

POROUS MEMORY AND THE COGNITIVE LIFE OF THINGS

John Sutton

COGNITIVE SCIENCE AND THE PREHISTORY OF CYBERCULTURE

Recent prehistorians of sound recording have recovered an exotic European fantasy of the early 1630s. A pamphlet called "Le courrier veritable" told Parisians of a strange sponge discovered by a Captain Vosterloch on a voyage to the South Seas. Local people used these sponges to communicate across long distances: a message spoken into one of them would be exactly replayed when the recipient squeezed it appropriately (Marty 1981, 10; Levin 1995; Draaisma 2000, 85-86).

These wondrous sponges, then, were unique cognitive tools, soaking up sound, embodying particular acoustic signals in an unusually porous medium. They are strange objects to have had this cognitive and cultural role, even in an imaginary space of early modern European fantasy. As a cognitive artifact, the sponge was more commonly a figure for the effacing of memory, so that Confession, for example, could be described as "that happy Spunge, that wipeth out all the blottes and blurres of our lives."¹

Sociologists and historians describe for us the complex social life of things, the peculiar fetishized or mundane biographies which certain objects accumulate (Appadurai 1986).² But some things, natural as well as artificial, also have a *cognitive* life. In use, these sponges were to act as what Merlin Donald (1991) calls "exograms," objects which embody memories and which combine in many different ways with the brain's distributed, context-ridden "engrams." In this short paper, I frame two historical examples in the bare outline of a framework for understanding the multiplicity of relations between engrams and exograms. Darren Tofts' kind of "prehistory," with its "plausible narratives which make links between disparate, achronological moments," and

1 The quotation is from John Trapp's commentary on the book of Ezra (1657), in the O.E.D. s.v. "sponge," 4b.

2 On early modern objects see also de Grazia, Quilligan, and Stallybrass 1996; Jones and Stallybrass 2000.

which recognize "fusions between the past and the present, between the *present* and the present" (Tofts and McKeich 1998, 10, original emphasis), is a natural part of the project. Brief forays into the history of theories and practices of memory can, I hope, be both justified and improved by attention to provocative and puzzling points of contact between new media theory and recent dynamical cognitive science.

The delicious story of message transmission by sponge brings home the difficulty we have in remembering just how magical it is, in a world of flux and mixture, that information can ever be enduringly stored, transmitted without distortion, and precisely reproduced. Our lives are irretrievably tangled with artificial systems which keep their contents ordered and immune from melding, and we trust that our computers won't creatively blend our files overnight. The media we use to fix, transmit, and reformat information, and to shift or transform representations from one context to another, are often more stable, less porous, than these sponges. But durable information storage is a cultural and psychological achievement, not a given, and it depends on the construction and exploitation of social and technological resources. In writing a paper, for example, I toggle between yesterday's handwritten scribbles, printed notes from months back, a few words which I jotted down during a phone conversation with a colleague this morning, and the crisp on-screen fonts in which I churn out, obliterate, and rework each version. The process involves multiple feedback loops as I rely on external jottings of yesterday's work, jottings which are more enduring and less context-sensitive than any traces overlaid on others in my brain. My brain and body can temporarily couple with external tools or media, forming an integrated cognitive system with capacities, characteristics, and idiosyncrasies quite different from those of the naked brain (Clark and Chalmers 1998).

In art, science, and ordinary life we construct, lean on, parasitize, and transform artifacts and external symbol systems. And in turn our bodies and brains are inflected and contaminated by the material supplements and cognitive prostheses which we incessantly internalize. Marius Kwint, recently urging us to address the sensuous and physiological dimensions of embodied memory, puts the point thus:

[H]uman memory has undergone a mutual evolution with the objects that inform it ... the relationship between them is dialectical. Not only does the material environment influence the structure and contents of the mind, but the environment must also have been shaped along the lines of what persists in the mind's eye (Kwint 1999, 4).

Kwint acknowledges that the attempt to fathom such loops must be specific, historically anchored, and insistently interdisciplinary.

So the cognitive life of things takes shape not only in their roles as storage aids or tools at the capricious or agonized disposal of the creator. An abstract artist, to take another example, may work incessantly with a sketchpad, because imagining an artwork "in the mind's eye" will not successfully allow the perception, creation, recognition, and transformation of the kind of hidden patterns which support surplus structure in the work. Just as the aesthetic appreciation of the layered meanings in the finished artwork may take prolonged interactive viewing, so the initial creation of such hidden regularities may have to be an iterative process of sketching and perceptually (not imaginatively) re-encountering the forms. The sketchpad here isn't just a convenient storage bin for pre-existing visual images: the ongoing externalizing and re-perceiving is an intrinsic part of artistic cognition itself. The artist and the sketchpad may be so tightly coupled that it's possible to see them more as a single temporarily integrated system

than as an agent operating on a distinct passive medium (Van Leeuwen, Verstijnen, and Hekkert 1999; Clark 2001, 147-150).

