

The Evolution and Dissolution of Cultural Memory

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The Evolution of Memory

The Unconscious Organization of Personal Memory

The Evolution of Cultural Memory

Cultural Sculpting of Hominin Dreams

Cognitive Structure in Cultural Memory

Transformations of Cultural Memory with the Rise of Civilization

The Opportunistic Rise of Authoritarian Cultures and Their Development of Abstract World Views

The Dissolution of Cultural Memory and Cultural Identity in the Present Era

Scientific Objectivity, Humanistic Subjectivity, and the Limited Dreams of the Academy

The Rejection of Cultural Memory and the Ambiguity of Identity in the Global Village

Abstract. Recent theoretical progress in understanding the neural mechanisms of human memory has provided new ways of thinking about the adaptive consolidation of experience within the social context. One perspective is motivation: the limbic organization of memory is directed by motive controls that for humans are inextricably bound with social relations. Another perspective is developmental: the extended development of human juveniles has evolved through neurodevelopmental mechanisms that are consolidated in a single period of sequential stages of nocturnal sleep. Bringing these biological perspectives to understanding human cultural evolution suggests that memory and culture are highly interdependent processes. Cultural memory organizes the developing identities of each generation. Whereas human cultures evolved as small societies of intimates, the advent of civilization created large societies of strangers facing novel challenges of collective self-regulation. Globalization is causing the dissolution of traditional ethnocentric cultural memory, leaving modern identities to develop within the ambiguity of a global culture.

The evolution of cultural memory began with mammalian intergenerational learning. The unique neoteny of homo sapiens (retaining juvenile features into adulthood) then evolved to allow the increasingly rich human culture to shape the increasingly extended process of human brain development (Gould, 1977). The result was the co-evolution of human memory capacity with human culture, resulting in a positive feedback loop that defined the evolution of cultural memory. More complex cultures achieved the social and economic success of hunter-gatherers that permitted the somewhat radical homo sapiens genetics mutations that created more immature and slowly developing juveniles with the extended learning and memory capacities to create even more complex cultures. In this way culture and evolution have resonated to create juvenile humans who can acquire a complex culture, make it their own, and then send it on to the next expressions of the genome.

In this chapter, we consider an evolutionary-developmental perspective on this co-evolution of human memory and culture (Jackson, 1931; Moczek et al., 2015). We briefly sketch the evolutionary trajectory of human memory, from its roots in the neurodevelopmental mechanisms retained throughout vertebrate evolution, to the evolution of complex memory and cognition in the mammalian neocortex, to the co-evolution of culture with the expanding efficiency and scope of memory consolidation in the recent emergence of homo sapiens. In important ways, the evolution of both memory and culture has progressed through the evolution of what appears to be a particularly efficient form of memory consolidation that evolved with the unique neurophysiology of human sleep stages.

We then consider the abrupt acceleration of modern cultural evolution, with the transition from Rousseau's *societies of intimates* in traditional cultures to the *societies of strangers* in modern civilizations (Givon, 2020; Givon & Young, 2002). Cultural memory is a shared construction of the past, with an accuracy that is typically compromised by the self-serving bias that the culture brings to its construction. Importantly, the interpretation of the past is not only conscious and instrumental, but proceeds through the unconscious integration of experience, in sleep and dreams. In traditional societies, cultural memory was naturally ethnocentric, reflecting not only the shared knowledge of the people, but defining the identity of the people as separate from the different and typically threatening outsiders. With today's rapid globalization of society, ethnocentric interpretations of the past are rejected in order to foster social justice for all people. Cultural memory in its traditional form is therefore rejected. The challenge for people today is to integrate a veridical narrative of the past that still provides a meaningful identity for all of us who find ourselves newly adrift in a global society.

The Evolution of Memory

Human memory has evolved as a unique and powerful extension of two basic themes of neural control that remained as somewhat separate systems in the

brains of fish, amphibians, and reptiles, and then appear to have been fused in the mutations that formed the mammalian neocortex (Tucker & Luu, 2012). One theme is the *lemnthalamic* pathway that is anchored in the reticular activating system of the lower brainstem and projects to specific (lemno) nuclei of the thalamus as well as the pallium (the primitive general cortex of amniotes that evolved into the mammalian neocortex) (Butler & Hodos, 2005). The primitive pallium organized by the lemnthalamic system seems to have supported a global representation of the organism's integrity within the environmental context.

