Memory

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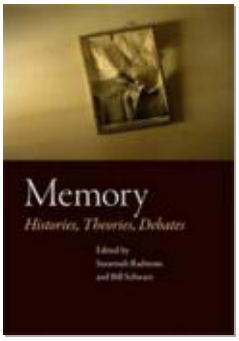

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23. Machines of Memory

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Introduction

In the age of sampling, chronology is twisted from a straight line into a loop. Cybernetic memories are plucked out of history, stored in machine banks, to be potentially mutated, then reassembled in any combination rhythmically. Digitally coded events leave sensory residue across distributed networks of body-machines. Memories are transgenetically transported across species and scales; biological programming becomes folded into unintended host bodies in a mnemonic symbiosis: layers of memory stratified into a machinery of achronological time.

The evolution of capitalism is marked by the technological development of human history. The idea that this evolution will result in homeostatic equilibrium (the tendency of progress toward a balanced end point or culmination of civilization) implodes and can no longer be maintained. In a schizophrenic disjunction, mnemotechnic capital, the packaging of memory into technical objects and their subsequent valorization, decodes and recodes personal biography and cultural history into memory implants, interchangeable commodified machine parts, exchangeable for money, while simultaneously erecting the dreary procession of monuments, commemorations, and memorials into the architecture of the mediatic city.

We want to argue for a postcybernetic conception of memory that questions the assumptions underlying the mnemotechnics of new media cultures. Human memory has now been externalized into ubiquitous networks and distributed digital storage devices. Memory has become prosthetic, a neuro-extension that can be archived via uploading and readily accessed via downloading. General memory capacity appears therefore to have been increased like computer memory; it can be moved, erased, recombined, and upgraded. While we agree that the

intervention of cybernetic technologies, both analog and digital devices working via feedback loops and binary codes, have produced a significant juncture in the relationship between culture and nature, technology and biology, we will seek to problematize the key ideas that inform critical approaches to this nexus.

We will point to a number of problems. First, we question the notion of technology as an extension of man (as, for instance, in the McLuhanist legacy). In such accounts, technologies operate on the sensory capacities of a body by amputating physiological functions via technological enhancements. For example, much has been written regarding the video camera as an extension of visual perception, which transforms the transitory image on the retina and its memory trace into a recorded image. Amputation here mutates the organ from being merely an access point to the outside world, into a port in a technological circuit. In the videotape, memory becomes a physical recording, amputating visual memory and installing it in the limited-to-storage space of tape library.

More recently, with the emergence of digital media, the outward explosion of media in prosthetics has been superseded by the implosion of information into neural networks. Theorists such as Friedrich Kittler emphasize that all media are information systems and that the computer is able to produce a mediatic environment, a matrix of information that goes beyond the mere prosthetic extension of specific organs.[1] The computer transforms the physically stored media recording into databases where memories can be retrieved with the touch of a button: in Paul Verhoeven's film *Total Recall* (1990), inspired by the Philip K. Dick story "We Can Remember It for You Wholesale," purchasable digital implants serve as memories of vacations only virtually experienced.

Most technocultural theories of memory take as an explicit or implicit starting point the insights of the science of cybernetics, where information systems cut across humans, animals, and machines. Our focus on machines of memory, however, places such technologies within a broader environment. Machines for us are dynamic environments or ecologies that can be composed of technical, social, and biological components. Such machinic ecologies are more than the sum of their component parts—the machinic in fact refers to the relation between the parts, which, we argue, must be treated as real, that is, autonomous, productive, and in contact with what is yet to come, what is not yet part of the system, its outside. Therefore, rather than imagine a cybernetic archive of the past, we argue by way of an engagement with the nonlinear temporalities of media that new technologies have realigned the archive away from merely storing or reconstructing the past of human experience, so that it becomes something that anticipates change, anticipates the not yet experienced. From the archive of the past, then, to a conception of memory or an archive of the future: This, we argue, takes us toward a postcybernetic conception of memory.

The following will investigate this apparently anomalous archive of the future, made possible by recent developments in new media technologies. It seems paradoxical to ask whether we can technologically archive an event which has not yet happened. Intrinsic to

the definition of the archive as a repository of stored memories is some basic sense of past-hood, time dissolved but recorded in some container, receptacle, or surface. Yet this paradox functions, we suggest, to hack some of the key programs of contemporary capital, which constantly packages sensations and perceptions into a real yet virtual presence. What we mean here is the way in which capital packages possibilities of experience, using becoming other or feeling other to promote consumption. Branding, for example, operates by producing perceptions of possibility, memories of what you can potentially experience to encourage expenditure. Similarly, this paradox is at work within the discourse of digital media production; the database compresses memories into codes and operates as a field of possibilities that feeds back on the production process. For instance, the media samples (for instance, recorded audiovisual memories) that are encoded in digital databases demarcate the field of possible designs. While stored as codes, these media samples are said not to have a physical presence but nevertheless, as possible content, they have a virtual influence on the process of production. For us, however, virtual memory exceeds the delimited field of possibilities of the digital. In this chapter, we will develop a postcybernetic conception of the virtual in relation to machines of memory.