In attending to this dynamic interplay between brains and world, we don't need to *identify* internal with external resources. Post-connectionist cognitive scientists like Andy Clark argue, on the basis of everyday cases like these, that the brain is a leaky associative engine, good at pattern-matching and pattern-transformation, but poor (in isolation) at the permanent storage or logical manipulation of individual items (Clark 1993; 1997, 53-69). The classical neuroscientific search for the engram failed because there are no enduring single memories stored alone at local fixed addresses (one neuron for my grandmother, one for my grandfather). Since brain traces are dynamic, we often leave information out in the environment, using the world as its own best representation (Brooks 1991). Brains don't replicate, but rather complement, the alien formats and media of external resources. It's just because representations in the brain are partial and action-oriented that external cognitive scaffolding and tools of many varieties supplement our relatively unstable internal memories. As Clark puts it, "our brains make the world smart so that we can be dumb in peace" (1997, 180). In a range of couplings with other people, instruments, machines, and objects, bodies come into what Clark calls relations of "continuous reciprocal causation" (1997, 163-166). In dance, improvisational music, interactive sport, and ordinary conversation, or in working, feeling, and thinking with cars, computers, airplanes, and sketchpads, there can emerge a mutually modulatory dynamics. Each component in the larger system is continuously responsive to the activity of the other components, and at the same time feeds back its own influences into the web of causal complexity (Haugeland 1998).

These concerns may seem remote from cultural history and theory. But the methodological revolution implied by these new sciences of the interface, which must combine cognitive science and media theory, is far-reaching. Cognitive systems can genuinely extend across brain, body, and world, and are potentially smeared across the natural, technological, and social environment. As Clark says:

The cash value of the emphasis on extended systems (comprising multiple heterogeneous elements) is thus that it forces us to attend to the interactions themselves: to see that much of what matters about human-level intelligence is hidden not in the brain, nor in the technology, but in the complex and integrated interactions and collaborations between the two ... The pay-off, however, could be spectacular: nothing less than a new kind of cognitive scientific collaboration involving neuroscience, physiology and social, cultural, and technological studies in about equal measure (2001, 153-154).

This means that the particular histories of cryptograms and codes, perspective, autobiographical genres, tattoos, roads, diagrams and graphs, photography, artificial memory techniques, laboratory practices, maps, clothes, and religious ritual (to name just a few) now become an integral part of a historical and comparative cognitive science, rather than mere humanistic curiosities. Careful analysis of historical theories and practices with a cognitive-scientific eye, then, may find problems in the past unlike those perceptible by the more cautious historian.

Some straightforwardly exegetical accounts of Augustine's philosophy of memory, to take one emblematic prehistorical example, focus on his attitude to Platonic doctrines of reminiscence and his efforts to parallel the Holy Trinity with the psychological triad of memory, understanding, and will (Teske 2001). Others examine the role of memory in his account of our awareness of time as a "distention of the mind," or investigate the significance of his theory of memory in

light of the autobiographical structure of the *Confessions* (Krell 1990, 52-55; Lloyd 1993, 14-22; Mendelson 2000). These are important and fascinating projects, but they do not rule out a different, more present-centered kind of cognitive-cybercultural history.³

The Renaissance arts of memory so richly described in Frances Yates' *The Art of Memory* (1966) and Mary Carruthers' *The Book of Memory* (1990) form one of two prehistorical case studies I sketch in more detail below. Augustine's attitude to the classical *ars memoria* is unclear (Yates 1966, 61-62; O'Donnell 1992, 177-178). But his notoriously spatial images of memory in Book 10 of the *Confessions* as a field, a palace, or a storehouse drive a less commonly noticed demand that in memory "everything is preserved separately."⁴ Items channeled through the different senses, for Augustine, are captured by the (personified) memory which swiftly "stores them away in its wonderful system of compartments." Augustine knows that control over the contents of memory is not always easy, for sometimes unwanted past experiences "come spilling from the memory, thrusting themselves upon us when what we want is something quite different." But his regulatory ideal is to be able at will to gather (*cogitare*) the scattered items in memory from the "most remote cells [and] ... old lairs," so that a mind which "has the freedom of them all" can "glide from one to the other," effortlessly surfing this strange virtual inner place which is yet not a place.

I want now to quiz two other sets of historical doctrines and practices of memory for their answers to these distinct questions we already glimpse in the case of Augustine, questions about subjective control of memory, and about the format of the vehicles or medium of "storage." Firstly I suggest that it's not unique to any modern crisis of memory to think of the inner components of memory systems as porous and active, rather than fixed in archives. Then I go back to one great era of the cognitive use of artifacts and imaginal places. These analyses only begin to apply the cybercultural grid which the historical material warrants, but they bring some tantalizing topics in the history of memory to the attention of new media theorists.

