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# A Duty to Remember, a Right to Forget? Memory Manipulations and the Law

82

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## Contents

Introduction .....	1280
Interventions into Memory .....	1282
Ethics of Memory .....	1284
Remembering Fitly and Truly .....	1285
Identity .....	1287
Self-Growth .....	1288
Memory & the Law .....	1289
Freedom of Memory .....	1291
Scope of the Right .....	1291
Effects on Responsibility .....	1298
Memory & Conscience .....	1299
Memories of Perpetrators .....	1300
A Duty to Enhance .....	1301
Conclusion and Future Directions .....	1301
Cross-References .....	1302
References .....	1303

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## Abstract

Neuroscience might develop interventions that afford editing or erasing memories, changing their content or attenuating accompanying emotions. This section provides an introduction to the intriguing ethical and legal questions raised by

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1279

such alterations, with a special focus on the report of the President's Council "Beyond Therapy" and the proposal of a right to freedom of memory advanced by Adam Kolber.

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## Introduction

Memory is a marvelous capacity. It allows representing the past and adapting future behavior in light of prior experiences. In a more colorful way, it is described as "mental time travel" (Tulving 1985) or "the presence of an absent thing stamped with the seal of the anterior (Ricoeur 2004, p. 17)." Memory is a multifaceted phenomenon, not a single entity but a bundle of functionally distinct yet interwoven capacities with different neurophysiologic foundations that enable the most basic forms of learning such as classic conditioning as well as reminiscing about the trajectory of one's life.

Current memory models differentiate several systems by content (LeDoux 2007): Declarative memory comprises semantic, autobiographic, and episodic contents that can easily be verbalized, whereas non-declarative memory stores motor or perceptual skills and conditioned stimulus–response patterns which can be behaviorally expressed but hardly articulated. Thus the verb "to remember" does not denote a single activity but comprises, e.g., the ability to express acquired procedural skills and factual knowledge as well as reexperiencing the past with that distinct phenomenal quality for which Elving Tulving coined the term "autonoetic consciousness" (Tulving 2002). In the following, we shall be primarily interested in the latter.

Further distinctions are drawn between temporal phases and processes. Memory content has to be acquired, stored, and recalled – accordingly, encoding, consolidation, and retrieval constitute the three main phases of memory. Directly upon encoding, memory traces are labile and prone to rapid decay. Most items in working memory (e.g., after perception) are never processed further; only some are transferred into long-term memory. During this process of consolidation, neural memory traces – also called "engrams" – are organized and stabilized. How memories are exactly stored remains a mystery and seems to differ for various types; the search for the engram is still on (Thompson 2005; Hübener and Bonhoeffer 2010). By all we know, memories are not stored in easily localizable brain structures but rely on networks of multiple brain areas and changes in the synaptic strength between neurons. The terms storage and consolidation suggest that contents of memory become permanently fixed traces in the brain, insensitive to modification, stored away until retrieval. However, such a static picture misses the dynamic and changeable nature of memories: During the retrieval process, sometimes induced through conscious effort, sometimes involuntarily, the engram seems to return into a temporarily fragile state and undergoes another process of consolidation (called reconsolidation) afterwards (Dudai 2012). Reconsolidation in humans is still subject to controversy and investigation and may have far-ranging implications (Schiller and Phelps 2011; Nader and Einarsson 2010). During the short period of reconsolidation, suspected to last

for a couple of hours, memories become open for alterations and seem to be “updated” in light of present knowledge. Reconsolidation might imply that the best recollection we have of a past event is our latest recollection of it (and not the original perception which may have been “overwritten” by the altered memory). As a consequence, our memories are alterable without our awareness. Memory is not, as the ancient metaphor of a wax tablet or modern variants of a computer storage device suggest, a replication or a copy of the initially encoded stimuli but a repeatedly reconstructive process and thereby susceptible to alterations and contaminations. A remarkable fact, because from our subjective experience, we are (too) confident that memory is more of a replay of recorded information than an active, potentially error-prone process.

Whoever speaks about remembering should not forget forgetting, an equally interesting and important process. Already its definition presents problems. As not every transient inability to recall (such as tip-of-the-tongue inhibitions) amounts to forgetting, how do we know, as Nietzsche pondered, whether we ever forget? Smells, sounds, or sights can trigger quite powerful memories which were irretrievable in the absence of such cues. Strictly speaking it can never be ruled out that some regularly inaccessible memory traces, excitable under the right conditions, still remain (Cf. Roediger III et al. 2010). Like remembering, forgetting is a multifaceted phenomenon for which no unified theory exists. It can have various causes: faulty initial consolidation, retroactive interference, trace decay over time, or simple retrieval inhibitions (Wixted 2004; Schacter 2002).

In any case, forgetting should not be conceived of as cognitive defect only. It is instrumentally useful for thinking – and possibly even remembering – because it prevents informational overload by filtering pieces worth remembering. Without forgetting we may suffer the fate of Funes the Memorious, a fictional character by Luis Borges, who cannot forget and is completely observed in details (Borges et al. 2007). Patients resembling Fuentes and suffering from their hyperthymestic memory exist (Parker et al. 2006). William James once remarked: “Selection is the very keel on which our mental ship is built. And in this case of memory its utility is obvious. If we remembered everything, we should be on most occasions be as ill off as if we remembered nothing” (James 2007, p. 680). Even apart from cases of complete memorizers, accurate recall is not always beneficial. One does not need to subscribe to controversial Freudian notions like repression or psychological defenses to acknowledge that too much of the past can burden the present.<sup>1</sup> Remembering all unpleasant or embarrassing moments is not conducive to well-being. Especially autobiographical memory seems to be selective. Attenuating or amplifying particular memories helps to maintain a coherent and positive self-image (Conway 2005). Reversely, goal-directed forgetting in the service of personal needs lets us see the past with misty eyes (Harris et al. 2010, p. 254). Remembering and forgetting are thus complementary processes and we should not overvalue one while depreciating the other.

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<sup>1</sup>A contemporary review of repression theory; see Erdelyi (2006).

## Interventions into Memory

We have to leave it here with this brief introduction to memory research and turn to what is relevant for normative purposes: interventions modulating memory. It goes without saying that our conscious powers over memory are limited. In recent years, several novel interventions have been studied that affect the fate of recently acquired memory traces and that might also afford altering more remote memories. Although most research is still in its infancy, the prospect that novel insights into the working of the memory systems and novel intervention techniques may allow to alter memories seems warranted in principle.<sup>2</sup> These are exciting times for memory researchers even though for safety and ethical reasons, many of the interventions studied in animals will never be carried out in humans.

Three main goals for interventions into memory are conceivable: enhancing memories through improving encoding and retrieval; diminishing memories through inhibiting recall, erasing traces, or attenuating emotional aspects; or changing contents of memories. Generally, interventions into memory are possible in all phases: before or during memory acquisition, consolidation, or recall – and, perhaps most interestingly, even after recall during reconsolidation. Moreover, case reports of patients with deficits in particular memory functions suggest that specific memory systems might be targeted individually.<sup>3</sup>

A growing body of research seeks to enhance memory by different means, mostly by improving information encoding or consolidation. A powerful natural way to enhance memory is emotional arousal which leads to increased release of stress hormones such as noradrenalin and cortisol that enhance encoding and consolidation but can interfere with retrieval (Joëls et al. 2011). Some common drugs have both memory enhancing and impairing effects, depending on the time of application: Benzodiazepines, for instance, impair memory anterogradely when taken before but enhance memory retrogradely when taken after encoding (presumably through reducing interference with later incoming information) (Beracochea 2006). The public debate on memory enhancement focuses mainly on pharmaceuticals, but most drugs currently in use in humans fail to exhibit overly impressive beneficial effects on memory (Repantis (2010a, b); Husain and Mehta 2011; Lynch et al. 2011). Several non-pharmacological memory enhancers have been demonstrated to be similarly or even more effective than drugs, e.g., nutritional supplements, physical exercise, sleep, mnemonic strategies, or brain stimulation.<sup>4</sup>

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<sup>2</sup>There will be many obstacles, especially in targeting specific memories; see, e.g., Levy (2007), Ch. 5.

<sup>3</sup>The most famous patient is the recently deceased H.M., c.f. Corkin (2002).

<sup>4</sup>For a broad overview c.f. Dresler et al. 2012; for nutrition c.f. Smith et al. (2011), Nehlig (2010); for exercise c.f. Roig et al. (2013), Hötting and Röder (2013); for sleep c.f. Rasch and Born (2013), Genzel et al. (2014); for mnemonics c.f. Karpicke and Roediger (2008), Worthen and Hunt (2010); for brain stimulation c.f. Coffman et al. (2014), Suthana and Fried (2014).

Different strategies exist for diminishing memories. Forgetting is the often unintended but natural fate of most memories. There are some indications that intentional forgetting of selected memories might be possible, a phenomenon called “directed forgetting” (Geraerts and McNally 2008). For emotional memories like conditioned fear, unlearning procedures (i.e., fear extinction) have long been established and have attracted renewed interest recently. Notably, however, most fear extinction procedures do not erase memory traces but merely inhibit recall through a newly learned safety memory (Myers and Davis 2007; Vervliet et al. 2013).