The other theme of vertebrate neural evolution is the *collothalamic* pathway that connects the midbrain at the top of the brainstem to the unique (collo) nuclei of the thalamus, the basal ganglia that support habit-formation and motor control, and the ventral component of the pallium (Butler & Hodos, 2005).

When these dual cybernetic modes were combined with the evolution of the mammalian neocortex, their differing subcortical mechanisms of neural control were fused to generate the dual systems of mammalian memory. It was these dual memory systems, consolidated uniquely in the dual and complementary REM (rapid eye movement) and NREM (Non-REM) sleep stages, that evolved rapidly in parallel with the recent advent of human culture. One system (with lemnthalamic roots) supports representations of *context memory* in the dorsal archicortical division of the neocortex. The other memory system (with collothalamic roots) supports representations of *object memory* in the ventral paleocortical division (Tucker & Luu, 2012).

Although the modern evidence is still rapidly accumulating, and interpretations remain controversial, we propose that a new theoretical synthesis of the neuroscience of memory is now possible through understanding the mechanisms of memory consolidation in sleep. The primordial *active* sleep state, highly conserved in vertebrate evolution, appears to reflect organizing activity in the lemnthalamic pathway. Although maintaining its primitive foundations, active sleep has evolved to form mammalian and human REM (rapid eye movement) sleep (Cirelli & Tononi, 2015). REM sleep is the neurophysiological basis for dreams (Aserinsky & Kleitman, 1953), the integration of emotional experience (Walker, M. P., 2009), and the implicit memory that allows much of human creative thought (Rasch & Born, 2013). Furthermore, our theoretical analysis suggests that the lemnthalamic REM consolidation system appears to underlie the contextual memory of the dorsal division of the human brain. This uniquely contextual implicit memory is implicated in the specialization of the right cerebral hemisphere for the dorsal context system's holistic, nonverbal conceptualization (Tucker & Luu, 2012). Importantly for understanding the foundations of culture, this dorsal memory system also appears to be the foundation for forming a sense of personal identity from close family attachments (Tucker, in preparation; Tucker & Luu, 2012).

In parallel, the *quiet* sleep state that alternates with active sleep in both embryonic and post-natal development has evolved to form the sequence of stages

(NREM or Non-REM sleep stages 2 and 3) that play essential roles complementing REM in the consolidation of human memory. Although the essential neurophysiology of this NREM mechanism seems to have evolved to support the goal-directed behavior and quadrupedal sequencing in reptiles (Rial et al., 2010), NREM sleep continues to be recruited as an essential mechanism of control in the evolution of higher neural function. Recent evidence suggests, in fact, that NREM sleep is integral to the consolidation of *explicit* memory, the organization of information within the synaptic architecture that in humans allows conscious report of previous experiences (Diekelmann & Born, 2010; Rasch & Born, 2013). Based in part on new evidence that NREM sleep is organized primarily by the ventral limbic regions, particularly in the left cerebral hemisphere (Hathaway et al., 2021; Morgan et al., 2021), we think that this NREM mechanism for consolidating object memory may be integral to the analytic and linguistic cognition of the human left cerebral hemisphere, and to the closely related individuation of personal autonomy in the social context (Tucker, in preparation; Tucker & Luu, 2012).

By understanding the unique ways that memory is consolidated, differentially within these dual systems of the human brain, and specifically through these differentiated yet sequentially integrated stages of sleep, there is a new opportunity for understanding the nature of human memory. This perspective on human memory and cognition gained by considering its consolidation in sleep is novel and unintuitive. It suggests that the primary mode of human cognition (consolidated by REM sleep, mediated by the dorsal, hippocampal system that is particularly elaborated within right hemisphere) is inherently subjective and egocentric, and also fundamentally unconscious. We are aware of perceptions, and of feelings, but are so subjectively fused with the holistic cognitive process that the process itself remains implicit.

In contrast, the secondary mode of human cognition (consolidated by NREM sleep, mediated by the ventral, amygdalar limbic networks that are particularly elaborated in the left hemisphere) is more explicitly conscious. It is also inherently objective — separated from personal subjectivity. Objects are delineated that are separate from their contexts, retaining their identity regardless of context, allowing the associated cognitive process to be more explicit. A key result of elaborating this cybernetic mode in the evolution of human cognition is language. Language allows not only explicit sequencing of conceptual objects, but also their representation separate from the subjective self, allowing an explicit mechanism for structured communication and a major advance in cultural complexity.