THE CARTESIAN PHILOSOPHY OF THE BRAIN

Just at the time the story of the sponge was circulating in France, a little-known anatomist and proponent of the new mechanical philosophy was completing a strange book on the philosophy of the body. After an extensive program of dissection in which he had opened "the heads of various animals [to] explain what imagination, memory, etc. consist in," René Descartes described the brain as "a rather dense or compact net or mesh," composed of "tissues" or flexible filaments with "pores or intervals" between them (Descartes 1996, 1.263, 11.171).⁵ Through these pores or conduits flow nervous fluids, the fleeting "animal spirits," which "trace figures in these gaps," patterned traces which somehow represent remembered objects and events (1996, 11.178).⁶

3 Among treatments more sensitive to questions about memory and media, see also especially Brian Stock's inventive account of Augustine's "theory of reading," which takes him as "the Western originator of the notion of autobiographical memory" (1996, 13, 212-220), and James O'Donnell's discussion of "an online Augustine" (1998, 124-143), which draws on his pathbreaking Internet Augustine seminars of 1994 and 1995: see <http://ccat.sas.upenn.edu/jod/augustine/>. One different extended attempt (which grew out of those seminars) to link Augustine's accounts of memory with contemporary debates is Katz n.d.

4 All quotations from Augustine are from R. S. Pine-Coffin's translation of the *Confessions* (Augustine 1979), Book 10 chapters 8-17. See also O'Daly 1987, 151-151; Coleman 1992, 90-100.

5 References are to volume and page numbers of the 1996 Vrin reprint of Adam and Tannery's edition of Descartes. Some of the passages cited are translated in Descartes 1985 and 1991. *L'homme* (Descartes 1996, 11:119-202) was not fully translated until 1972, and only brief extracts are included in the standard translation (Descartes 1985). For more on this remarkable work see Krell 1990, 62-73 and Gaukroger 1995, 269-290.

6 Descartes was fascinated by the forms of encoding and decoding found in anamorphosis and visual play, not just in aesthetics but as a model for the psychology of imagination and distortion. See Decyk 2000.

134

These animal spirits, which are the medium of memory and the passions, are derived from blood.⁷ Their particular state – their agitation, abundance, and purity – depends on the balance of bodily fluids (blood, semen, spirits, humors, sweat, tears, milk, fat) in the individual's internal environment; and this balance in turn depends on a ceaseless cosmobiological exchange of vapors between body and world (Descartes 1996, II.167-170; compare Carter 1983). Descartes' body-machines, animated statues that dream, imagine, feel, and remember (Descartes 1996, II.120, 201-202), are embedded in the same fluid dynamics which drive the whirling vortices of Cartesian cosmology (Gaukroger 1995, 249-256; Sutton 1998, 82-90). The body, like the cosmos, is full, so that every motion is inevitably coupled with other motions, in a physics of circulation and displacement, which is quite unlike a system of isolated atoms colliding in a void.

Through the blood and animal spirits, as Descartes' follower Malebranche ([1674] 1980, 341-342) wrote, after the Fall we are all "to some extent joined to the entire universe," for each man is linked "through his body to his relatives, friends, city, prince, country, clothes, house, land, horse, dog, to this entire earth, the sun, the stars, to all the heavens."

So the Cartesian body is not rigid and dull, its behavior "automatic" in the sense of endlessly repeatable. Rather, "with its interactive openness," it is the means by which difference is introduced into the human compound (Foti 1986, 76; compare Rorty 1992, Reiss 1996, Sutton 2000a). External parameters like diet, climate, social interactions, and stress, which change at a relatively slow rate, directly affect the fast dynamics of the internal state variables of blood and spirits. But because the spirits are the medium of perception, passion, memory, and imagination, and thus cause our behavior, changes in those external parameters are themselves partly caused by the internal processes with which they are coupled (for the terminology compare Van Gelder and Port 1995, 23-25).

Every act of remembering, then, as the reconstruction of patterns of flow in the animal spirits roiling through the pores of the brain, is context-dependent and causally holistic. Several different figures, Descartes notes, are usually "traced in [the] same region of the brain" (1996: II.185), so that every recomposed memory pattern is composite, just as every sensation dangerously carries the perceptual history of the perceiver. A single "fold of the brain" can "supply" many of the things we remember: Descartes thus dismisses any worries about the problem of finding room in the brain for all our memories, as they are "stored" only superpositionally and implicitly (Descartes 1991, 143, 148; Sutton 1998, 57-66).

Misassociation and imagination are thus intrinsic to the fluid dynamics of the Cartesian brain. Order is not built in to memory. Descartes hoped nevertheless to enforce clear distinctions between memory and imagination externally, by recourse to the guidance of reason. But few contemporaries found this at all plausible, and Descartes' theory of memory was thus one of the most fiercely criticized strands of his natural philosophy in the second half of the 17th century. English natural philosophers in particular complained that Descartes couldn't *guarantee* personal control over the preservation of the personal past. On Descartes' view of memories as motions, argued Joseph Glanvill, remembering anything would at once "put all the other Images into a disorderly floating, and so raise a little *Chaos* of confusion, where Nature requires the exactest order" ([1661] 1970, 36). The 1650s and 1660s, on either side of the Restoration of the monarchy after the regicide and Commonwealth, saw a terrible crisis of public memory in England,

⁷ On the prehistory of animal spirits see Sutton 1998, 25-49. For Descartes, these nervous fluids are "merely bodies," which "never stop for a single moment in any place" (Descartes 1996, II.335, 129). So it's not quite true, as Carolyn Merchant suggested, that in Descartes' work "all spirits were effectively removed from nature" (1980, 204).