Ubiquitous computation, by stringing together distributed digital storage devices across the planet, has meant that technical machines have increasingly become receptacles for human memory. The designed environment, with its ports and connections, mobile devices and wireless networks, hubs and hotspots, has become a mnemonic ecology. In this ecology, information saturation and sensory overload are the norm—and a symptom is the generalized condition of time anomaly, generated by the swirling weather system of looped media. This has been referred to as the sphere of prosthetic memory, which leads some to controversially suggest that in evolutionary terms, machines are currently acquiring human memory in nonhuman, technical networks.[2] Is this merely the extraction by capital of surplus value of bodily potentials, whereby every extension of the human nervous system becomes an investment for the increased efficiency of the system, technologically freeing up memory to leave more time for consumption? (Free your memory space, deliver your thoughts to the archives—data banks—and save your life in insurance policies so that you can be whatever you want to be now?) Despite its apparent success, such a model only scratches the surface in explaining how capital abducts memory. The symptom of this process, and the info-sensory overload it facilitates may lie behind the generalized proclivity toward distraction and attention deficit disorder, which are said to have become the cultural norm of late capitalist media networks, rather than a mere psychopathology. As William Bogard argues, distraction "removes you, takes you away, 'subtracts' you from your surroundings."[3] From the actual present, you are abducted and immersed into a technological environment of recorded audiovisual memories that demands a constant shift of attention. What is being capitalized is the gap between short-term and long-term memory, between moments of attention in such environments; that is, what capital recognizes is not each memory itself but the movement across memories.

Accompanying this ecology of media memory is the contemporary consolidation of preemptive power, where an attempt is made to populate and modulate that which has not yet happened by actualizing events instead of merely warding them off. This mode of power raises questions about accepted views of the linear relation between past and future and the complex unfolding of the present. For preemptive technocapital, an archive, a repository of stored memories of the future, is not just some predictive simulation but rather an investment in future feedback, an investment by intuitive anticipation.

Branding serves as an example of this mode of preemptive power in its active production of memories of the future—memories that you haven't had yet, despite their sense of familiarity. Branding generates an atmosphere of time anomalies crowding the media ecologies. Branding in this mode operates on the body by producing a feeling of virtual experience, one that has not yet happened as past. In its infinite differentiation of product ranges, branding plays with a combination of familiarity plus unfamiliarity, a *past-futurity*. Branding installs the memory of virtual experiences in order to produce a certain receptivity to brand triggers. No longer relying on lived bodily experience—physical sensuous feeling—brand memory implantation operates through the body remembering a virtual sensation. The remembrance is activated by the power of suggestion whereby the body, in being seduced, anticipates, precipitates, and propels a movement: the suggestion produces the memory. In short-term intuition, the future yet to be formed is actively populating the sensations of the present, anticipating what is to come, feeling what happens before its actualization.

In mnemonic dimensions of contemporary technoculture, a postcybernetic thought of nonlinear time broadens the narrow concerns with identity, biography, and history that demarcate the cultural study of memory. First, with cybernetics, human memory becomes wired up to the memory of technical machines. Here modes of storage and retrieval are entangled with a system's capacities of learning and interaction, modifying the notion of finite memory. Second, the ''science'' of memetics brings evolutionary approaches to the study of cultural and genetic memory. Converging with contemporary neuroscience, recent memetic theory suggests that memory is not located in the brain, but distributed in the gaps of neural networks, in the brain's synaptic plasticity. Finally, Bergson's and Whitehead's theories of virtuality and immediate time, we argue, open the concept of memory to the notion of cosmology, the ontology of the nonliving, beyond the extension of human memory into technical machines.

No longer can memory be restricted to the psychological, even when expanded to include a whole culture or collective unconscious, nor to the finite storage systems of hardware. Rather, we need a machinic conception of memory to argue that an exclusive focus on either technological or human memory remains inadequate. Instead our concern is with the affective and its relations to memory and the virtual, processes intensified by current media ecologies of connection, transmission, and transformation. We engage with

such processes to investigate further how the mnemotechnics of capital modulate desiring futurity.