A primary target for interventions are emotions that accompany memories, particularly painful and stressful emotions related to memories of traumatic events. In most persons who have experienced trauma, the emotional tone of the memory with time disconnects from the factual memory, a process in which sleep plays a crucial role (Walker and van der Helm 2009). Some persons, however, develop post-traumatic stress disorder (PTSD), a pathological condition characterized by anxiety, easily recurring and hard to suppress memories of traumatic events, flashbacks, emotional numbing, or hyperarousal, as well as behavioral changes such as evasion of particular people or places.<sup>5</sup> The powerful and persistent memories are caused by stress hormones released during the traumatic event which lead to an overconsolidation of memory traces (Pitman 1989; Glannon 2006). Most therapies aim to blunt the strong emotions associated with the factual content of the memory. However, insofar as the original memory trace is not replaced but only its recall inhibited, relapse is a common problem (Vervliet et al. 2013). Novel interventions might open new routes for prevention and treatment of PTSD. Substances could be administered to persons before they will be exposed to potentially traumatic situations (rescue workers) or immediately after they have experienced, e.g., sexual assault; or in therapeutic settings during reconsolidation of reactivated traumatic memories (President’s Council on Bioethics 2003; Donovan 2010; Poundja et al. 2012; Schiller et al. 2010). Consolidation and reconsolidation of emotional memories have been successfully targeted with the  $\beta$ -adrenergic blocker propranolol (Cahill et al. 1994; Kindt et al. 2009). In pilot studies, tampering with (re)consolidation processes has successfully reduced PTSD symptoms, but larger studies have yet to replicate these effects (Pitman et al. 2002; Vaiva et al. 2003; meta-analysis by Lonergan et al. 2013). Whether these interventions only diminish emotional aspects or affect factual recall is unclear at present.<sup>6</sup>

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<sup>5</sup>For the biological side of PTSD, see Pitman et al. (2012).

<sup>6</sup>Some researchers speak of “erasing emotional memories” by which they mean erasure of the emotional aspect only, while ethicists often speak indiscriminately of “blunting” of painful memories. These conceptual ambiguities might lead to misunderstandings and depend on the conception of memory traces. Cf. Holmes et al. (2010). For present purposes, it is only important that emotional and factual contents could, at least to some degree, be targeted and modified independently from each other.

The strongest form of memory manipulation is complete memory erasure. The first point for intervention is blocking initial consolidation to prevent information in short-term memory from being stabilized and transferred into long-term memory. It is also possible to intervene at later stages: During the labile phase upon recall, reconsolidation could be impaired or prevented (Pitman 2011; Parsons and Ressler 2013). In animal studies, blockade of both consolidation and reconsolidation has been repeatedly demonstrated by inhibiting protein synthesis in memory-related brain regions (Dudai 1996; McGaugh 2000; Nader et al. 2000; Alberini et al. 2006; Shema et al. 2007; Sacktor 2008). In humans, reconsolidation of episodic memory has been disrupted, e.g., through emotionally aversive stimuli or electroconvulsive therapy applied immediately after retrieval (Strange et al. 2010, Kroes et al. 2014).<sup>7</sup>

Another form of intervention changes contents of memories. The process of selective consolidation of a fraction of our experience and the repeated reconsolidation of these memory traces suggests that our memories may be less veridical than we expect. This intriguing view is backed by a long line of false memory research, most notably by Elizabeth Loftus, in which the content of memories could be altered or new memories implanted through various and quite simple means such as telling false stories about the past or suggestive questioning (Loftus 2003; Brainerd and Reyna 2005). In animal studies, false memories were implanted through sophisticated optogenetic interventions at the molecular level (Ramirez et al. 2013). The extent to which our memories deviate from our original experience cannot be reliably estimated at present, both in terms of false parts within a (by and large) correct memory and the overall amount of false memories. In general, the possibility of false memories is not the same as proving that many are indeed false. Supposedly, humans are capable of remembering many things correctly. Otherwise, the preservation of our memory system through natural selection appears unlikely (Schacter 1995, p. 25). However, Loftus' studies demonstrate that distrust in memory is warranted and that we can never be sure whether our recollections are correct – regardless of how vivid and familiar they appear to us. These findings have legal implications, especially for evaluation of eyewitness testimony and interrogative procedures (Schacter and Loftus 2013; British Psychological Society 2008; Nadel and Sinnott-Armstrong 2012).

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## Ethics of Memory

The ethics of memory is a fascinating topic that has received little attention yet (Cf. Blustein 2008; Margalit 2002). How should we remember – what, whom, and

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<sup>7</sup>The current state of research in humans is less consistent than in animals, partly due to the complexity of interactions between different memory systems during reconsolidation; for a review c.f. Schiller and Phelps (2011).

in which way? How often and intense should we, for instance, reminisce about late family members? To whom do we owe duties of remembrance, to ourselves or the person remembered? Should we try to forget particular persons or events or, by contrast, struggle against the natural decay of memories by fabricating cues and records? All these questions converge to the more general one: To which degree should the past influence the present? Answers have to take our limited powers over memory into account. But in a time when technologies may confer more control over remembering and forgetting and turn them into matters of choice, ethics of memory becomes an important issue.

The prospect of manipulating memory beyond our natural abilities has sparked the imagination of authors and artists from antiquity to modern days.<sup>8</sup> Although different interventions raise different questions and deserve detailed treatment on their own, some ethical worries apply to all of them (we loosely speak of “altering” memories). On the level of the individual, two ideas pull into opposite directions: For one, historical truthfulness speaks in favor of maintaining accurate recollections of the past. It finds support in prominent ethical ideas such as the ancient “know thyself.” By contrast, well-being and the pursuit of happiness may favor altering memories – even forgetting unpleasant ones – over accurateness. In both cases, memory serves as an instrument for cherished but potentially conflicting ethical ideals.

A good example of the first position is formulated by the US President’s Council of Bioethics in its report “Beyond Therapy.” It presents a balanced overview of potential benefits and pitfalls of memory alterations and placed the topic on the scholarly agenda. It has nonetheless attracted much criticism for its bioconservative stance and its (rather suggestive) conclusions. The Council expresses deep concerns over any form of memory alteration, including interventions that numb traumatic memories of PTSD patients: “Our memories make us who we are. By ‘rewriting’ memories pharmacologically we might succeed in easing real suffering at the risk of falsifying our perception of the world and undermining our true identity” (p. 227).<sup>9</sup>

### Remembering Fitly and Truly

As an ethical standard, the Council suggests “remembering fitly and truly” (p. 228), unfortunately without stating more clearly what “fitly and truly” means, what it implies or in which relation both criteria stand. “Fitly and truly” is presumably best understood as remembering appropriately and accurately and rules out falsifying,

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<sup>8</sup>Cf. movies like *Eternal Sunshine of the Spotless Mind*.

<sup>9</sup>Cf. Parens (2010) who reads the Council as not being opposed to PTSD treatment.



forgetting, or dampening memories. Prima facie, this appears to be an agreeable position. But let us explore it a bit deeper. Any obligation to remember accurately faces the problem that human memory is selective and distortive. Emphasizing accurateness would oblige us to rehearse memories that tend to be forgotten and dissuade us from romanticizing or glorifying the past. Consequently, interventions that improve true recall and diminish distortive effects should be endorsed. This, however, stands in some contrast to the spirit of the report, critical of any technological alteration of natural human abilities.

Eric Parens usefully suggests understanding “remembering fitly” in the following way: The intensity of memories and accompanying emotions have to stand in some relation to the magnitude of the event that caused them (Parens 2010). This criterion brings us some way in clearly disproportional cases. However, assessing the significance of events as well as adequate (emotional) responses is itself a value judgment in need of further criteria. What, for instance, is the appropriate response to the death of a friend, the breakup of intimate relationships, or embarrassing experiences? Hard to tell. And by whose standards? (Cf. Henry et al. 2007, p. 17) This is particularly important in regard to reactions to traumatic memories such as deep prolonged sadness and loss of trust or interest in mundane things. These might be quite appropriate responses to preceding events such as having gone through war or being sexually assaulted. In fact, how could we simply revert back to normality and enjoy life’s pleasures after living through such experiences? Even if affected persons were haunted by memories for years, their reaction is not evidently disproportionate to the magnitude of the event. The problem with traumatic memories is not so much that they are inappropriate to the past but that they may lead to a dysfunctional life in the future. “Fit” and “functional,” though closely related, have different reference points: appropriate vis-à-vis the past or a flourishing life in the future.

This leads us to the third ethical ideal which a US American Council cannot but recognize: the pursuit of happiness. The Council contends that remembering fitly and truly is a precondition for living a flourishing life. But this is dubious – at least, but not only – with respect to traumatic memories. The Council’s argument heavily draws on the idea that there is something like “real happiness,” different from feelings of pleasure, which requires coherence between the world and subjective feelings. Indeed, we should be skeptical about superficial happiness, gained only for the price of separation from reality and may (mis)appropriate Theodor Adorno’s famous saying here that there is no real living in a false life. But albeit distrust against superficial false consciousness is warranted, it is hard to get around the fact that certain memories are debilitating which is not a desirable state and that memory alterations could assist overcoming inner obstacles grounded in the past. The resulting flourishing life might not be so “unreal” or “false” that it is not worth having. While the Council claims that happiness and remembering fitly and truly are parts of the same coin, we suspect they are different ideals that can come in conflict with each other. Out of this tension, the real challenge arises: Are we obliged to remember fitly and truly *even though* it impairs a flourishing life?

## Identity

In the background of the argument stands the worry that memory alterations threaten identity. Indeed our autobiographical memories make us who we are. If taken away from us, we would be stripped from something fundamentally ours, deprived of some kind of access to ourselves – our autobiography. Nonetheless, the importance of every single memory should not be overstated. We all forget a myriad of things and events on natural ways without loosening our identity. Why should this be qualitatively different if we forget at will? Furthermore, a well-considered decision to erase memories might itself be an expression of one's personality.