135

reflected in neglected yet obsessive debates among natural philosophers about the neurophysiology of individual memory. After the uncontrolled multiplicity of opinion allowed free rein in the Interregnum, unity had to be imposed not only in worship, dress, and conduct, but in narratives of the personal and political past. "Memory is a slippery thing," wrote a preacher in 1657 (quoted in Cressy 1994, 68), and the reception of Descartes' physiological psychology in England was driven, in a sense, by the desire not to slip (Sutton 1998, 129-148).

Because the mere roaming of fickle fluids and spirits through the brain's networks would allow memories to interfere and blend with each other, the English instead constructed systems of internal fixity. In a lecture of 1682, the Royal Society technician Robert Hooke, for example, saw each item in memory as separately stored in order on physical coils of memory in the brain, spirals down which the soul could radiate its attention in calculating the temporal sequence of past experiences (Hooke [1705] 1971, 140). Descartes' innards, then, were too wet, his brain too porous for the English, making memory hostage to fluid animal spirits which, complained Henry More, are "nothing else but matter very thin and liquid." The brain can't reconstruct motions by itself, as Descartes' theory required, since it is just a "loose Pulp" of "a laxe consistence" which is no more fit to perform our noble cognitive operations than is "a Cake of Sewet or a Bowl of Curds" (More [1653] 1978, 33-34).

The naturalizing of localist or archival models of memory was thus a wishful resistance to Cartesian confusion. For Hooke, individual memory ideas must be "in themselves distinct," so that "not two of them can be in the same space, but that they are actually different and separate one from another" (Hooke [1705] 1971, 142). Even though Hooke himself used external aids to memory remorselessly and was an inveterate list-maker, recording the weather, his health, and his every orgasm (Mulligan 1992), his theory of human memory also imposed pure, "cleansed" order on our internal "Repository." If memory traces were active patterned motions, as Descartes argued, loss of control was inevitable: Glanvill complained that "one motion would cross and destroy another ... and there would be nothing within us, but Ataxy and disorder" ([1661] 1970, 39). Far safer, thought the English, for ideas in memory to be themselves passive and independent, to leave it up to the soul or the will to read, decode, and manipulate them (Sutton 1998, 135-156). Kenelm Digby ([1644] 1978) was the first to argue in English that Descartes' philosophy of the brain could not explain "how thinges are conserved in the memory" (282). Digby wanted every memory idea, on its entry into the brain, to "find some vacant cell, in which they keep their rankes and files, in great quiett and order; all such sticking together, and keeping company with one another, that entered in together: and there they lie still and are at rest, untill they be stirred up" by appetite or by the will (284-285). But the task of the cognitive agent in raiding the spongy brain's caches and compartments is not easy: when it has trouble recollecting some particular idea from memory:

[I]t shaketh again the liquid medium they all floate in, and rooseth every species lurking in remotest corners, and runneth over the whole beaderoule of them; and continueth this inquisition and motion, till eyther it be satisfied with retriving at length what it required, or that it be grown weary with tossing about the multitude of litle inhabitants in its numerous empire, and so giveth away the search, unwillingly and displeasedly (Digby 1978, 285-286).

Prone to boredom and petulance, lost in its own archive, Digby's soul is unable to navigate its own liquid empire. Disputes between dynamic and static accounts of memory traces are political as well as empirical, the historical distance afforded by examining these quaint and alien 17th

century debates revealing just the issues about control of the personal past which may still animate brain theory.

THE ARTS OF MEMORY

One reason prehistory is useful is that it's often difficult to see the mutual contaminations operating between brains and technology in the present. Historical case studies offer a better grasp on the ways in which machines like us are naturally cultural, flexibly soaking up and hooking up with a variety of norms and artifacts. The medieval and Renaissance arts of memory, way back beyond Descartes' porous memory, offer an example of the way humans can freeze their thoughts, interiorizing relatively stable forms of scaffolding in the quest for self-mastery. But where the English critics of Cartesian confusion tried to believe that stability was natural to the brain's storage systems, these earlier practitioners were sensitive to the inevitability of prosthetic supplements in anchoring human memory. The monks, scholars, and magi described by Yates and Carruthers can be seen as laboriously disciplining their brains by the use of specific inner objects.