Cybernetic Memory

To understand the impact of new technologies on memory, it is important to revisit their conceptual origins in early cybernetic science. Cybernetics, the science of communication and control of information in humans and machines, revealed that a linear conception of time was problematic in understanding how all physical systems, both living and nonliving, are able to learn, that is, to record, store, and retrieve information. Cyberneticist Norbert Wiener argued, for instance, citing the invention of learning machines—machines whose past preprogramming did not completely determine their future behavior—that it was misleading to rely on a Newtonian notion of time. Cause and effect could no longer be mapped into a linear relation between the past and the future.[4] Wiener noted, following the work of physicists J. W. Gibbs, Ludwig Boltzmann and Robert Brown's theory of motion, that the intervention of contingency, random motion, and statistical probabilities rendered future events uncertain.

For cybernetic systems to learn and adapt, they need to store information regarding their environment in a memory databank, a sort of black box regulated by feedbacks, where information, once inputted into the system, can be stocked up and later retrieved or recollected. Each new input that enters the system pushes it toward its storing capacity, risking a systemic overload. The storing capacity or memory of a system, living or nonliving, is related to a computing problem that has been addressed in different ways during what have been defined as the first and the second waves of cybernetics.[5] During the "first wave," memory was understood in terms of devices common to both humans and computers that encode, store, and retrieve information. When Alan Turing devised a machine able to compute information that passes it on a tape as a set of finite symbols (0, 1, or blank), it became apparent that mental processes were not just notes of instruction that could be emulated by logical machinery. Expanding on the work of Turing, John von Neumann claimed that memory capacity was shared by both computing machines (artificial automata) and the nervous system. Memory was a subassembly of the nervous system and could be converted from analog wave into digital bits: "A memory can retain a certain maximum amount of information, and information can always be converted into an aggregation of binary digits, 'bits.' "[6]

Yet these studies of the physical embodiment of memory in the nervous system suggested that memory had no definite location. Von Neumann argued that there were many parts of the nervous system, for example genetic material (DNA, RNA) and chemicals (hormones), that themselves worked as memories. The operation of these memory subsystems was controlled by nerve cells that enabled the flip-flops or switchings of the nervous system between one state and another, similar to how transistors or any high-speed

electronic technology select and control the flow of information and energy.[7] Memory storage, then, depended on the nerve cells, which stirred the input-output of information in different parts of the nervous system.[8] Thus, on this account, there was no true forgetting in the nervous system, since impressions, once received, could be removed from the center of attention, but never truly erased.[9]

The study of mental processes involved in memory and learning acquired a more central focus in the works of cybernetician Gregory Bateson, who claimed that a mental process is always a sequence of interactions between parts.[10] In a cybernetic system, each signal traveling through the information loops will also carry messages concerning the behavior of the whole system. Each message was at the same time a systemic memory, a recording of previous states of the system. The system could learn and remember: "it will build up negentropy and it will do so by the playing of stochastic games, called empiricism or trial and error."[11] Learning in this way implies that a system complexifies by turning energy into information. For Bateson, the mind was not a cybernetic black box, regulated by input–output encoding loops that maintain a constant negative feedback toward homeostatic balance. Rather, Bateson argued that learning occurred through trial and error, and he therefore defined mental states as open to positive feedback and modifications. On this account, the mind did not passively register information from the environment, but actively entered into transformative interactions with it. Bateson's work marks an important turn in cybernetic theory from the first to the second wave.

Following Bateson, the second wave of cybernetics suggested that living systems were autopoietic (self-creating) as opposed to nonliving or allopoietic (non-self-created)—and were anything but passive recorders of incoming data. According to Humberto Maturana and Francisco Varela, "the nervous system does not pick up information from the environment. . . . On the contrary, it brings forth a world by specifying what patterns of the environment are perturbations and what changes trigger them in the organism."[12] The nervous system was considered as a unity, a closed network of changes triggered by the activity between its components. Closed, self-referencing systems could still interact with their external environment, but only by producing representations of the outside in a neural map.

Maturana and Varela's so called "radical constructivism"[13] implied that the cognitive apparatus constructed its reality without knowing that these inputs came from the sensory surface of the system (living or nonliving). In other words, sensory input could not be clearly distinguished from any other nervous signal by the cognitive apparatus. This meant that the source of sensory signals could only be recognized after, *a posteriori*. Thus, memory did not at all consist in the retrieval of stored sensory information. Memory did not map reality onto the cognitive structure. It did not stock up external and internal data. Rather, according to Alexander Reigler, the function of memory was to compress sequences of constructed cognitive patterns into compounds that could be readily accessed afterward, ultimately serving as inputs for cognition.[14] Thus radical constructivism

brought together cognition and memory. Memory could not be compared to a static snapshot in isolation from the evolution of knowledge. It was rather implicated in cognitive processes. This relation between memory and cognition was central to the second wave of cybernetics and has therefore been crucial to the design of information technologies and systems such as consumer profiling databases that transform information into useful knowledge. For example, Amazon.com not only remembers your previous purchases as a pattern of information, but has also learned to suggest future purchases, by converting this data into knowledge by cross-referencing the data profiles of other users.

