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Memory as a String of Pearls

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Abstract

Which representational metaphor one chooses serves to exert a powerful influence upon how we conceive of and subsequently think about time. In the human perception of time, one of the most critical faculties is that of memory, since it appears that we remember the past and anticipate the future while simultaneously experiencing the present. We here present a ‘string of pearls’ metaphor which captures the features of episodic memories (both retrospective and prospective) as the pearls on the string. The underlying continuity of lived experience of existence is equated with the thread of the string itself upon which these respective episodic pearls are mounted. The advantages, nuances, and drawbacks of the use of this metaphor to the understanding of time perception are discussed.

Keywords

memory, string of pearls, episodic memories, autobiographical/procedural memory

“What’s past is prologue.”—William Shakespeare—The Tempest¹

Shakespeare’s observation serves to remind us that what is now stored in our memory was once only in the future. However, it also reveals that the primary purpose of any memory storage is to use this information for the process of predicting that future (Klein 2007; Schacter and Addis 2007). Thus, memory serves to shape the way in which we can understand what is to come and supports our rational behavior toward it (Suddendorf and Corballis 2007).

¹ It is of both interest and gratification to us that this self-same theme was chosen by the founder of the International Society for the Study of Time (ISST), the late Professor J.T. Fraser for his own essay on time and the future (see Fraser 2009). We were unaware of this contribution at the time of our original submission.

More simply, the principal purpose of memory is to anticipate the future, not to remember the past (Hancock 2009). It is this flow of experience that we wish to articulate in respect of a new metaphor concerning the evolution of the prospective utilization of information from retrospective memory. This we term the 'string of pearls' metaphor.

Arguably one of the most basic elements of all of life itself is the ability to distinguish self from non-self (Schrodinger 1944). This necessary spatial differentiation between the organism and its surrounding environment is partnered with an equal imperative for the recognition of individual temporal continuity. Thus the requirement to distinguish self from everything else lies at the very foundation of the continuity of experience. We continue to 'know' that we are ourselves, even after the hiatus of interruptions such as periods of sleep, traumatic unconsciousness, or even quite severe brain injury. While it is true that there are cases of episodic amnesia in which we forget our own particular autobiographical details, the persistence of a sense of personal self as an individual, even for injured and traumatized persons, is still sustained. It is this basic continuity of self-recognition, we argue, that comprises the string upon which the pearls of specific episodic memory are threaded. It is only under the most exceptional of circumstances that this thread is ever interrupted or broken, although death itself provides the termination. Indeed, death has been claimed controversially by Schopenhauer as the instant in which we are shocked out of capacity for the perception of self-persistence. In its essence, we forget to continue to live.

For most of us, our self-awareness is continual and constructively coherent. That is, the thread of self-recognition persists uninterrupted throughout our individual lifespan. In contrast to this thread of self-continuity, specific memories, our episodic 'pearls,' are much more spatially and temporally discrete in nature. They are coded representations of specific events or actions which are particularly meaningful to our own personal, individual existence. Socially, we share a number of these episodic pearls (e.g., 9/11). However, even here the personal episodic memory is largely context-contingent and interpreted within the individual's own constructed narrative.² While the sense of personal continuity is not necessarily contingent upon the richness of each episodic

² One question that was often asked in decades past was, "Where were you when Kennedy was shot?" It is one of the tragedies of life that many would now answer, "I was not born when Kennedy was shot." Thus, the Kennedy assassination is slowly transforming from a personal and social experience into the realm of written history.

experience, the two are to a degree inter-related such that the coding of specific episodes itself supports the chain of continued experience and can thus serve to influence the perception of experienced time (Hancock 2002).

To extend the metaphor further, the pearls of episodic recall are strung out along the string of personal continuity, but their respective size is contingent upon their perceived meaning and importance to the individual as well as their respective temporal distance from the present moment in both prospective and retrospective senses. Here, we view the “now” of experience or current instant in time, or what William James (1890, 398) referred to as the ‘specious present,’ as the central pendant of the string of pearls (see also Goldman-Rakic 1997). Either side of this present instant of experience, both toward the past and prospectively toward the future, we envisage that episodic salience (the size of each respective pearl) decreases systematically although not necessarily in any simple linear fashion as is often represented in a physical string of pearls. What can be recalled from the past is now contingent upon its prior episodic value and, reflexively, its potential future utility (Lombardo 2008; Nairne, Pandeirada, and Thompson 2008). Thus information pertaining to survival has a dominant effect, even when extracted from semantic recall rather than being used in actual survival circumstances (Nairne et al. 2009).

While survival has a dominant effect (see Klein 2007; Klein et al. 2009), the novelty of experienced events may influence the size of each episodic memory ‘pearl.’ Thus Tulving’s ‘novelty encoding hypothesis’ asserts that the prospect of memorial persistence is directly related to the novelty of stimulus or information (Tulving et al. 1996). Essentially, novel episodic memories entail a tactical evolutionary mechanism in which the prospect of reward is reinforced. The brain provides different levels of reward for novel versus familiar stimuli. This suggests that ‘highly novel’ episodic memories result in long-term potentiation in the hippocampus as a result of dopaminergic inputs from the reward centers of the brain (Wittmann et al. 2005). So, novel experiences serve to influence the brain to a different degree than previously experienced input. This tendency to focus on novelty does not, of course, mean that other factors are not involved in the storage of various episodic events (see also Levine and Pizzaro 2004; Scherer 2003). It simply means that to some extent, the brain is a novelty-preference machine.