Cybercultural theorists return zealously to these early forms of intelligence augmentation. They may celebrate the memory artists' architectonic immersion in an array of virtual inner data spaces, strange interactive habitats of the imagination (Davis 1994), or query new media hype by carefully teasing apart analogies and disanalogies between old and new forms of artificial memory (Tofts and McKeich 1998, 62-82). My brief remarks here seek to link this kind of "interiorization of the artefactual" (Scarry 1988, 95-96, 101-102) with my prehistorical topics, porous memory and the mnemonic role of things, as I try to historicize what the historians themselves tend to see only as "certain enduring requirements of human recollection" (Carruthers 1990, 130; compare Coleman 1992, 600-614).⁸

The techniques of local or place memory involve the internalization of a memory architecture, most simply a set of palace corridors with rooms on each side, but alternatively grids, theaters, bestiaries, alphabets, and wheels. I must insert a permanent set of memory locations or niches – two, perhaps, in each memory room – on which I will mentally place items when I'm learning a speech or a set of instructions. Then in recall I mentally walk down the corridor, entering each room in my chosen sequence and reading off whatever is stored at each address. Then I can erase this set of items and store new ones in the same locations for future use.

Initially the process seems to double the cognitive load: what's the point of remembering this memory palace as well as having to remember your speech? But the system is highly flexible: once locations are built in to my own memory architecture, I can use them for any purpose. The art of memory allows me to construct, or to turn my mind into, a random access memory system (Carruthers 1990, 7).⁹ Items are kept rigidly ordered by their location, to be inspected and manipulated only at will. Whether "stored" as images or as text, pictorially or linguistically, the key to success is the rigidity and the static nature of the format. Even when the images used to chunk encoded information were strikingly affective, bloody and violent, each atomistic item was to remain independent of all others, isolated at encoding. These are not *external* objects, yet they

⁸ For a more detailed treatment of these themes, in particular on the neglected role of physiology in Renaissance accounts of mental representation, see Sutton 2000b. There are intriguing essays on early modern information storage and retrieval in Rhodes and Sawday 2000.

⁹ Carruthers here equates "rigid order" with "easily reconstructible order." But these methods are not genuinely reconstructive, for after careful local encoding all the memory images are always already there, waiting: they have only to be found by an active, searching consciousness or subject, and do not (like dynamic or distributed memory representations) have themselves to be recreated anew each time. This is what gives local representations their characteristic context-independence.

are clearly artifacts, interiorized prostheses intended to revise the brain to render it susceptible to voluntary control. The desire is to trap intensity in the memory rooms. So the system has no intrinsic dynamics: the point is to eliminate the activity endemic in what was called "natural" memory, because it leads inevitably to the confusion of items. Semantic stability is thus built in, to allow only *deliberate* combination and recombination. These men's fantasy is of *totally* voluntary memory. So the Renaissance arts of memory were not wild proto-hypertextual schemes for the free flow of information, but the disciplined purging of what St Bernard called "filthy traces" (see Coleman 1992, 182-191) from the past. Adepts imposed (an approximation of) rigidity and inflexibility on their own mental representations. By freezing the contents of memory, monks and scholars sought to tame and recalibrate their minds. The control of items in memory was to be guaranteed by separating data from process, memory from executive self. Artifice was required just because of corruption, the result of sin or of embodiment, where one effect of the Fall was loss of control over the personal past. We are immersed in matter and in time: where angels constantly have in view the whole scene of their former actions, humans need to scramble for the past in the face of oblivion (Locke [1690] 1975, bk. 2, chap. 10). Hamlet assures the Ghost that he'll wipe away all trivial records from the table of his memory, vowing that the Ghost's urgent command "all alone shall live / Within the book and volume of my brain, / Unmix'd with baser matter" (*Hamlet* 1.5.102-104). The arts of memory were a moral quest, so that the true memory artist would never be haunted by reminiscence and the intrusion of unwanted thoughts. Escaping the murky forests of natural memory, the artist aspires to the angelical, using his artificial memories to resist the crowding, interfering, and overlapping of traces in the brain (compare Tofts and McKeich 1998, 80-82).

MATERIAL MEMORIES AND EXTENDED MINDS

But of course the branding of morality on the memory was always wishful. Hamlet fails to flatten his past out, to eradicate affect from memory, to act as a free or sovereign executive. Volition in memory is a vanishing goal, for the putative autonomous memory artist is already caught up in a vast and uneven world of objects inside and outside the skin (compare de Grazia, Quilligan, and Stallybrass 1996). As I've argued, we can't avoid leaning on artificial systems whether inside or outside of skull and skin. There's a continuum between the relatively mindless tidying of the local world in which most animals engage and these highly socialized and morally-charged quests for mastery of the self by the self. Many civilizing processes require a kind of self-oppression, in which control of the brain involves the assimilation of symbolic props and pivots. As Derrida argues, it's not as if evicting every such "prosthesis of the inside" would leave subjective reminiscence as "spontaneous, alive and internal experience" (1996, 11, 19; compare Wills 1995).