Contagious Memories

The field of memetics (a theory of cultural evolution) has further developed some of these cybernetic concerns with memory relevant to new media culture. The memeticist Aaron Lynch has pointed out that cultural evolution emerges from differences in the transmissivity, receptivity, and longevity of memes, the informational units of culture, suggesting that "classical" social sciences have neglected transmissivity and longevity in favor of receptivity.[15] An important insight of the memetic approach to culture was that memory need not inhabit the human brain but could be instantiated in physical objects or recording media, distributing memory across cultural networks. And while meme theory has a number of limitations, its utility in the context of new media network ecologies is still notable. As Matt Fuller has pointed out, "it is inherently collectivist . . . it sees the individual operator in culture as a nodal point, not a totality."[16]

The central concept in memetics was the meme, a concept coined by Richard Dawkins in his infamous text *The Selfish Gene*.[17] Describing the spread of certain beliefs as "viruses of the mind," Dawkins wrote that the meme was to cultural evolution as the gene was to biological evolution, a basic building block, a unit of transmission of cultural memory in an epidemiological field of minds. To host a meme was therefore to store it in memory. The key claim of the memeticists was that culture was affected by the abstract principles of evolution: selection, variation, adaptation, which constituted what Daniel Dennett called an evolutionary algorithm,[18] an evolving set of rules or repeated instructions.

Thus memes are a subspecies of the broader category of cultural replicators. In passing both inside and outside of brains, the meme is unique in that it is spread by a process of imitation, for example, humming a tune from an ad. Imitation, with or without mutation, is the evolutionary process of copying, depending on the fidelity, fecundity, and longevity of the replicators. Mutation and selection here may intervene, due, for example, to media-specific degradations (for instance, the loss of fidelity in the repeated copying of copies by an analog photocopier), the imperfections of human memory or communication (forgetting, stuttering, and so forth), time of contact or exposure (for instance, the

length of an ad containing an earworm), speed of transmission (influenced, for example, by bandwidth), and limitations on storage "space," (a problematic concept).

However, importing a hardware model of finite mnemonic storage space from early cybernetics into a memetic conception of memory remains problematic. In *The Electric Meme*, Robert Aunger argued that memes were essentially a specific subspecies of memory. Aunger compared the movement of memes with the movement of information patterns through the brain; when a particular skill becomes embedded as habit, "a meme may migrate through the brain as it goes from being a sensory stimulus to a short-term and then a long-term memory."[19]

For Aunger, the birth of memory involved the emergence of a set of specialized neurons that, unlike receptor and motor neurons, would fire only on certain types of input fed to them from other neurons; these were in a sense "inter-neurons" or connectors.[20] He maintained that memories were distributed across neural networks and were therefore always relational. The exact process of this distributed memory storage was thought to vary, most importantly between long-term and short-term memory, and went straight to the heart of memetics' primary *raison d'être*—the autonomy of cultural evolution from biological evolution, and in fact culture's ability to adapt biology. Memetics attempted to break with the dominance of genetics, which had repelled cultural studies from most other varieties of social Darwinism.[21]

In a suggestion crucial to understanding the varying functions of memory, Aunger maintained that the "primary difference between short-term and long-term memory is therefore the direct involvement of genes."[22] These memories were thought to be stored as variations in synaptic connections between neurons. These changes in the topology of the network could occur because new cells (networked nodes) or new connections between existing cells were added, thereby adjusting the physical wiring of the brain in relation to feedbacks from the environment. Requiring new cells or parts of cells, these storage systems related to more long-term memories. Finally, the plasticity of the synapses, that is, the microtemporally varying strength of the synaptic connections themselves was thought to relate more closely to short-term memory, which, as Aunger argued, functions "independent of new protein synthesis"[23] and therefore defined a zone of relative autonomy from genetic interference.

For memetics, memory was stored not in brain cells themselves, but rather in the synaptic gaps of neural networks, adding cultural memory to genetic memory. Just as memetics emphasized the autonomy of cultural memory from genetic physicality, so recent neuroscientific research on the workings of memory has argued that if states of mind are not exactly in the head, it is because they are extended throughout the whole of the physical body and its environment. As Andy Clarke suggested, neuroscience has come to rethink the brain as extended outside the headspace. Mental states, including states of believing, are grounded in physical traces that remain firmly outside the head, in the body and the environment.[24]

A step toward the notion of extended mind was initiated by research in the late 1980s and 1990s on autonomous agents. This research modeled the adaptive success of single, complete, embodied systems: insects that walk and seek food, cockroaches detecting and evading attackers, robots that learn to swing from branch to branch using real mechanical arms, etc.[25]

An intimacy between brain, body, and world defined an extended adaptive system, where the mind was the activity of an essentially *situated* brain: a brain at home in its proper bodily, cultural, and environmental niche. In this view, all kinds of external props and aids, such as laptops, filofaxes, texts, compasses, maps, slide rules, and so forth, partook in the extended cognition of the mind, which acted to counterbalance the limitations of its basic biological system. As a result, memory and cognition depended on the mind's expanding zones of interaction.