Worries over identity are a common topic in bioethical debates. It has proven useful to differentiate between several meanings. The strongest form, diachronic identity, concerns the continual existence of a person, i.e., the conditions under which a person at one point in time can be reidentified as the very same person at a later point. In the wake of John Locke, some argue that autobiographical memory, experiential knowledge of one's past, is a necessary condition for personal persistence over time.<sup>10</sup> This implies that loss of autobiographical memory leads to a fissure in persistence: The new person is, in a strong sense, a different person, while the old one has vanished.<sup>11</sup> Accordingly, Alzheimer's patients suffering from irreversible memory loss would be numerically distinct from the persons that inhabited their bodies before onset of the disease. While the tragedy of dementia-related erosion of personality is indeed a striking example of memory's importance, it also points to a weakness of the memory criterion. Theory aside, we usually identify the old lady who cannot remember her past as our grandmother who raised us as kids and therefore feel (and are) obliged to care for her.

As any theory of diachronic identity has to allow for the ordinary degree of forgetting, interventions such as numbing or erasing particular memories will regularly not call it into question (although the Council suggests otherwise). Yet, a weaker sense of identity, closer to the colloquial use, might be affected: one's personality. Everyone has a past, and this past cannot be undone. If memories of our past make us who we are, changing our memories may change us. The question is whether altering our personality in this way is wrong. Essentialist thinkers urge that one should preserve rather than "betray" who one is. By contrast, existentialist-minded positions hold that we should be authors of our life, actively shaping our future in light of attractive self-images, even if that implies radical departure from former personality traits (Cf. Bublitz and Merkel 2009; Erler 2011). The wrongness of "betraying" who one *was* in the quest of creating a more desirable future version of oneself can hardly be found in claims of the former personality against its successors. Instead, it needs to be grounded in present interests of the person. In their pursuit, anyone attracted to

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<sup>10</sup>In Locke (1979), he wrote of the "sameness of consciousness," traditionally understood as the memory criterion, but see, e.g., Strawson (2011).

<sup>11</sup>For more elaborated treatments on the relation between identity and memory, see Parfit (1984), DeGrazia (2005), Schechtman (2005), Galert and Hartmann (2007).

existentialist approaches may seek to alter the way she reacts to her past, including her memories, and concede historical untruthfulness for the sake of personal development. Abandoning parts of one's past is not tantamount to abandoning any personality, but altering it. Objections are thus convincing only if self-development is intrinsically wrong or if freeing oneself from one's past is counterproductive to that end. Given that many people seek to change the courses of their life and their way of being, often for the better, a wholesale rejection of self-creation appears implausible.

### Self-Growth

Perhaps, shaping one's future through cutting links to one's past is doomed to failure. We take this to be primarily a psychological hypothesis. Without doubt, coming to terms with oneself and one's past is among life's major challenges. But might forgetting or editing memories not be part of it? Especially theories of "narrative identity" emphasize the constructive processes in personality formation. Persons compose stories about themselves, woven from various sources such as their recollections, beliefs, self-image, perception by others, and expectations and aspirations for the future (Cf. Galert and Hartmann 2007). Interestingly, studies suggest that persons tend to evaluate their past not truthfully but in ways conducive to well-being, by embellishing or depreciating it. Putting one's former self in a negative light might – just as downward social comparison – make one feel better about the present (Wilson and Ross 2001). Forgetting, selective remembering, and waning emotional reactions are thus to some degree ordinary processes that do not necessarily impair construing meaningful and functional narratives about oneself – they even seem to be regular features (Bell 2008). Then, truthfulness to the past might not be a central condition for self-development.<sup>12</sup> While this does not imply that editing memories is ethically advisable, it shows that it is not an insurmountable obstacle for self-development.

Nonetheless, those who cannot draw upon their history might indeed be bound to repeat it. This old wisdom seems to have a neuroscientific analogy: Findings suggest that persons with memory deficits also have difficulties in prospective planning because the same brain systems are involved in both tasks. Scientists speculate that the (evolutionary) aim of remembering is not accurate reproduction of the past but rather simulation of the future.<sup>13</sup> Be this as it may, engaging with one's past can be extremely beneficial for personality development. It helps to understand where one comes from and enables learning from (unpleasant) experience and developing strategies to deal with stressful events and ordinary nuisances of life. Accordingly, when we lose our history, we lose opportunities for self-growth. This may even be true for

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<sup>12</sup>Some memory disorders impair forming a sense of self, e.g., Klein et al. (2004).

<sup>13</sup>The "constructive nature of episodic memory is attributable, at least in part, to the role of the episodic system in allowing us to mentally simulate our personal futures," Schacter and Addis (2007), p. 779, Schacter et al. (2007).

traumatic events which can acquire meaning in retrospect. Some traumatized persons experience “posttraumatic growth” and steer their life in novel directions (Calhoun and Tedeschi 2006). Blunting or erasing memories may block such developments. Yet, even though people give meaning to horrible events, it remains doubtful whether there is meaning to, e.g., being the victim of serious crimes. Presumably, giving meaning to tragedy is more a strategy for coping with emotional turmoil. Painful events should not be glorified because of potential positive side effects. Memory alterations could provide alternative ways of overcoming the shadows of the past and freeing up the inner resources that arduously working through trauma exhausts. But while therapeutic forgetting may have much to recommend, concerns that memory alterations could be used to overcome minor troubles and impair personal growth seem warranted, especially in light of notorious human traits such as impatience and discounting long-term drawbacks in favor of short-term benefits.

Finally, it should be reminded that even full memory erasure cannot ensure escaping one’s past as long as others retain their recollections.<sup>14</sup> The fact that others know more about a person than she herself does can lead to bizarre and uncomfortable situations which might be worse than retaining the original memory. And we can learn from patients suffering from involuntary memory loss that many persons would feel urged to find out as much about their history as possible. Then, memory erasure would be self-contradictory.

After all, the question about the extent to which the past should influence the future touches upon an amalgam of potentially conflicting ethical ideals, none of which can claim strict priority. Remembering fitly and truly is neither conceptually nor empirically a necessary condition for a flourishing life. Corresponding normative demands may speak in favor of manipulating natural abilities which do not live up to those ethical ideals. Nonetheless, memory alterations pose various dangers, many uses appear imprudent and should be discouraged. In spite of this, there are potential benefits. In the end, much depends on the kind of memory altered, precise effects of interventions, as well as psychological and social consequences. These aspects cannot be determined a priori but have to be cautiously explored empirically.

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## Memory & the Law

The perspectives of law and ethics differ in important ways. The law does not provide answers about what is morally advisable to do. Unlike moral advice, legal provisions are binding for all. Neutral and pluralist democracies should not seek to impose on citizens contested views of a good life but enable the peaceful coexistence of diverging life plans. Specific legal provisions have to conform to higher level principles that give form to the structure of legal norms, primarily those deriving from constitutional and human rights law. Deeply entrenched in liberal

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<sup>14</sup>In-depth discussions of further ethical aspects are Levy (2007) and Liao and Sandberg (2008).

rights is the idea that persons enjoy wide ranging autonomy in self-regarding matters, which entails the liberty to make imprudent and immoral decisions. The realm of legal freedoms is thus not coextensive with the morally good. Because of this, legal paternalism is highly contested, at least in theory (see, e.g., Feinberg 1986). In practice, most legal systems allow hard paternalism in order to prevent severe self-harm. Furthermore, legal rights are understood here as *prima facie* entitlements that have to be balanced against countervailing rights of others or legitimate public interests before final judgments can be made. Finally, since legal systems and cultures differ widely, the following has to remain on an abstract level and might not apply to every jurisdiction to the same degree.

In most countries, the use of memory-altering substances or tools is regulated by different legal provisions. Pharmaceuticals such as propranolol or antimentia drugs are scheduled substances which require prescription. Tools like brain stimulation devices fall under different regulations, while mnemonic training, physical exercise, meditation, or sleep are not regulated at all. Many provisions that restrict access to specific means are not enacted in virtue of their effects on memory but for other reasons. Current regulations based on means may thus appear incoherent *sub specie* memory and might be reexamined in view of present knowledge.

In general, only few legal provisions directly pertain to mental states. At least in theory, strong human rights such as freedom of conscience and thought place some parts of the mind outside the reach of governmental control.<sup>15</sup> Memory, however, is among the exceptions. States have always had legitimate interests in acquiring knowledge about the past. Every citizen can be summoned to testify as a witness and this may entail the duty to remember correctly.

Two rights are noteworthy: Mental health, a human right, e.g., under the European Convention of Human Rights,<sup>16</sup> affords citizens claims against states to refrain from actions that inflict mental harm and to protect them against such actions by private parties. Thereby it provides protection against infliction of memory disorders that amount to mental health problems. In addition, curbing access to effective (and relatively safe) treatments of mental disorders would interfere with the right to mental health. Consequently, it appears unlikely that courts would consider the promotion of ethical ideas such as truthfulness to one's past as sufficiently grave interests to justify, e.g., prolonged suffering from PTSD.

Moreover, some aspects of memory concern issues of identity and personhood and may therefore relate to human dignity.<sup>17</sup> For instance, retrograde amnesia or personality dissolving effects of advanced Alzheimer's can undermine dignity (make a dignified life almost impossible). Respect for dignity not only implies the obvious – a strict prohibition to contribute to severe memory loss – but might

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<sup>15</sup>Art. 9 ECHR, Art. 18 Universal Declaration of Human Rights.

<sup>16</sup>Art. 8 ECHR, e.g., *Bensaid v. UK*, App.No: 44599/98, 6.5.2001.

<sup>17</sup>Although not always codified and subject to controversy, human dignity is often understood as the overarching principle of human rights law.

also oblige states to prevent the onset of these diseases, e.g., by providing access to antimentia treatment. However, the extent of positive obligations in general and to health care in particular varies greatly from country to country.