To celebrate the Internet as "a chaotic memory system" (Locke 2000, 30) is to be overimpressed by the decentralizing of authority, and to forget how familiar is the Net's primary localist mode of information storage. As Tofts notes, "sites are simply 'there,' located at a particular address" (Tofts and McKeich 1998, 115). Not only does the hype confuse issues about control with quite distinct issues about the activity of the bearers or vehicles of information,¹⁰ it also takes our attention from the deep contingency of the dynamic historical and developmental processes by which we extend our minds with various forms of external scaffolding.

¹⁰ The Internet is in fact an interesting case here, demonstrating that ease of control doesn't automatically follow from the nature of the vehicles of representation. Items in the virtual environments of the *ars memoria* were rendered passive specifically in order to aid the quest for mastery. And it's because of the intrinsic activity, or tendency to confusion, of the distributed post-connectionist vectors or animal spirit patterns in our brains that creatures like us must come to terms with the limits of choice and will. So far, the more dynamic the

Just as infants learn to walk by leaning on objects and by holding others' hands, until they achieve some fragile motor autonomy, so our cognitive skills require scaffolding. The development of autobiographical memory exemplifies the process (Sutton 2002a). Children learn to remember in company, with their initial narratives of experienced episodes being prompted and heavily guided by parental intervention and shared reminiscence. This scaffolding doesn't then simply disappear with the inevitable triggering of a blueprint for autobiographical memory. Instead, the parental scaffolding is internalized, often in some idiosyncratic detail. Developmental studies show that the particular emotional tone, and the elaborative or pragmatic style of talk about the past in the child's local narrative environment, influences not just the expression but the contents of the child's own memories (Nelson and Fivush 2000). A child's autobiographical memory, then, isn't the product of an automatic unfolding of autonomous capacities; rather it's already sculpted by and embedded in specific and uneven narrative worlds.

Questions about the *location* of the cognitive technology in this kind of scaffolding thus become less pressing, for there just may not be constant or determinate interfaces between brain, body, and world (Haugeland 1998). More interesting are the idiosyncratic cognitive trajectories along which our particular cultural and institutional learning aids allow us to go. We can understand the old arts of memory as one culturally-anchored way to "minimize contextuality" (Clark 1997, 210). Clark's description of the cognitive function of the reusable, relatively stable linguistic media in which we learn to fix our mental representations could be applied equally well to the special fixed pictorial images with which the Renaissance memory artists sought to order their minds:

[B]y 'freezing' our thoughts in the memorable, context-resistant, modality-transcending format of a sentence, we thus create a special kind of mental object – an object that is amenable to scrutiny from multiple cognitive angles, [and] is not doomed to change or alter every time we are exposed to new inputs or information (Clark 1997, 210).

The biggest challenge, then, in constructing a genuinely dynamical framework to analyze the cognitive life of things in memory, is to acknowledge the diversity of feedback relations between objects and embodied brain. Just as architects can occasionally be too confident that buildings or monuments can act as simple analogues or substitutes for memory (Forty 1999), so cognitive anthropologists and psychologists can too easily neglect the sheer variety of the forms of media and exograms which humans have developed since the Palaeolithic emergence of notations and external symbol systems. Merlin Donald's initial classification, for instance, strongly contrasts the fading, constantly-moving contents of biological working memory with the enduring, unlimited, supramodal, context-independent, and reformattable nature of exograms (1991, 314-319). Certain formats *do* freeze information, allowing it to be held up to multiple scrutiny in future, transmitted more widely across a variety of networks, altered and then re-entered into storage; and these properties of exograms have had essential roles in the development of artistic and theoretic culture. But of course different external media hold information in quite different ways, on quite different timescales, and interact quite differently with individual memories.

representation, the more decentralized the access and executive processes. But the Internet's much-vaunted resistance to global control is a counterexample to this neat equation: at least at present, what some critics lament as its "regrettable lack of organization, uniformity, and strategic planning" (Florida 1999, 85) nonetheless coexists with a thoroughly atomistic, localist, page-by-page representational format. The distinction between local and distributed representation, though, is notoriously hard to draw (Sutton 1998, 149-156), and (paradoxically) the increased control permitted by new digital Web technologies may encourage the use of increasingly dynamic bearers of information.

Information in notebooks, sketchpads, and word-processing systems, whether really external or interiorized, may normally sit passively on call, awaiting mobilization. But other kinds of memory objects are themselves dynamic, like pets and landscapes and cars and friends and ghosts, or will themselves decay or fade or break, like films and knots and bowls and buildings and unreliable machines. Information and emotional memory are held also in rituals which occur only once, or in the dynamic singularity of a group performance, or in other human minds, unpredictable and fragile. It's just because our bodies and brains are porous, our memory thus opened up to time, sensation, and pain, that objects don't just trigger and unlock memory retrieval, but can also stagger it, halt it, haphazardly twist it, and leave it in *disarray*.