In a similar vein, neuroscientist Gerald Edelman argued that memory was not a content to be placed in the brain. Following William James, who described the "specious present" in which perceptual and memory systems interacted, Edelman called the ability to construct a conscious scene "the remembered present."[26] At each moment, the perception of the now interacted with the perception of the past. The past did not simply reduce the perception—now or present—to what it was. Rather, it was the now or present that was added to the past, producing a new perception of the past laid down in one's neural groups. Edelman thus argued that memory was nonrepresentational. It had neither semantic nor syntactic properties. "Memory is more like the melting and refreezing of a glacier."[27] Instead of representation being stored in snapshots of the present, the fluidity of the passing present each time became solidified, compacting memory in new configurations. Here perception altered recollections, and recollections altered perception: fluctuating memories served not to store but to construct the present-past.

Most recently, loosely grouped under the heading of affective computing, interfaces have been developed to remember more than merely the information typed in at the keyboard but also, with the aid of sensors that detect micro-movements of facial muscles and heart rate, the emotional and physiological status of the user. Such developments have derived from the insights of scientists such as Antonio Damasio, who argued for a neurophysiological analysis of the interrelation between emotion and consciousness.[28] While some feelings—pleasurable feelings, for example—optimized learning and recall, others—especially painful feelings—perturbed learning and suppressed recall.[29] According to Damasio, this is because memory depended on the state of the affected body.[30] Memory was not in the mind but in the emotional experience of the body. The linking of emotion with memory provided evolutionary advantages, since an affective experience of danger taught a person to recognize danger and thereby avoid it.[31] The evolutionary advantage of emotional memories, therefore, lay more in the importance of foreseeing the future than of passively retrieving the past. Thus, what was stored was only the information necessary to reassemble the approximate record of the past and not a complete

record of physical and physiological data. What was stored was a trace, the affect of a memory trace. Each time the same event was remembered, the pattern of convergence between brain regions would be different, changed by a complex network of new emotional associations and experiences.[32] Memories were emotional constructions of the present. In much the same way, biosensing media architectures have become increasingly responsive to the moods and movements of the user.

Virtual Memory

Whereas recent neuroscientific research has challenged the early cybernetic notion of memory as storage, highlighting the relation between memory and perception, the past and the present, these studies only partially assist with our problematic: To what extent can cybernetic technologies produce an archive of the future, an anticipative memory of what is yet to come? It may be argued that these neurocybernetic conceptions of memory are still too dependent on models of probabilities whereby the future remains a statistical calculation of past experience. In other words, the past remains a function of future-prediction, and the recalling of the past remains a constructive action of the present. For example, cellular phone operating systems regulate syntactic possibilities by predicting the text that is to be entered, what is yet to come, what is yet to be keyed into the phone, is only a probability derived from a preprogrammed past. Hence, the advent to come has already happened: in predictive text, there is no room for futurity or potentials for linguistic mutation.

Déjà vu

New media technologies, insofar as they create immersive environments networked to digital sample memory, have precipitated a condition whereby images and sounds from the non-present can reappear in any place or time, producing a kind of technologically enhanced déjà vu. In the age of remixing, this leads to more than the constant pastiche effect pointed to by theorists of postmodernism whereby nothing new can ever be created but only the past recycled—in other words, a world in which cultural memory is predetermining. Rather, we suggest, in the mediatic attention/distraction economy, media technologies are constantly and unpredictably intervening in the gap between long-term and short-term memory. It is common now to falsely hear the familiarity of tones or falsely recognize apparently seen images. Rather than identify technologically stored cultural memory as predetermining, we propose a machinic ecology of memory where the past coexists as a potential of the present.

In contrast with the focus of second-wave cybernetics on the cognitive probabilities of memory, where memory depends on the acquisition of knowledge, Henri Bergson's