## Freedom of Memory

Interventions into memory not directly related to dignity or health might not be adequately captured by current law. Defining novel, memory-specific regulations could soon become a challenge for lawmakers and legal theorists. As a starting point, Adam Kolber has proposed to acknowledge a novel right, “freedom of memory,” which he describes as a “yet poorly defined bundle of rights to control what happens to our memories” (Kolber 2006, p. 1622; Kolber 2008). We concur with Kolber’s proposal. Freedom of memory follows straightforwardly from the general presumption of liberty and is part of the special protection of the person, arguably the foundational concern of human rights law. In the following, we shall give some contours to the idea and sketch issues future scholarship has to address.

## Scope of the Right

### Right to Remember

Our strongest interest in memory is remembering our past, to preserve biographical events against sinking into oblivion. In virtue of its significance, it deserves heightened legal protection. On a basal level freedom of memory thus entails the right to remember.<sup>18</sup> It guarantees that persons are entitled to use their powers of memory at will. This right corresponds with a duty of others to refrain from interfering with memory. Interventions that impair memory such as electroconvulsive therapy or pharmaceuticals interfere with this right and require strong justification if administered without consent. We suggest, as a rule of thumb, that the right to remember is stronger – and more likely outweighs countervailing interests – the higher the relevance of particular memories or capacities for construing a meaningful and truthful life narrative.

In addition, the right has to protect accurate memories against distortive influences. Courts were confronted with this issue in repressed memories cases in the 1990s. According to some psychological theories, repressed traumatic childhood experiences can be recovered through explorative psychological procedures. Upon undergoing such treatments, some patients remembered that they were sexually abused as children and brought claims against ostensible perpetrators. These memories often turned out to be false. They were not recovered but (negligently) implanted by psychotherapists through suggestive techniques such as hypnosis, guided imagery, drugs, and positive feedback for reports of memories with abusive

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<sup>18</sup>A right to remember does of course not entail a duty to remember.

content (Cf. Loftus and Ketcham 1996; Brainerd and Reyna 2005, Ch. 7). At times patients recalled bizarre events such as satanic ritual abuse and group rape. More astonishingly, even some alleged perpetrators confessed horrible crimes which they never committed, only because suggestive police interrogations implanted false memories.<sup>19</sup> For lack of reliability and scientific consensus, courts grew reluctant to admit evidence of repressed memories. Today, chances of conviction based on testimonies from recovered memories without further corroborative evidence are low.

These cases raised the question whether patients or the wrongly accused have causes of action against therapists. The patient–psychotherapist relation is subject to contract law; therapists have to provide treatment *de lege artis*, according to standards of medical practice, which were arguably not observed in these cases. At least, methods that potentially alter memory should, just as physical interventions into bodies, require informed consent. Patients have to be informed about the scientific status of the repressed memory paradigm and the risk of false memories. Implanting false memories may thus give rise to malpractice suits.

Moreover, the work of Loftus demonstrates that false memories can be implanted outside of psychotherapeutic contexts. To capture such cases, the law would have to establish noncontractual duties of care toward other persons' memories. The problematic point is that false information can suffice to distort memories, but as misinformation is virtually everywhere, it can by itself hardly warrant tort claims (Morgan et al. 2013). The law has to tailor more narrow duties for persons with special responsibilities such as interrogating police officers. Implanting memories not as innocuous as the one's used in research, e.g., having been lost in a mall as a kid, should suffice to ground tort claims (e.g., infliction of mental distress, a tort accepted in some but not all jurisdictions).<sup>20</sup>

### Protection Against Erasure

Furthermore, the law should provide protection against unwanted memory erasure even when it does *not* lead to mental distress. Walter Glannon discusses a real case in point, here in a slightly modified form<sup>21</sup>: For removal of suspicious tissue, a patient has consented to local anesthesia and, if necessary, for full sedation. During surgery, the locally anesthetized patient overhears the pathologists diagnosing “bad cancer” and starts to panic. The doctor injects her propofol, sometimes called “milk of amnesia” because it induces short-term anterograde amnesia through blocking initial memory consolidation. After waking up, the doctor tells the patient the surgery has gone smoothly and reveals her devastating diagnosis in the following days.

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<sup>19</sup>In a famous case, the accused confessed the murder of 25 infants after authorities pressured him to remember the events; cf. Levy (2007).

<sup>20</sup>A further question is whether third parties – the accused – can bring claims against therapist. In the landmark case *Ramona v. Isabella*, the court granted a wrongly accused father remedies; see Mullins (1996).

<sup>21</sup>Glannon (2010), 240f. The case is taken from TIME, Oct. 15th 2007.

This is a case of genuine memory erasure, but instead of causing distress the intervention temporarily relieves it. Similarly, perpetrators could erase memories of victims so that they are unable to identify them which could have the positive effect of preventing PTSD. Without causing mental distress, these interventions might not fall within the scope of currently accepted torts. In that case, tort law should be expanded to outlaw unwanted memory erasure regardless of its negative or positive consequences. Because of their importance, lawmakers may even consider to render the unwanted erasure of memories into a criminal offense (Bublitz and Merkel 2014). Of course, memory erasure might be justifiable in exceptional cases (arguably in the one discussed by Glannon).

### **Right to Enhance Memory**

In the 1950s, Wilder Penfield pioneered experimental stimulation of the brain. Electrical stimulation of the temporal lobes evoked vivid memories of events long forgotten. At least, this is what patients reported. As those memories were never verified, they might have been mere fantasies (Schacter 1995, p. 12). However, more precise stimulation and better insights into memory traces could afford new ways to explore buried memories, and, so we suppose for the sake of argument, sufficiently veridical ones. Should persons have a right to undergo such procedures? Other means that potentially enhance memory such as the nontherapeutic use of antidementia drugs or mnemonic training raise structurally similar questions. Given widespread complaints about the fallibility of memory and the natural curiosity about one's past, a high demand for effective memory enhancements can be expected. As part of the struggle against episodes of one's life fading away and becoming irrecoverable, the use of enhancements falls within the scope of the right to remember. It is neither conceptually nor normatively confined to our limited natural powers of recall. It guarantees remembering as one pleases which implies a permission to employ memory-aiding tools. Restricting access to such tools interferes with the right.

### **Limits**

These interferences could be justified. As a form of cognitive enhancement, memory-boosting tools face many of the ethical objections reviewed elsewhere in this volume. Apart from issues of safety, efficacy, and undesirable consequences of overly perfect memories, ethical and social concerns may justify limiting freedom of memory. However, in light of the importance of memory and the fact that our natural powers are limited – at times, tools may be the only way to acquire access to one's past – countervailing interests would have to meet a high threshold. Social interests strong enough to outweigh, e.g., the interest to remember significant events of one's life are hard to imagine.

Furthermore, restrictions of modern versions of the ancient *ars memoriae* such as mnemonic training seem hardly justifiable, although they may e.g., give a competitive edge in the job market. Access to pharmaceuticals can be regulated in virtue of side effects, but unless considerable negative effects on individuals or society at large are expected, doctors should be free to prescribe them. The liberty



to use memory enhancements becomes even stronger insofar as they have preventive effects against memory decay in the future.

In extraordinary cases, freedom of memory might find its limits in legitimate interests of others that some events be forgotten (Kolber 2006). Think about an offender's vivid memories of how he humiliated and abused a victim. Victims may have the understandable wish that these memories shall not persist. Yet, these memories may also be important for offenders (e.g., for coming to terms with their deeds). If means to erase particular memories become available, the law needs to strike balances between these interests. Apart from such extreme cases, the right to remember regularly prevails over social interests to forget.

### **Right to Forget**

As memory is the interplay between recall and forgetting, the freedom of memory also entails the right to not remember and even to forget. Again, good ethical reasons may speak against intentional forgetting, but legal freedoms do not coincide with the realm of the morally advisable. Only severe self-harm can be prohibited on paternalistic grounds.

### **Not Being Reminded of Something**

A right to forget entails that others do not have claims against the rightholder to remember. Therefore, the romantic promise of lovers to never forget a precious moment (and each other) cannot be understood as a binding and enforceable legal contract. Moreover, in our quest to forget, we try, to suppress thinking about particular persons or events. Often in vain, as we are inadvertently reminded of them by external audiovisual or olfactory cues. The right to forget cannot protect against being reminded as this would restrict other persons' freedoms, e.g., the right to speak about issues others are not pleased being reminded of. Only particular means of evoking memories in others can run afoul of freedom of memory such as unwanted electrical stimulation of the brain. Unlike speaking, no one is entitled to directly interfere with another person's brain. Even if such interventions were free of side effects, the elicitation of unwanted memories by itself violates freedom of memory. Between speech and brain stimulation lies a grey area of ways to stir up another person's memories, e.g., through placing cues in public places. But if elicitation of memories were sufficient ground for banning cues from the public, all kinds of stimuli would have to be removed. The public sphere, however, attended to by different persons with different sensitivities, must remain a place for free expression even if some take offense. A different conclusion might be warranted in special cases, such as a graffiti artist who intentionally places symbols that trigger traumatic memories in the social environment of abuse victims (such cases do exist). It is not the illegitimate appropriation of the public for personal purposes but the intentional elicitation of memories that can ground claims in those cases. In general, PTSD and stressful memories are a growing field of litigation, and the law seems more willing to accept such claims, providing some protection for peace of mind, although scope and limits remain to be worked out in detail (Shen 2012).

### **Intentional Forgetting**

While freedom of memory cannot protect against exposure to any memory cue, it encompasses the right to forget through straightforward measures. Umberto Eco once pointed to an asymmetry between the *ars memoriae* and *ars oblivionalis* (Eco 1998). While we can establish associations and cues to remember, there is no analog method to forget. Although some indirect strategies to suppress unwanted memories exist (Anderson and Green 2001), forgetting is, by and large, not under our conscious control. The advent of consolidation-blocking substances could change this, and their use would fall under freedom of memory. But, just like any other freedom, it can be limited by countervailing interests.