Because it has evolved in culture, human memory — with its dual cybernetic modes — is not only formative for individual identities; it is essential to the cohesion of a societal identity that is continually reconstructed in the process of cultural memory.

The Unconscious Organization of Personal Memory

This brief summary can only hint at the mechanistic insights that are emerging from the rapidly developing neurophysiological research on sleep and memory consolidation (Walker, M., 2017). Nonetheless, the implication for psychological theory are important, as we can now rethink our concepts of human memory from the new evidence on how experiences are continually assimilated within the self in the unconscious background of the mind's operations, in waking quiet periods and in sleep. Psychological theories have proposed functional distinctions, such as *declarative* memory for what can be reported consciously, *episodic* memory for the concrete events of experience, *semantic* memory for the knowledge of the culture that is not tied to specific episodes, and *implicit* memory for knowledge that can be demonstrated in behavior but not consciously articulated (Squire, 1986, 1987). Although these have been useful functional distinctions, the recent neurophysiological evidence has provided a more articulate theory of memory systems that can inform psychological analysis of the motive control of cognition and social relations.

Although the events of REM dreams are typically bizarre, the process of dreaming is one of personal consciousness of agency in attempting to cope with these bizarre events. Although the neurophysiology of this form of contextual consolidation is complex and unintuitive (Hobson, 2009), the theoretical interpretation we propose is that the REM dream process is essential to the *subjective* organization of experience, in the implicit conceptualization that results in creative insight and emotional integration. With its implicit weaving of self with context, REM sleep through its dorsal limbic memory system supports the identification of self with the social world (Tucker, in preparation).

The second memory system, as important to clinical memory deficits as the dorsal, hippocampal system (Yonelinas, 2006), is centered on the amygdala and ventral limbic division, and it supports *object* memory. The fact that this ventral limbic memory system is consolidated through the NREM sleep that allows explicit memory points to the key role of object memory and focused consciousness in the process of *objective* reasoning. This memory system's integral motive control — anxiety — biases the mind toward introversion and defensive vigilance. Considering this bias, it seems that explicit memory may be imbued with the unique motive controls of independence and social autonomy.

There are clear implications of these divisions of memory for the process of cultural transmission and the evolution of cultural memory. Whereas we must assume that ancestral hominins evolved their more limited cultural capacities through nonverbal communication, homo sapiens gained a transformational mode of communication and conceptualization with the evolution of language at some point between 200 and 100 kya. At roughly the same time, the appearance of sophisticated art in early homo sapiens culture (Cupchik, 2016) suggests that the evolution of hemispheric specialization to elaborate object memory — and eventually language — was only one profound restructuring of memory that accelerated culture. The complementary elaboration of the imaginative cognition of the

right hemisphere, grounded particularly in the dorsal, hippocampal memory system, may have spawned the specific capacities of artistic construction and technical creativity that allowed paleolithic and eventually neolithic technology. This dual evolution of memory systems created the complementarity of holistic with analytic conceptual skill that defines the recent development of human intelligence.

This increasing sophistication of intellectual capacity was almost certainly paralleled by an increased sophistication in social cognition, such that both the identification with the cultural group and the individuation of personal autonomy became more fully articulated, and complex, with the evolving linguistic and imaginative capacity of homo sapiens. Recent evidence and theoretical work in anthropology has suggested that the evolution of cultural intelligence was paralleled by the evolution of the unique and complex patterns of human sleep that are necessary to consolidate cultural memory.

The Evolution of Cultural Memory

Humans are unusual among mammals in the complexity of their sleep stages and in the single episode of nocturnal sleep that allows 4 or 5 cycles of these sleep stages to organize sleep neurophysiology in a structured sequence. This sequential nature of the sleep stages is apparently required for efficient memory consolidation. The stages of one sleep cycle proceed through the N1 transition from wake to sleep, the N2 stage of K-complexes and spindles, the N3 stage of slow oscillations (deepest or less responsive stage of sleep), and the REM stage of active EEG, vivid dream imagery, and rapid eye movements.