early-twentieth-century investigation of the relation between memory and matter offers a view of the mind in movement, what he calls duration.[33] Anticipating contemporary neuroscience, Bergson also conceived of memory as enmeshed with perception.[34] Yet, for Bergson, perception is not a representation of the world but is intrinsically entangled with the movement of a body.[35] The lived body itself exists, in addition to its immersion in a media environment, as an image among many, receiving and giving back movement. Bergson distinguishes between psychological memory (memory of the psyche), habitual memory (memory of the body) and ontological memory (pure, virtual recollection).[36] Each time we remember, each time we recall a past perception, we do more than psychologically retrieve data fixed in the brain or in the body. Instead, for Bergson, to remember is to enter a realm in which the past coexists virtually (in potential) with the present. For Bergson, each perception can activate potentials for memory, which exceed actual past perceptions. Remembering, then, has nothing to do with a psychological recollection, the reconstruction of narrative from the standpoint of the subject, an autobiographical rehearsal of the self. With virtual memory, the body is an indeterminate center of action, not the container of representations of the self,[37] the model, for example, on which personalized computing is based. We move, therefore, from the virtual identities of digital selves in the cultural theories of new media, which, we argue, are sustained by the cybernetic notion of memory as a databank of probabilities, toward a notion of memory as virtual recollection that can account for the feeling of déjà vu intensified in an audiovisual sample-based culture. The introduction of the concept of the virtual points us to a postcybernetic conception of memory, in which the database does not archive fixed representations, but matter itself functions as an archive of potentiality, where the past and the future coexist in the present. In this way, the past never passes but remains contemporaneous with its present. The past stays in potential, continuously ready to actualize its present anew. This is why, according to Bergson, we experience paramnesia, the illusion of déjà vu, false recognition, time anomalies, and memories of past-futurity. What is left of memory when past-present chronology collapses?

The term *déjà vu*, common in English and German, translates from the French literally as the ''already seen.'' The sensation that it usually tags relates to an uncanny feeling of familiarity with something you should or could not be familiar with because you are experiencing it for the first time. Déjà vu suggests time collapsed onto itself, perhaps some kind of mnemonic haunting or future feedback effect. In the literature on déjà vu, it is often related to a memory disorder known as paramnesia, a term referring to the illusion of remembering events while they are being experienced for the first time (or a condition in which the proper meaning of words cannot be remembered). In the scientific literature, the déjà vu feeling has often been tied to temporal-lobe epilepsy, usually occurring just before an attack or during the seizure in the gaps between convulsions. But it is widely accepted that it is actually much more widespread than its identification as psychological pathology would suggest.

For Bergson, paramnesia is a symptom that explains that "there is a recollection of the present, contemporaneous with the present itself," as Deleuze puts it.[38] Here the sense of duration occurs as the past appears to be lodged between two tendencies of the present. As Deleuze puts it: "The present is the actual image, and its contemporaneous past is the virtual image, the image in a mirror."[39] Thus, a memory does not chronologically follow a perception in the present but rather is to be rigorously understood as contemporaneous with it. At each moment, duration splits into two trajectories: one verging toward the future and the other veering into the past. Two enmeshed planes coexist: virtual memory—the past in itself contracted and expanded—and actual memory—a memory of the present and the emerging future. Hence memory can detach itself from the past by differentiating itself in something new. Like Dick's memory implant that offers you a memory of a past you haven't lived, memory conjoined to the virtual can create a sense of familiarity with occasions you have never experienced.

The virtual plane of the past indeed indicates that the past and the future are not separated as a past of the present and a future of the present. On this Bergsonian account, time is not conceived of as linear but as intensive duration, degrees of covariations whereby perception, the actual present, is the continual activation of memory, the virtual, the past. This is not linear continuity, where the past determines the present or the present constructs the past. Each present perception stirs what lies in potential, the futurity of the past, emerging again yet anew. The lived present is thus a synthesizer of the past and the future contracted in microtemporality. Here déjà vu points to actions at a distance, echoes and resonances, replays of a multiplicity of memories in duration.

So while the info-saturation of proliferating media technologies may encourage the feeling of time anomaly associated with déjà vu, the conception of temporality it points to exceeds the effect of recent media technologies and is rather, for Bergson, an ontological principle.

Anterior Future

"We think of the future in time-spans of centuries, or of decades, or of years, or of days. We dwell critically upon the mass of fables termed history. . . . In considering our direct observation of past, or of future, we should confine ourselves to the time-spans of the order of magnitude of a second, or even a fraction of a second."[40]

The technological environment, we argue, does not just encourage us to think the coexistence of the past with the present. In the déjà vu example, our false familiarity with an occasion may denote not just that we have already experienced it sometime in the past. It may also be that we feel the inevitability of the unfolding occasion to the extent to which the future coexists with the present or the present opens onto anticipation.