### **Paternalistic Limits: Erasure of Autobiographical Memory**

Let us briefly turn to one example of justifiable paternalism: complete erasure of autobiographical memory. It may sound like mockery to the ears of those who suffer from severe memory loss, but some persons may seek to completely eradicate their autobiographical memory. At present, there are no means to do so, but tragic examples of brain lesions prove that it is possible in principle. Suppose an intervention erases memory without impeding the capacity to store new information. In the great majority of cases, availing oneself of such means would be an imprudent decision that causes more harm than relief and states should step in. However, cases are conceivable in which even this radical memory modification appears as an understandable wish, all things considered, e.g., if tragic circumstances have come over the person which were not of her own making and severely obstruct a flourishing life in the future. To some, autobiographical memory erasure disrupts diachronic identity and it might be conceived as a minor form of suicide.<sup>22</sup> Countries that tolerate or assist suicide might, in order to prevent suicide, discuss regulations and procedures for such interventions, bizarre as they may appear at first glance.

### **Limits: Collective Memory**

The tempting short-term relief provided by memory modifications might come at the price of negative long-term effects on personal development for which paternalistic restrictions seem warranted. We cannot delve deeper into this contentious issue here and shall turn to limits which derive from interests of the common good. A recurring theme in the debate concerns the effects of memory alterations on collective memory. The Council argues that “our own memory is not merely our own; it is part of the fabric of society in which we live” and pictures the social consequences of memory dampening by asking: “What kind of people would we be if we did not want to remember the Holocaust, if we sought to make the anguish simply go away?” (p. 231) The Council concedes that “we cannot and should not force those who live through great trauma to endure its painful memory *for the benefit of the rest of us.*” Yet, rather

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<sup>22</sup>The law would probably not accept changes in numerical identity and still consider the person as the same as she was before erasure of autobiographical memory with respect to, e.g., financial obligations. Whether persons can still be punished for crimes committed before is a more intricate question, see, e.g., Dufner (2013).

than concluding that victims should be free to forget painful events, the Council suggests that society should compassionately suffer with victims instead.

The Council worries that atrocities and outrageous crimes could simply be forgotten and that victims would no longer seek to redress injustice. In that case, we would indeed be morally bankrupt. However, if we listen to the stories of (traumatized) survivors, the assumption that they could have chosen to forget if they only had effective means at their disposal seems misplaced. On the contrary, many seem to have derived the strength to survive from what they conceived as their moral duty: to tell the world what has happened and to seek justice, in the name and in memoriam of those brutally murdered. The engraving on the Holocaust Museum, “for the dead and the living, we must bear witness,” seems to express a deep existential commitment rather than an externally imposed duty. In the Oath of Buchenwald, survivors declared “it was one thought that kept us alive: the time for revenge will come” and pledged to “take up the fight until the last culprit stands before the judges of the people.”<sup>23</sup> For many, forgetting has never been an option.<sup>24</sup> However, we shall refrain from speculating about personal motivations of survivors because atrocities might simply not be the right angle for framing general discussions of memory alterations. How to come to terms with singular historical catastrophes far exceeds present parameters, and such events may not lend themselves to generalizations. We suppose that one can unconditionally endorse the imperative to never forget the Holocaust but still argue about manipulating memory in minor cases. Those we shall have in mind in the following.

The Council contends that memories are not “merely our own”, not at one’s free disposal because they are part of collective memory, and, further, that forgetting or numbing could impair or render impossible fulfilling collective duties of remembrance. However, the contested, perhaps only metaphorically useful concept of collective memory seems to be misleading.<sup>25</sup> Individual memories are the sources from which communities weave the stories about their past. The construction of these social narratives parallels individual memories in interesting ways: It pursues goals, primarily strengthening collective identities, not necessarily historical truthfulness. Parts of history are embellished, others are left out; stories are retold and rearranged through cultural and commemorative events in the service of present interests. Accordingly, historians speak of memory distortions on the collective level, too (Schudson 1995). Normatively, however, the fact that individual memories are sources of collective remembrance does not make them “memories of the community,” nor do communities derive claims to access or preservation simply from the fact that they can utilize them. Arguments in this vein presuppose that

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<sup>23</sup>Oath of Buchenwald, April 19, 1945.

<sup>24</sup>How to reconcile the duty toward memory with the need to forget is a central theme for Holocaust survivors; cf. the writings of Elie Wiesel, e.g., his Nobel lecture, Dec. 11, 1986 ([www.nobelprize.org](http://www.nobelprize.org)).

<sup>25</sup>See Ricoeur’s (2004), p. 120 discussion of Halbwachs’ ideas who coined the term collective memory.

individuals are obliged to contribute to forming collective identities and facilitating collective goals. This might be a moral duty, but not a legal one.

Regarding duties of remembrance, an ambiguity of the concept “remember” might be at play. Collectively remembering historical events is not the same as individuals reexperiencing the past. The former means, e.g., drawing lessons from history, paying tribute to involved persons, and commemorating the dead. It does not mean, by contrast, that the collective or any individual entertains an auto-noetic, first-person memory. The collective duty is independent from, and can be fulfilled without, autobiographical recollections.<sup>26</sup> Because of this, collective memories of historical events can be kept alive even when all contemporary witnesses have passed away. Erasure of individuals’ memories does not automatically affect collective memory. Surely, oral accounts of moral witnesses can support collective remembrance, and they may have a moral duty to testify. But if witnesses cannot, as the Council concedes, be compelled to painfully remember for the benefit of society, their testimony should be encouraged but ultimately left to their discretion.

### **Social Interests: Witness Testimony**

In this regard, the law is stricter. Irrespective of painfulness, it imposes duties to remember on witnesses for the benefit of the common good, more precisely, for purposes of law enforcement.<sup>27</sup> In many jurisdictions, the failure of a summoned witness to testify accurately constitutes punishable offenses. The law has to rely on witnesses. For lack of other obtainable evidence, testimony plays an important part in various legal proceedings. Memory alterations could impair the accuracy of testimony, fact-finding, and the administration of justice. For reasons of a fair trial, testimonies have to be given before a judge or a jury and be called into question by all parties. This makes oral proceedings necessary. As they unavoidably commence some time after the incident in question, the law has to address the duties of witnesses and the legal status of their memories during the meantime.

While the legitimacy of the duty to testify is hardly disputed in principle – everyone has to contribute his share to maintaining a (just) legal order – its precise contours are less clear. Before court, witnesses have to testify to the best of their knowledge. However, if memories were erased beforehand, witnesses cannot but truthfully refer to their memory blanks. We are all too aware of the notorious memory gaps that strikingly often befall people as soon as they enter courtrooms (not all of them *bona fide*). Since memory blanks can be beneficial for witnesses, they might be tempted to bring them about, and other interested parties might offer incentives to do so. Already today, witnesses might be able to render their testimony useless for legal purpose by exposing memories to ordinary risks such as alcohol or repeated recall under distortive influences (or seek the help of false memory implanters). At least intentional memory

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<sup>26</sup>The same can be said about worries to “make the anguish go away”. Is it the anguish of the victim that shall persist or not rather the anguish of noninvolved persons, as an empathic response to the suffering.

<sup>27</sup>In special cases, procedural rules recognize painfulness of memories, e.g., in sex-related cases.

distortions contradict the duty to testify truthfully. As self-induced witness amnesia would seriously obstruct the administration of justice and cannot be tolerated by the law, memory alterations that undermine accurate testimonies should be prohibited. Insofar as current provisions do not capture self-induced memory loss, offenses such as destruction of or tampering with evidence should be extended to encompass engrams in the brain.<sup>28</sup> However, tampering with engrams is in many ways dissimilar to tampering with physical objects. Whereas the latter can be confiscated and stored, persons can, in view of the dynamic nature of memory, hardly be obliged to preserve unmodified memories (or the initial perception). Some modifications are inevitable as long as memories are recalled and reconsolidated. Thus the law should reconsider the scope of witnesses' duties of care towards their fragile memories in light of current research.

Memory blunting might be the most pressing issue. On the empirical side, the impact of emotional blunting on factual recall has to be investigated. If emotional responses can be numbed while facts are largely preserved, the main legal interest in memory – gaining knowledge about the past – is not seriously threatened.<sup>29</sup> If, by contrast, blunting deteriorates factual recall, delicate balances have to be struck between societal interests in preserving accurate memories and witnesses' right to mental health. Roughly, we suggest that persons not responsible for the event such as victims or bystander witnesses cannot be expected by law to suffer intense and debilitating trauma. The short time window for interventions during consolidation (a couple of hours) raises a host of practical problems that need to be addressed (Cf. Kolber 2006, p. 1587).<sup>30</sup> Eventually, after witnesses have testified, the law does not stipulate further claims over their memories.

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## Effects on Responsibility

Another objection pertains to the effects of memory alterations on moral responsibility. The Council voices the concern that the idea of moral responsibility could unravel because victims would not seek justice any longer: Instead of forgiving, they would simply forget.<sup>31</sup> From a legal perspective, this worry seems farfetched and reverses the interests in question. Among the major aims for holding persons responsible is redressing harms inflicted on victims. The victim's main claim is restoration of the status quo ante, i.e., to put him in a position as if the harming

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<sup>28</sup>See Kolber (2006), p. 1589 for a US-specific argument to this end.

<sup>29</sup>On occasion, the law might have further interests in unmodified emotions (e.g., in assessing damages), Kolber (2006), p. 1592.