The overall sequence of the night causes changes the nature of the early and late sleep cycles. The early cycles of the night show extended deep (N3) sleep and only brief REM episodes. In contrast, the later cycles of the night show only brief N3 periods and longer REM episodes (Diekelmann & Born, 2010; Walker, M., 2017). As we are understanding the key role of N2 and N3 to consolidating explicit memory — complementing REM and its emotional integration and implicit memory — the recognition of this sequential sleep architecture suggests that the explicit experiences of the day must be replayed and consolidated in the NREM phases of the early night before the neocortex's synaptic architecture is ready for the more affectively-charged and organismic integration that is achieved in the late night extended REM episodes.

Cultural Sculpting of Hominin Dreams

Other large primates have a simpler, more generic mammalian, sleep architecture compared to humans. Like most mammals, they alternate the sequence of NREM and REM episodes through multiple sleep periods during the 24 hour period (Fruth, Tagg, & Stewart, 2018). These shorter sleep periods appear to have

the important adaptive advantage of minimizing the risk to predation that is posed by the single long nocturnal period of human sleep.

Chimpanzees and bonobos sleep in trees, in simple nests they construct (apparently to allow the atonia or loss of motor control in REM without falling). The importance for avoiding predation is suggested by the observation that apes make their nests higher in trees under conditions of greater predation risk (Fruth et al., 2018).

As early hominins transitioned to terrestrial habitats, sleep on the ground would have increased the risk of predation. The earliest hominin to have lost its skeletal adaptation to an arboreal habitat now seems to have been homo erectus (Samson & Nunn, 2015). As an essential process in homo sapiens' evolution, our ancestors evidenced not only increasing neoteny, but extended immaturity over the juvenile period that was necessary to allow the protracted brain development required for learning the increasingly complex human culture, including its increasingly differentiated linguistic and imaginative components.

This confluence of terrestrial sleep with an extended period of juvenile incompetence would have almost certainly enhanced the risk of predation for our recent hominin ancestors. Considering this, Sampson and Nunn (2015) have proposed the *sleep intensity* hypothesis, suggesting that human evolution included the development of an efficient single period of nocturnal sleep in order to allow the intensive learning required for human culture, while minimizing the length of unresponsive sleep and thus the risk of predation.

Additional evidence suggests that human sleep involves a marked decline of the deep N3 period in adults (Helfrich, Mander, Jagust, Knight, & Walker, 2018; Tucker & Luu, submitted). One effect of limiting this deep, unresponsive period of sleep would be to allow adults to be vigilant to predator threat during the night, even as their nascent juveniles were allowed the extended sleep deep intervals required for consolidating their increasingly complex memory.

A plastic and powerful brain can only be actualized in the context of a supportive learning environment. As a result, the neurophysiological advances of human memory consolidation could only evolve within *cultures*. These were the well-coordinated social groups that —working together— could not only maintain extended support for complex incompetent juveniles but also provide the rich information, in language and technology, to challenge the increasingly efficient young brains to acquire, and then convey, cultural memory. The parallel sophistication in the motive control of social identification and autonomous individuation suggests that the complexity of culture itself evolved with increasing complexity of human memory consolidation, achieved through the increasing efficiency of the extended sequential organization of human sleep architecture.

Cognitive Structure in Cultural Memory

Traditional culture is transmitted in many implicit ways, but also in the explicit device of storytelling. The themes of traditional storytelling are highly metaphorical (Scheub, 2012), with not only heroes but unpredictable tricksters, perhaps more consistent with the cognitive structure of dreams than of explicit narrative description. If we consider the functional role of culture to be providing guidance for problems of living (Geertz, 1973), then it may seem that traditional storytelling can only play a trivial role, given that it is typically concerned with the entertainment and education of children with idiosyncratic and highly metaphorical imagery (Goody, 2010).

Yet we can also think that the engagement of the minds of children with the shared vision of the people — the collective dream (Abell, 1957) — is one of the more important functions of cultural memory. The cultural memory of traditional peoples likely evolved and dissolved in many forms over the 100 to 200 thousand years of homo sapiens' unique evolutionary progression. Yet the neural mechanisms of sleep and memory consolidation were constant reflections of the unique cybernetics of REM and NREM neurophysiology, weaving the organization of imagination and language in ways that would shape subjective experience, the dynamics of social identification and individuation, and the unconscious continuity of cultural memory.