Memories, for Alfred North Whitehead, are always memories of the future, time anomalies where the future is immediate to the present's contraction of the past, as if the future were haunting its own emergence. For Whitehead, the past does not determine the future but eats into the future. In such achronological causation, the future is active in the present, unfolding the process by which the past-present enters the present-future. The past does not determine the future any more than the future determines the past—they are in co-causal relation. Whitehead suggests that to prehend the transition between the immediate past and the immediate future is of the order of short-term intuition—a time-span that lasts a second or fraction of a second—"which lives actively in its antecedent world."[41]

For Whitehead, prehensions or feelings[42] are microtemporal modalities of perception defining not only the conceptual feeling of past occasions in present experiences but also the way the objective existence of the present lies in the future. Conceptual prehensions indicate not that the past predicts the future, but that the future is anticipated in the present. As Whitehead argues: "Cut away the future, and the present collapses, emptied of its proper content. Immediate existence requires the insertion of the future in the crannies of the present."[43] Whitehead distinguishes two coexisting modalities of perception, "causal efficacy" and "presentational immediacy." Causal efficacy is a direct perception of prior actual occasions, which are causally related or relevant to a subsequent actual occasion. Here perception is enmeshed with memory as what has passed; particular occasions are objects of prehension in the present. On the other hand, presentational immediacy is a direct perception of present actual occasions, which may lead to a process of integrating these occasions with actual occasions in the past. Thus perception is caught between two parallel feelings of the body, the feeling of the precedent world, or the past, and the feeling of the current world, or the present. But these feelings are not exclusively sensory. Indeed, there is a nonsensuous—or extrasensory—dimension to them, which defines prehensions as the grasping of the immanent connection between actual occasions in the past and the present.

Whitehead argues that we prehend two kinds of data: sensuous and nonsensuous. On the one hand, "perception in the mode of presentational immediacy" marks the precise, digital kind of data that nerves transmit. These sensuous data constitute physical prehensions. Memory, on the other hand, is the nonsensuous mode in which we perceive past actual occasions. Whitehead cites immediate (short-term) memory as an example of nonsensuous perception. The memory that enables me not to forget the point I am making while completing a sentence exposes the immediate grasp of the vague past that floods the whole bodily system, a "perception in the mode of causal efficacy."[44]

Thus, alongside physical prehensions, we prehend concepts. These make up the mental pole of an actual occasion of feeling. At the mental pole, we prehend the infinite world of what-might-be. Conceptual prehensions can be understood as pure potentials in

abstraction from embodiment. From the actual entities that we prehend physically, we can abstract some potentials, what they may become. Conceptual prehensions are entangled with the physical prehensions of previous actual occasions and thus produce the propositions of the past, which are again reassembled in a process of reenaction not directed by present physical data. Thus, while linked to past physical prehensions, conceptual prehensions are of a nonphysical nature—that is, they embody the feeling of the passing of time that is autonomous from sensory information. A memory would then be considered a conceptual object imbued with potentials—the infinite world of what-might-be. When remembering, we prehend an actual occasion in the past reenacted by an actual occasion in the present, which does not reproduce the past but tends toward its own future. The immanent relation between actual occasions of the past and present, however, does not follow the same pattern as the relation between the present and the future. While the actual occasions of the past are prehended by present occasions, there are no actual occasions in the future "to exercise efficient causation in the present."[45] The future is not occupied by actual occasions. In the present, there are not future occasions. If the future is immanent to the present, it is so in a different sense, compared to the way individual occasions of the past are prehended in the present.

Whitehead proposes to understand the "doctrine of the future" according to a process of self-completion of each individual occasion, a passage from reenaction to anticipation. Here the future belongs to the conditions of the present, which are themselves linked to the actual occasions of the past. Yet, this does not imply that the past could have foreseen its forthcoming present or that the present merely reproduces the past. While present occasions derive from the past, the past itself does not predict the actual occasions of the present. In the same way, a present experience does not refer to any particular future memory of itself. Memory is thus a unidirectional relatedness. Here the relationship between past, present, and future is a cycle of creation and destruction, reenaction and anticipation intermitted by the acquisition of novel content.

To remember, then, entails a cyclical yet nonlinear dynamic whereby an occasion of experience is initiated in the past—which is alive in itself—and terminated in the future—which is also alive. Such an occasion starts as an effect facing its past and ends as a cause facing its future. If the present emerges from the past, it is also, at the same time, immanent in the future. The reenaction of the past passes through the acquisition of the new to be accomplished in the present, yet the content of the present remains the future. Completion is also anticipation. Anterior future: the present remains at once occupied by the past and the future. Yet, this is not the cybernetic prediction of probabilities, whereby future contingencies can be statistically calculated. On the contrary, prehensions tackle a universe of microtemporalities, enabling the future not to be predicted by means of probabilities but to actively occupy the present by means of immediacy.

Similarly, against the entrapping of memory in the autobiographical historical narrative of the past, Whitehead suggests that it is in short-term memory, short-term intuition,

that the sense of a present's immediate past and future returns, a sense of invention inherent in the present.[46] "In this sense, the future has objective reality in the present. . . . For it is inherent in the constitution of the immediate, present actuality that a future will supersede it."[47] Whitehead defines this temporal immediacy as the enjoyment of the present: an open-ended enjoyment of reenaction and anticipation where the future enters the present once the past has perished for futurity to populate the present anew.