The desire thus to attend to artifacts, media, and brains all at once does not require a unitary view of memory along classical reductionist lines; rather, the idea is the construction of parts of a partial but potentially integrated framework within which different memory-related phenomena might be understood (Sutton 2002b). Memory may have to be studied in both natural and human sciences, while such institutional distinctions remain; but nature is as patchy and idiosyncratic as culture, and the social and technological products of human cognition and action in turn "have direct effects upon individual cognition" (Donald 1991, 10). I suggest that, in the bewilderingly interdisciplinary future of the sciences of memory, from *neurobiology* to *narrative theory*, from the computational to the cross-cultural, historical and prehistorical studies should play a significant role.¹¹

11 My thanks to Belinda Barnet, Tony Bond, Chris Chesher, Andy Clark, Charles Green, Adam Holland, Doris McIlwain, Andrew Murphie, Will Sutton, Darren Tofts, Maria Trochatos, Mitchell Whitelaw, and Elizabeth Wilson for help and for comments on earlier versions of this material.

REFERENCES

- Appadurai, A. (ed.). 1986. *The social life of things: Commodities in cultural perspective*. Cambridge: Cambridge University Press.
- Augustine 1979. *Confessions*. Trans. R. S. Pine-Coffin. London: Penguin.
- Brooks, R. 1991. Intelligence without representation. *Artificial Intelligence* 47:139-159.
- Carruthers, M. 1990. *The book of memory*. Cambridge: Cambridge University Press.
- Carter, R. B. 1983. *Descartes' medical philosophy: The organic solution to the mind-body problem*. Baltimore: Johns Hopkins University Press.
- Clark, A. 1993. *Associative engines*. Cambridge, MA: MIT Press.
- . 1997. *Being there: Putting brain, body, and world together again*. Cambridge, MA: MIT Press.
- . 2001. *Mindware: An introduction to the philosophy of cognitive science*. Oxford: Oxford University Press.
- Clark, A. and D. Chalmers. 1998. The extended mind. *Analysis* 58:7-19.
- Coleman, J. 1992. *Ancient and medieval memories*. Cambridge: Cambridge University Press.
- Cressy, D. 1994. National memory in early modern England. In *Commemorations: The politics of national identity*, ed. J. R. Gillis. Princeton NJ: Princeton University Press.
- Davis, E. 1994. Technosis, magic, memory, and the angels of information. In *Flame wars: The discourse of cyberculture*, ed. M. Dery. Durham, NC: Duke University Press.
- de Grazia, M., M. Quilligan, and P. Stallybrass. 1996. *Subject and object in Renaissance culture*. Cambridge: Cambridge University Press.
- Decyk, B. N. 2000. Cartesian imagination and perspectival art. In *Descartes' natural philosophy*, ed. S. Gaukroger, J. Schuster, and J. Sutton. London: Routledge.
- Derrida, J. 1996. *Archive fever: A Freudian impression*. Trans. E. Prenowitz. Chicago: University of Chicago Press.
- Descartes, R. 1985. *The philosophical writings of Descartes, volume 1*. Trans. J. Cottingham, R. Stoothoff, D. Murdoch. Cambridge: Cambridge University Press.
- . 1991. *The philosophical writings of Descartes, volume 3: Correspondence*. Trans. J. Cottingham, R. Stoothoff, D. Murdoch, A. Kenny. Cambridge: Cambridge University Press.
- . 1996. *Oeuvres de Descartes*. Eds. C. Adam, P. Tannery. Paris: Vrin.
- Digby, K. [1644] 1978. *Two treatises*. New York and London: Garland Publishing.
- Donald, M. 1991. *Origins of the modern mind*. Cambridge, MA: Harvard University Press.
- Draaisma, D. 2000. *Metaphors of memory: A history of ideas about the mind*. Cambridge: Cambridge University Press.
- Floridi, L. 1999. *Philosophy and computing: An introduction*. London: Routledge.
- Forty, A. 1999. Introduction. In *The art of forgetting*, ed. A. Forty and S. Kuchler. Oxford: Berg.
- Foti, V. 1986. Presence and memory: Derrida, Freud, Plato, Descartes. *The Graduate Faculty Philosophy Journal* (New York: New School for Social Research) 11:67-81.
- Gaukroger, S. 1995. *Descartes: An intellectual biography*. Oxford: Clarendon Press.
- Glanvill, J. [1661] 1970. *The vanity of dogmatizing*. Brighton: Harvester Press.
- Haugeland, J. 1998. Mind embodied and embedded. In *Having thought: Essays in the metaphysics of mind*, ed. J. Haugeland. Cambridge, MA: Harvard University Press.
- Hooke, R. [1705] 1971. Lectures of light. In *The posthumous works of Robert Hooke*, ed. R. Waller. London: Frank Cass and Co.
- Jones, A. and P. Stallybrass. 2000. *Renaissance clothing and the materials of memory*. Cambridge: Cambridge University Press.