The question emerges: does the manner in which episodic memories are encoded necessitate continuity? That is, to what degree are individual memories necessarily related to the continuing autobiographical narrative of the individual? Our metaphor implies that such a relationship is indeed necessary

and that there is a tight coupling between the sense of self-continuity and the periodic episodes of highly memorable incidents that decorate that thread. However, this does not imply an obligatory isomorphism between the conceptual arrangement and the neurophysiological substrate that supports its physical instantiation. Thus, our metaphor in no way denies the traditional and more recently postulated network architectures for memory recall (Anderson 1995). Although our metaphor is simple and can thus be viewed as a simple iconic representation (see Figure 1), we must concede that there are inevitable subtleties and nuances that have to be recognized. Among these is the necessary utility of procedural memories which are not purely episodic in nature but subserve capacities like skilled performance. We might consider these as a secondary string of pearls, but each of these memory forms is roughly equal in size compared to impactful episodic memories. If anything, this recognition expands our metaphor into a braided rope of pearls, but such exploration of further metaphoric embellishment is beyond the scope of the present brief note. If our metaphor has particular value, it is surely in emphasizing the symmetry of memory's utility. From the traditional view that memory has everything to do with the past, the present emphasis on prospective memory, its use for the future, is the element that will perhaps strike the reader as most odd. Interestingly, this self-same sense is reflected by Alice in her 'Looking-Glass' world and thus we would conclude with the following observation from that experience:

“Living backwards!” Alice repeated in great astonishment. “I never heard of such a thing!” “But there's one great advantage in it, that one's memory works both ways.” “I'm sure mine only works one way,” Alice remarked. “I can't remember things before they happen.” “It's a poor sort of memory that only works backwards,” the Queen remarked.

Lewis Carroll, *Through the Looking-Glass*

References

- Anderson, J.R. 1995. *Learning and Memory*. New York: Wiley.
- Carroll, L. 1872. *Through the looking glass, and what Alice found there*. London: MacMillan & Co., 6.
- Fraser, J.T. 2009. “Whose Past Is Our Prologue?” *Kronoscope: Journal for the Study of Time* 9 (1-2): 5-12.
- Goldman-Rakic, P. 1997. “Space and Time in the Mental Universe.” *Nature* 386: 559-560.
- Hancock, P.A. 2002. “The Time of your Life.” *Kronoscope: Journal for the Study of Time* 2 (2): 135-165.

- . 2009. "The Battle for Time in the Brain." In *Time, Limits and Constraints: The Study of Time XIII*, eds. J.A. Parker, P.A. Harris, and C. Steineck. Leiden: Brill.
- James, W. 1890. *Principle of Psychology*. New York: Holt.
- Klein, S.B. 2007. "Phylogeny and Evolution: Implications for Understanding the Nature of a Memory System." In *Science of Memory: Concept*, eds. H.L. Roediger III, Y. Dudai, and S.M. Fitzpatrick, 377-381. Oxford: Oxford University Press.
- Klein, S.B., L. Cosmides, C.E. Gangi, B. Jackson, J. Tooby, and K.A. Costabile. 2009. "Evolution and Episodic Memory: An Analysis and Demonstration of a Social Function of Episodic Memory." *Social Cognition* 27: 283-319.
- Levine, L.J., and D.A. Pizarro. 2004. "Emotion and Memory Research: A Grumpy Overview." *Social Cognition* 22 (5): 530-554.
- Lombardo, T. 2008. *The Evolution of Future Consciousness*. Bloomington, IN: Author House.
- Nairne, J.S., J.N. S. Pandeirada, K.J. Gregory, and J.E. Van Arsdall. 2009. "Adaptive Memory: Fitness-relevance and the Hunter-gatherer Mind." *Psychological Science* 20: 740-746.
- Nairne, J.S., J.N.S. Pandeirada, and S.R. Thompson. 2008. "Adaptive memory: The Comparative Value of Survival Processing." *Psychological Science* 19: 176-180.
- Schacter, D.L. and D.R. Addis. 2007. "The Ghosts of Past and Future." *Nature* 445: 27.
- Scherer, K.R. 2003. "Vocal Communication of Emotion: A Review of Research Paradigms." *Speech Communication* 40: 227-256.
- Schrodinger, E. 1944. *What is Life?* Cambridge: Cambridge University Press.
- Suddendorf, T., and M.C. Corballis. 2007. "The Evolution of Foresight: What Is Mental Time Travel, and Is it Unique to Humans?" *Behavioral & Brain Sciences* 30: 299-313.
- Tulving, E., H.J. Markowitsch, F.E. Craik, R. Habib, and S. Houle. 1996. "Novelty and Familiarity Activations in PET Studies of Memory Encoding and Retrieval." *Cerebral Cortex* 6: 71-79.
- Wittmann, B., B. Schott, S. Guderian, J. Frey, H. Heinze, and E. Duzel. 2005. "Reward-Related FMRI Activation of Dopaminergic Midbrain Is Associated with Enhanced Hippocampus-dependent Long-term Memory Formation." *Neuron* 45: 459-467.



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Figure 1. Simple iconic representation of the present 'string of pearls' metaphor.

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