory". The responsible parties agreed to the condition. So Roddy submitted the paper under the "varieties" title. The title was approved by the copy editor and went through various proof stages intact. In final page proofs it still read as "varieties." However, when the book appeared in print, Roddy witnessed a miracle: The title had again turned into "Kinds of Memory." How do these kinds or varieties of miracles

happen? I do not know. The experts' ways, like those of other powers in our world, are unfathomable.

2. I am simplifying matters a bit, of course. Also, I am talking about the mainstream practices and received wisdom. An alert student of history of science may be able to find exceptions to the caricature I have presented, but the exceptions were rare.
3. I regret that I cannot provide the proof here publicly, for educational reasons. But those readers of this paper who try this fun game and who cannot find the name of a science in the Appendix, can phone or email Roddy Roediger for the answer. Roddy knows. In case Roddy has forgotten, the answer is: Brainerd, C. J., & Reyna, V. F. (2005). *The science of false memory*. New York: Oxford University Press.
4. A parenthetical note, and another practical suggestion to readers who think that talking about "memory matryoshkas" in a Festschrift is unbecoming, or worse. Take the previous paragraph, the one about memory matryoshkas, and rewrite it in loftier, scientific language. You might try invoking the concept of class-inclusion hierarchies; even better, try to tackle the matryoshka problem as an instance of ontological conjunction of *N*-dimensional mereological and mereotopical relations. Anyhow, try it out, it might be fun.

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APPENDIX: ALPHABETICAL LISTING OF KINDS OF MEMORY

(In most cases only the term modifying “memory” is printed.)

abnormal	cellular	early
abstract	cerebellar	echoic
accessible	chemical	elementary
acoustic	childhood	emotional
acquisition	cognitive	enhanced
active	collective	episodic
active cultural	color memory	episodic-like
affective	concrete	ERP (event-related potentials)
age-related	configural	evaluative
age-related relational	conscious	event memory
allocentric	constructive	everyday
allocentric spatial	context	experiential
animal memory	context-dependent	expert
anterograde	cortical	explicit
archival cultural	cultural	external
arousal-mediated	declarative	eyewitness
articulated	diencephalic	facial
associative	direct	fact memory
auditory	discovered	factual
autobiographical	disembodied	false
bodily	distinct	fear-dependent
brain-stem	distributed	fear memory
cache memory	dream memory	first
categorical	dynamic	

flashbulb	mobile memory	prospective
forgotten	modal memory	public autobiographical
frontal	mood-dependent	raw
future	motor	reactivated
general	muscular	re-embodied
general political	musical	real-world
generic	narrative	recall memory
genetic	natural	recent
genuine	network	recognition
gist memory	neural	recollective
global	neuronal	reconstructive
habit	new memory	recovered
hippocampally-mediated	nonconscious	reference
historical	nondeclarative	reflective
human	nonhippocampally	relational
iconic	dependent	remote
illusory	normal	repisodic
illusory	object-in-place	representational
immediate	object-object association	representative
immunological	object-recognition	retrieved
impaired	object-reward association	retrograde
implicit	object working	retrospective
implicit conceptual	odor memory	reviewed
improved	older memory	right memory
inaccessible	olfactory	rote
inaccurate	ordinary	scratch-pad
independent	organized	screen
indirect	original	secondary
individual autobiographical	particular political	self-defining
infant memory	Pavlovian	self memory
intentional	Pavlovian fear	semantic
involuntary	perceptual	semi-permanent
involuntary conscious	perceptually-rich	sense memory
item-based	permanent	sensitive
item memory	personal	sensory
labile	personal episodic	sentence
latent	personal semantic	shape memory
later	phonetic	short-term
lexical	phonological	single
life	place memory	skilled
list	political	sleep memory
literal	potential	social
locale memory	practiced	socialized
long-term	prefrontal	source
long-term familiarity	primary	spatial
material-specific	primate	spatial working
mechanical	primitive	specific
medial temporal lobe	prior	standard
melodic	procedural	state-dependent
meta-memory	prose	stimulus-response habit

stored	traditional	unitary
subcortical	transactive	unwanted
subsequent	trauma	verbal
superior	traumatic	verbatim
synaptic	trial-unique object	veridical
tacit	recognition	visual
target memory	true	visual spatial
temporal	typical	voice
temporal context	unaware	waking
test memory	unconscious	well-practiced
time memory	uncontaminated	working
topographical	unimpaired	
traceless	unintentional	

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