<sup>30</sup>Perhaps immediate, taped interrogations to record at least a first unaltered testimony should be developed. But even then some parties have a disadvantage as they cannot cross-examine the witness. Also, in the immediate aftermath it is impossible to predict who will develop trauma, so the interests to be balanced are unclear in the moment in which actions have to be taken. Furthermore, it is often not evident whether memories will be of legal relevance; how long should people wait?

<sup>31</sup>Ricoeur (2004) argues that forgiving can be facilitated through forgetting.

action had never occurred (*restitutio in integrum*). Because history cannot be undone, this claim often remains unfulfillable, and secondary (financial) remedies are awarded instead. Easing negative mental consequences for victims would be the closest approximation to full restoration. Mitigating psychological harm, if necessary through memory alterations, is therefore a demand of justice, not its abandonment.<sup>32</sup>

The sinister consequences memory numbing may have on responsibility are often illustrated by two powerful images: One is the soldier with subdued emotions, blind and unresponsive to the horrors in which he participates, an epitome of a soulless human killing machine. The other is borrowed from Shakespeare's *Macbeth*:

Cure her of that: Canst thou not minister to a mind diseas'd; Pluck from the memory a rooted sorrow; Raze out the written troubles of the brain; And with some sweet oblivious antidote Cleanse the stuff'd bosom of that perilous stuff / Which weighs upon the heart?<sup>33</sup>

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## Memory & Conscience

The idea of people washing away their feelings of guilt along with their recollections or of murderers with a clean conscience is highly troublesome. Accordingly it is widely held that perpetrators of crimes should not, as *Macbeth* hoped for his wife, numb their pangs of conscience through memory-blunting drugs (Parens 2010). On a closer look, memory plays only an instrumental role in these cases. What is really at stake is whether persons are sometimes obliged to experience feelings of guilt. Moral intuitions suggest that a guilty mind should be a conscience-struck mind. But is this also a legal duty? This intriguing question falls within the ambit of another, firmly established human right: freedom of conscience, enshrined in every human right treaty and among the core guarantees of the human rights system. Judicature and scholarship consider the inner side, the so-called *forum internum* where conscientious beliefs and emotions are formed, as protected unconditionally, i.e., intrusions are strictly prohibited. The central idea is that the conscience of the individual must, in principle, remain outside of the reach of governments. Although the precise contours of the right and its limits have yet to be defined,<sup>34</sup> freedom of conscience seems to imply that states do not have any legal claim over the conscience of the individual and that regulations of substances cannot be grounded in undesirable effects on conscience. The social interest in sustaining pangs of conscience then appears insufficient to curb its freedom.

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<sup>32</sup>Furthermore victims have moral claims against perpetrators, e.g., to explain their reasons for actions. Memory erasure could thwart these obligations, which are often not enforceable by law because defendants enjoy privileges against self-incrimination and can remain silent.

<sup>33</sup>Shakespeare, *Macbeth*, Act V, Scene 3.

<sup>34</sup>The best analysis is Hammer (2001).

However, one should recall that the notion behind the absolute nature of the right lies in the protection of the individual against persecution for deeply held moral convictions and pressure to renounce one's faith. The origins of the right date back to confessional wars in medieval times. Neither in its historical genesis nor in legal scholarship the possibility of intentionally silencing one's "inner guiding voice" of conscience has been thoroughly considered. It raises the deeper question whether liberal states can require citizens to possess a minimum set of socially desirable psychological traits. Can a legal duty to be a moral agent, potentially riddled by a guilty conscience, be imposed on citizens; might it be legally enforced through denial of access to conscience-numbing drugs or even involuntary enhancement of moral dispositions? Perhaps. These issues run much deeper than freedom of memory. Current interpretations of liberty of conscience *prima facie* speak against a legal duty to be struck by one's conscience.

### Memories of Perpetrators

As a consequence, soldiers are not legally obliged to feel remorse and cannot, in virtue of this fact, be stopped from altering their conscience, but military codes of conduct could proscribe use of memory-impairing substances. In practice, however, the military likely encourages numbing if it lives up to the promise of reducing the high rates of personnel suffering from PTSD. We share worries of soldiers killing with a clean conscience and – although we acknowledge the general weakness of arguments based on human nature – cannot but agree that some valuable essence of what it means to be human might be lost in those cases. However, we also sense some hypocrisy in the contention that soldiers ought to bear painful trauma for what others have commanded them to do.<sup>35</sup>

The most convincing case for an exception to the absolute protection of conscience can be made with regard to culpable offenders. In an insightful analysis, Carter Snead shows that the various aims of criminal punishment in one way or another presuppose that offenders and society remember fitly and truly. Memory modifications may thwart these aims (Snead 2011). What follows from this? In general, offenders do not have to contribute to the aims of the criminal justice system. This point is particularly important with respect to rehabilitation, the reduction of criminogenic psychological factors to reintegrate offenders upon release, which is among the main penological aims. In many countries, offenders are entitled to access to rehabilitative support but cannot be coerced into participation. States may provide incentives and rewards (e.g., reduced sentence, therapy as a condition for parole), but offenders can ultimately refuse rehabilitative attempts to remold their minds and serve their full sentence instead (and may

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<sup>35</sup>Kolber (2006), p. 1621 draws the parallel between physical and emotional wounds. If treating the former raises no worries, why the latter? We suspect because of an (implicit) intuition that soldiers deserve mental torments, which is unconvincing as a general principle.

remain in preventive custody subsequently).<sup>36</sup> Whether coerced rehabilitation is viewed favorably depends on one's stance on the legitimacy grounds for punishment. The venerable issue may attract renewed attention if novel means for rehabilitation prove effective. Perhaps states might deny access to substances that subdue emotions conducive to rehabilitation such as guilt, remorse, or shame as part of punishment. Nonetheless, we hasten to remind that offenders are entitled to basic rights such as mental health, including treatment of painful mental consequences which originate in their wrongful deeds. Thus borders between self-incurred (and morally deserved) mental turmoil and pathological trauma might have to be drawn. While working through and coming to terms with one's deeds should be the default position, in cases of severe PTSD symptoms, offenders' right to mental health seems to outweigh societal interests in their suffering and entitles them to therapeutic memory alterations.

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### A Duty to Enhance

Finally, Vedder and Klaming have proposed employing memory enhancements for the common good, e.g., to improve recollection of witnesses (Vedder and Klaming 2010). In their view, public interests in obtaining accurate testimony might outweigh freedom of memory of witnesses. Although for lack of reliable enhancers such calls are premature at present, it is worth pondering whether states could stipulate duties to enhance memory. Freedom of memory does not oppose voluntary but protects against mandatory enhancements. As argued before, duties of witnesses seem to end where (more than trivial) side effects begin. But even for apparently side-effect-free memory enhancements like regular sleep (Thorley 2013) or repeated retrieval of the respective memory (Chan and Lapaglia 2011; Pansky and Nemets 2012), a legal obligation might be considered an undue burden to witnesses. Further details depend on particularities of each jurisdiction. Some do not even require witnesses to "refresh" their memory, e.g., through consulting records, while others explicitly ban memory-altering tools, including enhancements.<sup>37</sup> If lawmakers are tempted to amend current provisions, more than side effects should be taken into account. Vedder and Klaming's proposal is intriguing because it prompts general considerations over the politics of memory.

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### Conclusion and Future Directions

For the most part of history, humankind's knowledge of the past has relied on orally transmitted accounts based on memories, individual and collective. Memory has been an extremely important capacity for cultural development, reflected in the

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<sup>36</sup>Some countries have mandatory rehabilitation programs for drug users and sex offenders.

<sup>37</sup>Cf. § 136a German Code of Criminal Procedure.



fact that duties to remember can be found in the writings of many major religions (Margalit 2002). Forgetting has likewise been a tool for political power. Imperatives to erase names of disgraced persons can be found in the bible. A Roman punishment consisted in *damnatio memoriae*, the “condemnation of the memory” of a person. These were predecessors of notorious attempts to manipulate collective memory such as Stalinist retouching of historical photographs. Ricoeur points to the Edicts of Nantes by Henry IV whose very first article proclaimed that “the memory of all things that have taken place” during preceding wars “remains extinguished and dormant as something that has not occurred” (Ricoeur 2004, p. 454). Back then, amnesia was prescribed to secure peace. Today we can witness converse tendencies such as granting amnesty for people who truthfully testify before South Africa’s Truth and Reconciliation Committee. Both examples prove the political dimension of memory.

Calls to employ enhancements for public interests should be viewed with suspicion. They would, for the first time, expand the reach of governmental powers over memory from external records directly into minds and brains. What if states enhance only those memories supportive of their cause – might the past not be alterable through partially enhancing recollection? What if other memories were subdued or erased? How could misuse of these powers be effectively ruled out?

The inaccessible nature of one’s own and others’ memories has shielded them from direct governmental access. Neuroscience might overcome these natural barriers with potentially far-ranging implications for the way society deals with memories of individuals and with history at large. They need to be discussed not only by ethicists but the general public and democratic institutions, in order to formulate a framework for a politics of memory. On occasion, the memories of a single individual have changed the course of history. This perspective might underscore the importance of freedom of memory and motivate its acceptance as a fundamental right. After all, as George Orwell urged, if governments acquire the means to alter the way we perceive the past, they may well acquire those to alter the future.