Certainly there were many novel and even bizarre and dysfunctional forms of early human culture, consistent with the modern anthropological record (Diamond, 2013; Farhat-Holzman, 2008; Geertz, 1973; Mann, 2005). Yet the requirement for collective efficiency in hunting and gathering led surviving cultures to be reasonably well-balanced societies of intimates, with defining forms of cultural memory (and cultural identity) that were transmitted to subsequent generations.

For example, although physical punishment of children is both traumatic and common in male-dominated cultures, including both European and Chinese families (Lin & Fu, 1990), more effective ways of training children have been observed in traditional cultures such as the Inuit of the Canadian Arctic (Briggs, 1998). Anthropologist Jean Briggs observed a group of Inuit in the 1970s, living under traditional conditions in tents and igloos, and was impressed with the stoicism and self-control the people showed under frustrations that would severely stress most Europeans. She then observed how children, acting out natural tantrums of frustration, were distracted by their mothers and aunts with interesting stories of the culture. A vivid imaginative story, of mythical animals and characters, immediately captures the attention of a child. It also allows the parenting figure to convey the lesson of the culture — such as the necessity of dealing with frustration if you are to survive — that is not easily forgotten. The child captured by a story is offered a sophisticated form of psychological self-regulation, interrupting excessive affect to reflect on a novel mythical episode and its metaphoric, abstract meaning for understanding the challenges of living. Such idiosyncratic but usefully metaphoric imagery may be typical of the cultural memory conveyed to children in the stories traditional cultures (Goody, 2010).

As we consider the neural mechanisms of memory consolidation that were co-evolving with the manifold variations of homo sapiens culture, we can identify the new forms of cognitive structure that humans brought to the traditional forms of cultural memory in the myths and stories of the people. The developing sophistication in object memory, which we propose is consolidated by NREM sleep, was very likely the underlying neurophysiological basis for the evolution of language (Tucker & Luu, 2012). Words can gain meaning in the culture because they are efficiently parsed as conceptual objects, independently from the unique subjective minds of the interlocutors. Language then allows explicit, denotative communication between the minds in the culture, providing a rich basis for the growth of objective cultural information.

Yet when we examine the stories that conveyed cultural memory in traditional societies of intimates, the meaning is highly metaphorical and intuitive, connotative rather than denotative. The subjective, contextual, and intuitive component of mind that is consolidated by the dreams of REM sleep may be an essential cognitive process for understanding the meaning of the culture as conveyed by traditional myths and legends.

In the co-evolution of human brains and culture over the last 200K years, we can thus infer there was a kind of dialectical complementarity, between the objective and subjective mechanisms of mind, in which the increasingly complex and efficient architecture of sleep was able to weave integrated forms of mind and cultural memory from these venerable NREM and REM mechanisms. Yet the integration is relative, even today. The human mind, and human societies, seem to continue to struggle to weave these forms of memory that must be consolidated separately in the divergent neurophysiological states of the NREM and REM cycles in each night's sleep and dreams.

Transformations of Cultural Memory with the Rise of Civilization

If the uniquely human brain indeed evolved its largely unconscious capacity of memory consolidation in concert with the increasing capacity for transmitting cultural memory, then this confluence of genetics with human tribal-family culture would have transpired over an interval of time that is relatively brief in evolutionary terms (say, 200K years or 10K generations), yet still sufficient for adaptive selection in a range of ecological niches. It was in this era of pre-history, in the societies of intimates of traditional cultures, that the co-evolution of the human brain with cultural memory can be understood as a coherent and interdependent natural phenomenon.

In contrast, the rise of civilization occurred over a very brief interval, from the emergence of agriculture and herding to the modern era (10K years or 500 generations). Even though we naturally consider the history of civilization as the cultural memory of our modern societies and our modern minds, the changes were so abrupt and chaotic as to be difficult to describe with the evolutionary analysis

that we have just applied to the co-evolution of uniquely human brains, their unique mechanisms of memory consolidation, and their resulting continuity of cultural memory.

In the next section, we will point to two observations on the rise of civilization, one from a recent scientific discovery, and the other from an ongoing historical analysis of the transformational ideas of early societies of strangers. The goal is to set the stage for some concluding comments on the dissolution of traditional cultural memory, and the ways that the integration of the functional domains of the human mind continues to be challenging in the modern age.

