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Judy Illes, Stanford Center for Biomedical Ethics

Sometimes, we see the past so clearly, and read the legend of its parts with such acuity, that every stitch of time reveals its purpose, and a kind of message is enfolded in it. Nothing in any life, no matter how well or poorly loved, is wider than failure or clearer than sorrow. And in the tiny, precious wisdom that they give to us, even those dread and hated enemies, suffering and failure, have their reason and right to be.

—Gregory David Roberts, *Shantaram* (2003, 872)

From Hermann Ebbinghaus (1885) to Eric Kandel and Larry Squire (Squire and Kandel 1999), the study of memory has been a core pursuit for researchers of human cognitive function. In each of the forms that memory takes—short-term, long-term, working—it provides the glue binding sensorimotor function through its integration into higher order, executive function. As Stuart Younger and his colleagues review in this third issue of *AJOB-Neuroscience* (Henry et al. 2007), the envelope of memory research has extended beyond the borders of consolidation, retention, and retrieval to include the dissociations of emotions from memories, and perhaps the eventual prospects of selective and voluntary forgetting.

The question of whether dampening or loss of memory is, in fact, a gain or loss to a person is one of the most unique to neuroethics in that no genetic or other model for it exists in any domain. Approaches to answers are informed by reference to each of the four themes for neuroethics originally defined at the Neuroethics Mapping meeting (San Francisco, CA) in 2002 (Marcus 2002). Can altered memory change the notion of self? Unequivocally yes. Does the professional community need to think about social policies and clinical guidelines for introducing such pharmacology or technology? Certainly. Use in the context of remediating pathologized personal habits at the tails of normal behavior, or personal strategies to mitigate embarrassing memories of a previous night's cocktail party, would jeopardize medical benefits.

Have advances been disseminated and the discussion reached the public sphere? Clearly yes, and in many and intriguing ways. Curiosities about fundamental aspects of human memory, for example, have been elaborately dissected

in cinema, arguably still a dominant twenty-first century art form. In the film *Eternal Sunshine of the Spotless Mind* (Sony Pictures, 2004), for example one of the protagonists remarks with admiration how a memory-erasing procedure (reminiscent of transcranial magnetic stimulation [TMS]) gives people the chance to “start again” by obliterating pre-selected memories. With metaphorical beauty, *Eternal Sunshine* reveals the deep inextricable relationship of human memory and experience. However mind-numbing some might consider this science fiction, *Eternal Sunshine* reveals with metaphorical beauty the deep inextricable relationship of human memory and experience. It captures many contemporary neuroethics themes as they relate specifically to the modulation of memory, as well as the role of commercialized neuroscience in society, privacy, confidentiality and quality control.

In a more comedic and poignant cinematic piece, *50 First Dates* (Sony Pictures, 2004), the personal choice to preserve or delete memory is not an option. In this film, the protagonist has suffered a traumatic brain injury in a car accident. The irrecoverable consequences of her head injury are that memories acquired during wakefulness are lost during sleep. While *Eternal Sunshine* entertained us about the precious interconnectedness of memories, consciousness and personal identity, *50 First Dates* causes us to reflect on the fact that, no matter how sweet each first kiss may be, loss of its memory is a painful loss of enduring value.

In the context of law and justice, conversation about the potential of memory-erasing drugs or devices to interrupt the cycle of criminal activity often perpetuated by those who are themselves abused is yet untapped (Coxe and Holmes 2005; Weiler and Widom 2001). If interfering with memory could intervene with the anger, revenge, and hopelessness experienced by people who are abused—sufferers of a *bona fide* form of post-traumatic stress disorder in its own right—the impact on the way in which society views and enacts criminal punishment could be profound. The prison population in the United States alone has quadrupled to two million inmates since 1980—an unprecedented explosion that is creating unprecedented costs. Surely, the personal

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and societal cost of rehabilitation and reintegration over incarceration of these individuals, especially children and adolescents, would be reduced. Difficult questions would need to be answered: What would a maintenance schedule for intervention look like? What would be the long-term effects, especially on the still-plastic young brain? What support systems would be needed and how they would be financed? Neuroimaging could be combined to predict behavior or recidivism but, as Stacey Tovino's (2007) target article suggests, how that could be achieved with acceptable accuracy and without coercion or stigma is an open question. Nevertheless, in asking the question of gain or loss, I would still wager gain. At the very least, new research will tell us about possible practical, tangible gain, even in the face enduring moral uncertainties.

Our brains are input-output machines that benefit from an exquisite balance of excitatory and inhibitory activity. Good memories and bad memories have their place, and they each contribute to the formulation of our identity and our values. We inhibit the consolidation of certain memories—certainly the extraneous or mundane—and sometimes we forget things we would rather not (an imperfect but often age-appropriate excitatory-inhibitory imbalance). Of what we do consolidate, of the good and the bad, we may derive meaningful experience. There is room for modulated remembering when, like the effects of profound physical pain, suffering from the memory is unbearable or leads to behavioral madness. We have medicines to put cancers into remission, medicines to cure sexually transmitted diseases, and medicines for alleviating the effects of countless neurologic and psychiatric disorders. Why not medicines to dull the edge of emotional suffering from memories that are harmful to a person's (and potentially others') well-being? No doubt requirements for health safety must

be met, and challenges of usage, possible misuses (such as dropping a dose of a drug into an acquaintance's drink), or overuse must be well attended to. But once the efficacy of medicines that can alleviate the destructive forces of mental pain is proven and an ethical framework for their introduction formulated, these medicines must be made available. This is not a political matter. It is a matter of ethics, human dignity, good health policy, and common sense. ■

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