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## Cross-References

- ▶ [Impact of Brain Interventions on Personal Identity](#)
- ▶ [Mind, Brain, and Law: Issues at the Intersection of Neuroscience, Personal Identity, and the Legal System](#)
- ▶ [Neuroenhancement](#)
- ▶ [Neuroethics and Identity](#)
- ▶ [Reflections on Neuroenhancement](#)
- ▶ [The Morality of Moral Neuroenhancement](#)

## References

- Alberini, C. M., Milekic, M. H., & Tronel, S. (2006). Mechanisms of memory stabilization and destabilization. *Cellular and Molecular Life Sciences*, *63*, 999–1008.
- Anderson, M. C., & Green, C. (2001). Suppressing unwanted memories by executive control. *Nature*, *410*, 366–369.
- Bell, J. (2008). Propranolol, post-traumatic stress disorder and narrative identity. *Journal of Medical Ethics*, *34*, e23.
- Beracochea, D. (2006). Anterograde and retrograde effects of benzodiazepines on memory. *Scientific World Journal*, *6*, 1460–1465.
- Bernecker, S. (2010). *Memory: A philosophical study*. Oxford: Oxford University Press.
- Blustein, J. (2008). *The moral demands of memory*. Cambridge/New York: Cambridge University Press.
- Borges, J. L., Yates, D. A., & Irby, J. E. (2007). *Labyrinths: Selected stories & other writings*. New York: New Directions.
- Brainerd, C. J., & Reyna, V. F. (2005). *The science of false memory* (Oxford psychology series, Vol. 38). New York: Oxford University Press.
- Bublitz, J. C., & Merkel, R. (2009). Autonomy and authenticity of enhanced personality traits. *Bioethics*, *23*(6), 360–374.
- Bublitz, J. C., & Merkel, R. (2014). Crimes against minds: On mental manipulations, harms and a human right to mental self-determination. *Criminal Law and Philosophy*, *8*(1), 51–77.
- Cahill, L., Prins, B., Weber, M., & McGaugh, J. L. (1994). Beta-adrenergic activation and memory for emotional events. *Nature*, *371*(6499), 702–704.
- Calhoun, L. G., & Tedeschi, R. G. (2006). *Handbook of posttraumatic growth: Research and practice*. Mahwah: Lawrence Erlbaum Associates.
- Chan, J. C., & Lapaglia, J. A. (2011). The dark side of testing memory: Repeated retrieval can enhance eyewitness suggestibility. *Journal of Experimental Psychology: Applied*, *17*, 418–432.
- Coffman, B. A., Clark, V. P., & Parasuraman, R. (2014). Battery powered thought: Enhancement of attention, learning, and memory in healthy adults using transcranial direct current stimulation. *Neuroimage*, *85*, Part 3, 895–908.
- Conway, M. (2005). Memory and the self. *Journal of Memory and Language*, *53*, 594–628.
- Corkin, S. (2002). What's new with the amnesic patient H.M.? *Nature Reviews: Neuroscience*, *3*, 153–160.
- DeGrazia, D. (2005). *Human identity and bioethics*. Cambridge: Cambridge University Press.
- Donovan, E. (2010). Propranolol use in the prevention and treatment of posttraumatic stress disorder in military veterans: Forgetting therapy revisited. *Perspectives in Biology and Medicine*, *53*(1), 61–74.
- Dresler, M., Sandberg, A., Ohla, K., Bublitz, C., Trenado, C., Mroczko-Wąsowicz, A., Kühn, S., & Repantis, D. (2012). Non-pharmacological cognitive enhancement. *Neuropharmacology*, *64*, 529–543.
- Dudai, Y. (1996). Consolidation: Fragility on the road to the engram. *Neuron*, *17*, 367–370.
- Dudai, Y. (2012). The restless engram: Consolidations never end. *Annual Review of Neuroscience*, *35*(1), 227–247.
- Dufner, A. (2013). Should the late stage demented be punished for past crimes? *Criminal Law and Philosophy*, *7*(1), 137–150.
- Eco, U. (1998). An ars oblivionalis? Forget it. *Publications of the Modern Language Association*, *103*, 254–261.
- Erdelyi, M. H. (2006). The unified theory of repression. *Behavioral and Brain Sciences*, *29*, 499–551.
- Erler, A. (2011). Does memory modification threaten our authenticity? *Neuroethics*, *4*(3), 235–249.
- Feinberg, J. (1986). *The moral limits of the criminal law*. New York: Oxford University Press.
- Galert, T., & Hartmann, D. (2007). Person, personal identity, and personality. In R. Merkel et al. (Eds.), *Intervening in the brain. Changing psyche and society*. Berlin/New York: Springer.

- Genzel, L., Kroes, M. C., Dresler, M., & Battaglia, F. P. (2014). Light sleep versus slow wave sleep in memory consolidation: a question of global versus local processes? *Trends in Neurosciences*, *37*, 10–19.
- Geraerts, E., & McNally, R. J. (2008). Forgetting unwanted memories: Directed forgetting and thought suppression methods. *Acta Psychologica*, *127*, 614–622.
- Glannon, W. (2006). Psychopharmacology and memory. *Journal of Medical Ethics*, *32*(2), 74–78.
- Glannon, W. (2010). The neuroethics of memory. In S. Nalbantian et al. (Eds.), *The memory process, neuroscientific and humanistic perspectives* (pp. 233–251). Cambridge, MA: MIT Press.
- Hammer, L. M. (2001). *The international human right to freedom of conscience: Some suggestions for its development and application*. Aldershot/Burlington: Ashgate/Dartmouth.
- Harris, C., Sutton, J., & Barnier, A. (2010). Autobiographical forgetting, social forgetting, and situated forgetting: Forgetting in context. In S. Della Sergio (Ed.), *Forgetting* (pp. 253–284). New York: Psychology Press.
- Henry, M., Fishman, J. R., & Yougner, S. J. (2007). Propranolol and the prevention of PTSD: Is it wrong to erase the “sting” of bad memories? *American Journal of Bioethics*, *7*, 12–20.
- Holmes, E. A., Sandberg, A., & Iyadurai, L. (2010). Erasing trauma memories. *British Journal of Psychiatry*, *197*, 414.
- Hötting, K., & Röder, B. (2013). Beneficial effects of physical exercise on neuroplasticity and cognition. *Neuroscience & Biobehavioral Reviews*, *37*(9), 2243–2257.
- Hübener, M., & Bonhoeffer, T. (2010). Searching for engrams. *Neuron*, *67*(3), 363–371.
- Husain, M., & Mehta, M. A. (2011). Cognitive enhancement by drugs in health and disease. *Trends in Cognitive Sciences*, *15*, 28–36.
- James, W. (2007). *The principles of psychology*. New York: Cosimo Classics.
- Joëls, M., Fernandez, G., & Roozendaal, B. (2011). Stress and emotional memory: A matter of timing. *Trends in Cognitive Sciences*, *15*, 280–288.
- Kandel, E. (2007). *In search of memory: The emergence of a new science of mind*. New York: Norton.
- Karpicke, J. D., & Roediger, H. L., 3rd. (2008). The critical importance of retrieval for learning. *Science*, *319*(5865), 966–968.
- Kindt, M., Soeter, M., & Vervliet, B. (2009). Beyond extinction: Erasing human fear responses and preventing the return of fear. *Nature Neuroscience*, *12*, 256–258.
- Klein, S., German, T., Cosmides, L., & Gabriel, R. (2004). A theory of autobiographical memory: Necessary components and disorders resulting from their loss. *Social Cognition*, *22*(5), 460–490.
- Kolber, A. (2006). Therapeutic forgetting: Legal and ethical implications of memory dampening. *Vanderbilt Law Review*, *59*, 1561.
- Kolber, A. (2008). Freedom of memory today. *Neuroethics*, *1*(2), 145–148.
- Kroes, M. C., Tendolkar, I., van Wingen, G. A., van Waarde, J. A., Strange, B. A., & Fernández, G. (2014). An electroconvulsive therapy procedure impairs reconsolidation of episodic memories in humans. *Nature Neuroscience*, *17*, 204–20.
- LeDoux, J. (2007). Consolidation: Challenging the traditional view. In H. L. Roediger, III, Y. Dudai, & S. M. Fitzpatrick (Eds.), *Science of memory: Concepts* (pp. 171–176). Oxford: Oxford University Press.
- Levy, N. (2007). *Neuroethics*. Cambridge/New York: Cambridge University Press.
- Liao, S. M., & Sandberg, A. (2008). The normativity of memory modification. *Neuroethics*, *1*(2), 85–99. doi:10.1007/s12152-008-9009-5.
- Locke, J. (1979). *An essay concerning human understanding*. In P. H. Nidditch (Ed.), Oxford: Clarendon
- Loftus, E. (2003). Our changeable memories: Legal and practical implications. *Nature Reviews Neuroscience*, *4*, 231–234.
- Loftus, E., & Ketcham, K. (1996). *The myth of repressed memory: False memories and allegations of sexual abuse*. New York: St. Martin’s Griffin.