The Opportunistic Rise of Authoritarian Cultures and Their Development of Abstract World Views

Recent genetic research documents the restriction of the Y chromosome in much of the human population starting about 10 thousand years ago (kya). Across the interbreeding populations of Western Asia and Europe — and apparently independently within the Andes of the new world — a few males came to dominate mating with females in a net ratio of 1:17 (Karmin et al., 2015). At the present time, the interpretation of this *Y chromosome bottleneck* remains speculative (Furholt, 2021; Karmin et al., 2015; Zeng, Aw, & Feldman, 2018). Yet the implication seems to be that the economic success of agriculture and herding was seized upon by dominant males as the opportunity to control the resources of the successful and rapidly growing societies of strangers. It is difficult to imagine any scenario for rapid social changes to allow each male to control reproduction with 17 females — across the entire ancestry of early nation states in the old world and the new — that does not involve widespread subjugation of females and killing and/or enslavement of the majority of males in the population.

Of course, the evidence of historical times suggests that even moderate stress causes many societies of strangers to regress to an authoritarian mode, where subservience to a dominant male is not only forced but actively embraced by the people. Whatever the contemporary process during the rise of civilizations, the facts written in our genes show that those of us who are descendants of the early civilizations were fathered by a very small number of dominant males.

Equally remarkable is the historical evidence that within a few millennia (7 to 5 kya), these new societies formed by military conquest and male dominance would create complex new forms of commerce, art, and literature that were the novel products of sophisticated cultures.

In his psychological analysis of early civilizations, the psychiatrist Karl Jaspers concluded that, over a relatively short period of time (about 7 to 3 kya) there arose a new kind of abstract thought in the philosophies of several major cultures, in Judea and the Mediterranean, in Persia, India, and China. Somewhat later this transformation included Islam (Eisenstadt, 2012; Jaspers, 1948). Prior to this *axial age*, traditional cultural memory could be said to reflect *mundane* con-

cerns of everyday human problems, even if these concerns are expressed by gods and demons of a traditional mythology. In fact, the life of the gods and spirits and the life of every day people were intermingled on this same plane of familiar experience (Eisenstadt, 2012; Jaspers, 1948; Scheub, 2012). In terms of the structure of mind in our current analysis, the fusion of mythology with the mundane realm would reflect the highly intuitive, contextual conceptual system that is consolidated by REM sleep.

In contrast, the new philosophies and religions of the axial civilizations emphasized *transcendental* concerns, with more abstract principles of right and wrong, and with both human meaning and the supreme being to be found on a higher, transcendent plane. The transcendent was not only separate from the plane of mundane human life, but often opposed to it (Jaspers, 1948). These became the accepted foundations of new forms of cultural memory, enshrined in sacred texts. Because literacy seems to have been essential to these new disciplined forms of thought, the rise of axial age thought must have built increasingly upon the object memory of the ventral corticolimbic system, consolidated by NREM sleep.

Importantly, the new mind of the axial age was not just analytic, but abstract. In modern psychological terms, the formation of abstract belief systems requires the integration of both contextual-subjective and objective conceptual systems. As a result of this integration, the abstract concepts emerge at a higher (transcendent) level that subordinates the concrete constructions of either the holistic or analytic domains (Johnson & Tucker, 2021). This was the remarkable consequence of the rise of early civilizations, devolving at first to violent authoritarianism, but then supporting the social role specialization of literate elites in the new societies of strangers. With the cognitive discipline and powerful information access of literacy, the scholarly elite found themselves with a new level of human intelligence.

What seems to have been important was not just the capture of information in written form, but the advances in the conceptual ability of minds that were exercised in the discipline of a literate education. How can we understand the continuity of these new minds with the differentiated REM and NREM memory systems that evolved over the hundreds of millions of years of mammalian evolution, and were refined slowly in the co-evolution of memory, sleep, and culture through the hundreds of thousands of years of homo sapiens evolution in the context of societies of intimates? Can we imagine new forms of consolidation of conceptual systems in the sleep of the new axial minds?