Mnemo-Machinery

We have attempted to establish a postcybernetic conception of memory as virtual body, virtual matter, in which the future and past are deeply implicated in the present. The temporal dislocation of the technocultural matrix and its tendency toward total sensation experience is central to preemptive power, but this can only be inadequately understood in terms of simulation. To assume the neuroprogramming of a digital power that manipulates us at the level of memory through the generation of a hyperreality—a simulated, packaged world—is to ignore the nonlinear workings of virtual memory, the microtemporalities of duration. What such postmodern accounts of living in global media saturation neglect, in their portrayal of hyperreal simulation as a mega-mnemo-implant construct outside of historical time, is the *achronological compossibilities* of the virtual—the coexistence of multiple durations.

As Deleuze, following William Burroughs maintains, cybernetic control society operates through mediatic addiction by way of bodily habits.[48] This does not stand for a zombification of the body through dependence on the imperatives of the mediascape but rather for the microactivation of what a body can do, albeit within the terms of the domain of demarcated and relatively predetermined possibility. Contemporary branding culture, for example, sets out to distribute memory implants across technical media platforms, which provide you with the already-enjoyed, already-sensed, to encourage repetition of consumption, a repetition of a memory that you haven't had. *The operation of power, through branding, seeks to remodel long-term memory through a kind of time anomaly. Branding tends to occupy the shortest possible time spans by entering the dynamics of short-term intuition—the coexistence of the past-present-future—at the same time, ceaselessly affecting long-term memory by instigating movement in the neurophysiological plasticity of the brain.* Branding potentiates long term memories through the stirring of new synaptic connections, the marking of new paths of memories that are immediately familiar. Long-term memories are continuously reassembled in nonlinear combinations as a result of the immediacy of short-term memory.

Thus branding attempts to create a collective mood that induces loyalty through repetition. Of course loyalty to a brand, the nonhuman agency of the virtual corporate body, is simultaneously a mode of addiction. Branding both installs a web of associations

and generates loops of libidinal investment. But this double-edged process of addiction is inadequately understood if conceived in terms of closed loops or the locking down of behavior in a homeostatic circuit whereby a chain of association becomes habit and moves from short-term to long-term memory through reward. What is crucially omitted from this picture is positive feedback, the immediate transformation of virtual memory.

Could it be that memory has always been prosthetic, so that its extension into the networked cybernetics of mediatic communication was actually invented during the genesis of culture, as explored in evolutionary theories of memetics? If so, a cosmology of memory begins with the evolution of sensuous thought, at the point when transmission becomes affective contagion, the propagation of sensations. The time-scrambling of Bergson and Whitehead suggests that, in a specific sense, memories of the future are conceivable, so long as these memories are either intuitive or prehensive, as opposed to simply knowledge of possible futures. Affect is both the unfolding of the past into present experience but also the way this experience acts on the past to unravel a new future.

Affective power acts on autonomic responses, that is bodily memory, but these instinctual responses are not simply reducible to habits. Central to Brian Massumi's conception of affect is the suspension of the linear causation of stimulus and response.[49] *Every time autonomic response is activated through media power, an unpredictable potential enters.* There is a relationship between physical bodies and technical machines that is more than simply informational or emotional. Such relation, we argue, is virtual.

Hence our focus on the importance of moving beyond memetics' obsession with imitation to emphasize virtual mutations in cultural replicators, germinators of difference and not stabilizers of variations. With each occurrence, a body is transformed through the vague memory of the previous instance, and the anticipation of the next occasion. Cultural replications would then entail the propagation of infectious copying habits, the "bad habits" of normalization, of enforced replicators. Memories here are an affective impingement of bodies on bodies, a mnemotectonics of speeds and slowness, entering into compositions, concrescences, that activate potential in a rhythmic oscillation between the virtual and the actual, inventing process and processing invention. Memories are therefore material relations. They are not confined to individual subjects. Neither are they specifically human. Memories no longer relate purely to a trace of the past but, more importantly for us, hint at the activity of the future in the present. Every actual body is shadowed by its virtual double. As with monads, each body has it own singular enfolded memory of matter ready to enter a new curvature of time.

What kinds of symbiogenetic or mutant compositions do the machines of memory initiate? From synapses to bodies to technical machines, across scales, every connection provokes mnemonic mutation. However, whether conceived as the alleviation of the pressure of remembering—the amputation of memory—or as a mnemonic extraction by the technosphere, for us, the machines of memory have always been prosthetic, always been

ecologically distributed across drifting layers of mnemonic involution, the virtual coexistence of the past and future in the present. As we have argued, memory is inextricably entangled with futurity. Thus, memory cannot be conceived purely as an accumulator or container of lived experience, a technical archive of the past. On the contrary, to the designers of new media theories and technologies, we pose anew our earlier paradox: How to engineer an *archive of the future*?