- Lonergan, M., Olivera-Figueroa, L., Pitman, R., & Brunet, A. (2013). Propranolol's effects on the consolidation and reconsolidation of long-term emotional memory in healthy participants: A meta-analysis. *Journal of Psychiatry & Neuroscience, 38*(4), 222–231. doi:10.1503/jpn.120111.
- Lynch, G., Palmer, L. C., & Gall, C. M. (2011). The likelihood of cognitive enhancement. *Pharmacology, Biochemistry, and Behavior, 99*, 116–129.
- Margalit, A. (2002). *The ethics of memory*. Cambridge, MA: Harvard University Press.
- McGaugh, J. L. (2000). Memory – Century of consolidation. *Science, 287*(5451), 248–251.
- Morgan, C., Southwick, S., Steffian, G., Hazlett, G. A., & Loftus, E. F. (2013). Misinformation can influence memory for recently experienced, highly stressful events. *International Journal of Law and Psychiatry, 36*(1), 11–17.
- Mullins, J. (1996). Has time rewritten every line? Recovered memory therapy and the potential expansion of psychotherapist liability. *Washington Law Review, 53*, 763–802.
- Myers, K. M., & Davis, M. (2007). Mechanisms of fear extinction. *Molecular Psychiatry, 12*, 120–150.
- Nadel, L., & Sinnott-Armstrong, W. (Eds.). (2012). *Oxford series in neuroscience, law, and philosophy. Memory and law*. Oxford/New York: Oxford University Press.
- Nader, K., & Einarsson, E. O. (2010). Memory reconsolidation: An update. *Annals of the New York Academy of Sciences, 1191*(1), 27–41.
- Nader, K., Schafe, G. E., & Le Doux, J. E. (2000). Fear memories require protein synthesis in the amygdala for reconsolidation after retrieval. *Nature, 406*(6797), 722–726.
- Nehlig, A. J. (2010). Is caffeine a cognitive enhancer? *Alzheimer's Disease, 20*(Suppl 1), S85–S94.
- Pansky, A., & Nemets, E. (2012). Enhancing the quantity and accuracy of eyewitness memory via initial memory testing. *Journal of Applied Research in Memory and Cognition, 1*, 2–10.
- Parens, E. (2010). The ethics of memory blunting and the narcissism of small differences. *Neuroethics, 3*(2), 99–107.
- Parfit, D. (1984). *Reasons and persons*. Oxford: Clarendon.
- Parker, E., Cahill, L., & McGaugh, J. (2006). A case of unusual autobiographical remembering. *Neurocase, 12*, 35–49.
- Parsons, R. G., & Ressler, K. J. (2013). Implications of memory modulation for post-traumatic stress and fear disorders. *Nature Neuroscience, 16*(2), 146–153.
- Pitman, R. K. (1989). Post-traumatic stress disorder, hormones, and memory. *Biological Psychiatry, 26*(3), 221–223.
- Pitman, R. K. (2011). Will reconsolidation blockade offer a novel treatment for posttraumatic stress disorder? *Frontiers in Behavioral Neuroscience, 5*:11.
- Pitman, R. K., Sanders, K., Zusman, R., Healy, A., Cheema, F., Lasko, N., et al. (2002). Pilot study of secondary prevention of posttraumatic stress disorder with propranolol. *Biological Psychiatry, 51*, 189–192.
- Pitman, R.K., Rasmusson, A. M., Koenen, K. C., Shin, L. M., Orr, S. P., Gilbertson, M. W., Milad, M. R., & Liberzon, I. (2012). Biological studies of post-traumatic stress disorder. *Nature Reviews Neuroscience, 13*(11), 769–787.
- Poundja, J., Sanche, S., Tremblay, J., & Brunet, A. (2012). Trauma reactivation under the influence of propranolol. *European Journal of Psychotraumatology, 3*. doi:10.3402/ejpt.v3i0.1547.
- President's Council on Bioethics. (2003). *Beyond therapy: Biotechnology and the pursuit of happiness*. Washington, DC: President's Council on Bioethics.
- Ramirez, S., Liu, X., Lin, P. A., Suh, J., Pignatelli, M., Redondo, R. L., Ryan, T. J., & Tonegawa, S. (2013). Creating a false memory in the hippocampus. *Science, 341*(6144), 387–391.
- Rasch, B., & Born, J. (2013). About sleep's role in memory. *Physiological Reviews, 93*, 681–766.
- Repantis, D., Laisney, O., & Heuser, I. (2010a). Acetylcholinesterase inhibitors and memantine for neuroenhancement in healthy individuals: A systematic review. *Pharmacological Research, 61*, 473–481.

- Repantis, D., Schlattmann, P., Laisney, O., & Heuser, I. (2010b). Modafinil and methylphenidate for neuroenhancement in healthy individuals: A systematic review. *Pharmacological Research*, *62*, 187–206.
- Ricoeur, P. (2004). *Memory, history, forgetting*. Chicago: University of Chicago Press.
- Roediger III, H. L., Weinstein, Y., & Agarwal, P. (2010). Forgetting: Preliminary considerations. In S. Della Sergio (Ed.), *Forgetting* (pp. 1–22). New York: Psychology Press.
- Roig, M., Nordbrandt, S., Geertsens, S. S., & Nielsen, J. B. (2013). The effects of cardiovascular exercise on human memory: A review with meta-analysis. *Neuroscience and Biobehavioral Reviews*, *37*, 1645–1666.
- Sacktor, T. C. (2008). PKM $\zeta$ , LTP maintenance, and the dynamic molecular biology of memory storage. *Progress in Brain Research*, *169*, 27–40.
- Schacter, D. (1995). Memory distortions: History and current status. In D. Schacter (Ed.), *Memory distortions. How minds, brains and societies reconstruct the past*. Cambridge, MA: Harvard University Press.
- Schacter, D. L. (2002). *The seven sins of memory: How the mind forgets and remembers* (1st ed.). Boston: Houghton Mifflin.
- Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and imagining the future. *Philosophical Transactions of the Royal Society, B: Biological Sciences*, *362*(1481), 773–786.
- Schacter, D. L., & Loftus, E. F. (2013). Memory and law: What can cognitive neuroscience contribute? *Nature Neuroscience*, *16*(2), 119–123.
- Schacter, D. L., Addis, D., & Buckner, R. (2007). Remembering the past to imagine the future: The prospective brain. *Nature Reviews Neuroscience*, *8*, 657–661.
- Schechtman, M. (2005). Personal identity and the past. *Philosophy, Psychiatry, & Psychology*, *12*(1), 9–22. doi:10.1353/ppp.2005.0032.
- Schiller, D., & Phelps, E. A. (2011). Does reconsolidation occur in humans? *Frontiers in Behavioral Neuroscience*, *5*. doi:10.3389/fnbeh.2011.00024.
- Schiller, D., Monfils, M.-H., Raio, C. M., Johnson, D. C., LeDoux, J. E., & Phelps, E. A. (2010). Preventing the return of fear in humans using reconsolidation update mechanisms. *Nature*, *463*(7277), 49–53.
- Schudson, M. (1995). Dynamics and distortions in collective memory. In D. Schacter (Ed.), *Memory distortions. How minds, brains and societies reconstruct the past* (pp. 346–364). Cambridge, MA: Harvard University Press.
- Shema, R., Sacktor, T. C., & Dudai, Y. (2007). Rapid erasure of long-term memory associations in the cortex by an inhibitor of PKM. *Science*, *317*(5840), 951–953.
- Shen, F. (2012). Monetizing memory science: Neuroscience and the future of PTSD litigation. In L. Nadel & W. Sinnott-Armstrong (Eds.), *Oxford series in neuroscience, law, and philosophy. Memory and law* (pp. 325–357). Oxford/New York: Oxford University Press.
- Smith, M. A., Riby, L. M., Eekelen, J. A., & Foster, J. K. (2011). Glucose enhancement of human memory: A comprehensive research review of the glucose memory facilitation effect. *Neuroscience and Biobehavioral Reviews*, *35*, 770–783.
- Snead, C. (2011). Memory and punishment. *Vanderbilt Law Review*, *64*, 1195–1264.
- Strange, B. A., Kroes, M. C., Fan, J. E., & Dolan, R. J. (2010). Emotion causes targeted forgetting of established memories. *Frontiers in Behavioral Neuroscience*, *4*, 175.
- Strawson, G. (2011). *Locke on personal identity: Consciousness and concernment* (Princeton monographs in philosophy). Princeton: Princeton University Press.
- Suthana, N., & Fried, I. (2014). Deep brain stimulation for enhancement of learning and memory. *Neuroimage*, *85*, Part 3, 996–1002.
- Sutton, J. (2012). Memory. In E. Zalta (Ed.), *The stanford encyclopedia of philosophy*. <http://plato.stanford.edu/entries/memory/>.
- The British Psychological Society. (2008). Guidelines on memory and the law: A report from the Research Board, Leicester. June 2008.
- Thompson, R. F. (2005). In search of memory traces. *Annual Review of Psychology*, *56*(1), 1–23.

- Thorley, C. (2013). The effects of recent sleep duration, sleep quality, and current sleepiness on eyewitness memory. *Applied Cognitive Psychology, 27*(5), 690–695.
- Tulving, E. (1985). Memory and consciousness. *Canadian Psychology/Psychologie Canadienne, 26*(1), 1–12.
- Tulving, E. (2002). Episodic memory: From mind to brain. *Annual Review Psychology, 53*, 1–25.
- Vaiva, G., Ducrocq, F., Jezequel, K., Averland, B., Lestavel, P., Brunet, A., & Marmar, C. R. (2003). Immediate treatment with propranolol decreases posttraumatic stress disorder two months after trauma. *Biological Psychiatry, 54*(9), 947–949.
- Vedder, A., & Klaming, L. (2010). Human enhancement for the common good – Using neurotechnologies to improve eyewitness memory. *AJOB Neuroscience, 1*(3), 22–33.
- Vervliet, B., Craske, M. G., & Hermans, D. (2013). Fear extinction and relapse: State of the art. *Annual Review of Clinical Psychology, 9*, 215–248.
- Walker, M. P., & van der Helm, E. (2009). Overnight therapy? The role of sleep in emotional brain processing. *Psychological Bulletin, 135*, 731–748.
- Wilson, A. E., & Ross, M. (2001). From chump to champ: People's appraisals of their earlier and present selves. *Journal of Personality and Social Psychology, 80*(4), 572–584.
- Wixted, J. T. (2004). The psychology and neuroscience of forgetting. *Annual Review of Psychology, 55*, 235–269.
- Worthen, J. B., & Hunt, R. R. (2010). *Mnemonology*. New York: Psychology.