The Dissolution of Cultural Memory and Cultural Identity in the Present Era

An astute chronicler of the transformation of societies with the rise of science, Alfred North Whitehead, recognized long before the recent genetic evidence that the origins of civilization were in the politics of military conquest and the economics of slavery (Whitehead, 1997 [1925]). Whitehead emphasized that the

increasing scientific education of society has led not only to accelerating technology and economic success, but also to the intellectual development that allows a rational understanding human of problems. The continuing pace of scientific revolutions (Floridi, 2014; Kuhn, 1962) underscores that the powerful abstractions of scientific intelligence are continuing to transform the knowledge, and cultural memory, of societies.

Scientific Objectivity, Humanistic Subjectivity, and the Limited Dreams of the Academy

At the same time, these scientific advances remain restricted to the explicit, technical knowledge of sciences, and have failed to be integrated with the humanistic concerns that are essential for informing subjective human meaning (Johnson & Tucker, 2021). Instead, the subjective perspective is the exclusive domain of the humanities, where in many university communities the post-modern deconstructionist account of cultural relativity leads many proponents to deny the possibility of objective knowledge.

The classic analysis of the division between science and humanities, the Two Cultures of the academy, was offered by C. P. Snow, in his complaints about the British educational system in the 1950s (Snow, 1959). Snow was upset with his colleagues in science who failed to appreciate the importance of great literature. He was also distressed by those in the humanities who seemed unable to master the discipline to understand the significant recent advances in science.

If we consider the co-evolution of human neurophysiology and culture in the 200K years of societies of intimates, the modern university would seem to be a powerful vehicle for allowing young minds to acquire cultural memory, integrating both subjective and objective perspectives into an abstract intelligence that yields both objective realism and subjective meaning. Yet the persistence of the Two Cultures suggests that the rapid advance of complexity in the modern societies of strangers seems to be overwhelming the capacity of human sleep architecture to integrate the differentiated structures of mind.

The Rejection of Cultural Memory and the Ambiguity of Identity in the Global Village

The globalization of human society has proceeded slowly over the last several millennia, interwoven with the fits and starts of ethnocentrism in modern nation states. Yet over the last couple of centuries the progression toward increasing liberalization of social values, and the rejection of traditional ethnocentrism, seem to have been inexorable results of the acceleration of global communications (McLuhan & Powers, 1989; Tucker, in preparation).

In many societies, the reaction to increasing liberalization has been a resurgence of conservative values. Of course, the traditional cultures of societies of intimates have now faded from the scene. As a result, the remembered traditions by the conservatives of society (such as the assumption of a universally shared but

now lost American identity) are embraced as sacred canons of cultural memory, whereas they are in reality fairly recent and facile fabrications. Still, most liberals cannot seem to avoid taking the reactionary conservative resurgence seriously, and they vigorously oppose the conservatives' natural ethnocentrism, calling it racist.

Traditional cultural memory is indeed ethnocentric. What defines a culture — The People — is not just the shared characteristics, but the important differences from foreigners — the Non-People — who are actively denigrated in order to define the boundaries of the culture. As a result, the vigorous and principled suppression of ethnocentrism by educated youth may require a suppression of the last vestiges of traditional cultural memory in the current global society. A relevant question for these times is whether the suppression of traditional cultural identification then leads to the increasing ambiguity of personal identity for those cast adrift from traditional cultural memory.

As we study the unconscious consolidation of memory in the coming years, and thereby realize the importance of implicit and intuitive as well as explicit and objective forms of memory, it may be possible to more clearly understand the nature of implicit biases rehearsed each night in sleep, as well as the organization of personal identity that has long been aligned with cultural identity and informed by cultural memory. The uniquely human brain evolved over 200K years in the context of societies of intimates, with implicit conceptual mechanisms supported through emotional attachments within a small and familiar group. Both group identification and individual autonomy have been achieved by each generation within the close support of the band of intimates. The new theoretical synthesis we are envisioning suggests that each of these key social orientations consolidated in a different stage of sleep: subjective identification in the implicit memory of REM; autonomy and objectivity in the explicit memory of NREM.

Even as children still develop within parental and family bonds, these bonds are soon reduced in significance with the shifting context of the young person's identity within the larger society of strangers. As much as traditional cultural memory, with its inherent ethnocentrism, is now rejected as a personal reference for identification with society, we may need to understand how identities are to be formed, and societies are to be maintained, in the absence of cultural memory.

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