- Katz, S. n.d. Memory and mind: An introduction to Augustine's epistemology. At <http://ccat.sas.upenn.edu/jod/augustine/sheri> (accessed April 22, 2002).
- Krell, D. F. 1990. *Of memory, reminiscence, and writing: On the verge*. Bloomington, IN: Indiana University Press.
- Kwint, M. 1999. Introduction: The physical past. In *Material Memories*, ed. M. Kwint, C. Breward, and J. Aynsley. Oxford: Berg.
- Levin, T. Y. 1995. Before the beep: A short history of voice mail. *Essays in Sound 2: Technophonia*.
- Lloyd, G. 1993. *Being in time: Selves and narrators in philosophy and literature*. London: Routledge.
- Locke, C. 2000. Digital memory and the problem of forgetting. In *Memory and methodology*, ed. S. Radstone. Oxford: Berg.
- Locke, J. [1690] 1975. *An essay concerning human understanding*. Ed. P. H. Nidditch. Oxford: Clarendon Press.
- Malebranche, N. [1674] 1980. *The search after truth*. Trans. T. M. Lennon, P. J. Olskamp. Columbus, OH: Ohio State University Press.
- Marty, D. 1981. *The illustrated history of phonographs*. Trans. D. Tubbs. New York: Dorset Press.
- Mendelson, M. 2000. Venter animi/distentio animi: Memory and temporality in Augustine's *Confessions*. *Augustinian Studies* 31:137-163.
- Merchant, C. 1980. *The death of nature: Women, ecology, and the scientific revolution*. New York: Harper and Row.
- Mulligan, L. 1992. Robert Hooke's "Memoranda": Memory and natural history. *Annals of Science* 49:47-61.
- More, H. [1653] 1978. An antidote against atheism. In *A collection of several philosophical writings, volume 1*. New York and London: Garland Publishing.
- Nelson, K. and R. Fivush. 2000. Socialization of memory. In *The Oxford Handbook of Memory*, ed. E. Tulving and F. I. M. Craik. Oxford: Oxford University Press.
- O'Daly, G. 1987. *Augustine's philosophy of mind*. Berkeley: University of California Press.
- O'Donnell, J. J. 1992. *Augustine, Confessions: Introduction and text, volume 3*. Oxford: Clarendon Press.
- . 1998. *Avatars of the word: from papyrus to cyberspace*. Cambridge, MA: Harvard University Press.
- Reiss, T. J. 1996. Denying the body? Memory and the dilemmas of history in Descartes. *Journal of the History of Ideas* 57:587-607.
- Rhodes, N. and J. Sawday. 2000. *The Renaissance computer: Knowledge technology in the first age of print*. London: Routledge.
- Rorty, A. 1992. Descartes on thinking with the body. In *The Cambridge companion to Descartes*, ed. J. Cottingham. Cambridge: Cambridge University Press.
- Scarry, E. 1988. Donne: 'but yet the body is his booke.' In *Literature and the body*, ed. E. Scarry. Baltimore: Johns Hopkins University Press.
- Stock, B. 1996. *Augustine the reader*. Cambridge, MA: Harvard University Press.
- Sutton, J. 1998. *Philosophy and memory traces: Descartes to connectionism*. Cambridge: Cambridge University Press.
- . 2000a. The body and the brain. In *Descartes' natural philosophy*, ed. S. Gaukroger, J. Schuster, J. Sutton. London: Routledge.
- . 2000b. Body, mind, and order: Local memory and the control of mental representations in medieval and Renaissance sciences of self. In *1543 and all that: Word and image in the proto-scientific revolution*, ed. G. Freeland and A. Coronas. Dordrecht: Kluwer.
- . 2002a. Cognitive conceptions of language and the development of autobiographical memory. *Language and Communication* 22.
- . 2002b. Representation, reduction, and interdisciplinarity in the sciences of memory. Forthcoming in *Representation in mind*, ed. H. Clapin, P. Staines, and P. Slezak. Westport, CT: Greenwood Publishers.
- Teske, R. 2001. Augustine's philosophy of memory. In *The Cambridge companion to Augustine*, ed. E. Stump and N. Kretzmann. Cambridge: Cambridge University Press.
- Tofts, D. and M. McKeich. 1998. *Memory trade: A prehistory of cyberculture*. Sydney: Interface Books.
- Van Gelder, T. and R. R. Port. 1995. It's about time: An overview of the dynamical approach to cognition. In *Mind as motion: Explorations in the dynamics of cognition*, ed. R. F. Port and T. Van Gelder. Cambridge, MA: MIT Press.
- Van Leeuwen, C., I. Verstijnen, and P. Hekkert. 1999. Common unconscious dynamics underlie uncommon conscious effects: a case study in the interaction of perception and creation. In *Modeling consciousness across the disciplines*, ed. J. Jordan. Lanhan, MD: University Press of America.
- Wills, D. 1995. *Prosthesis*. Stanford: Stanford University Press.
- Yates, F. 1966. *The art of memory*. London: Routledge and Kegan Paul.