Outsourced Memory: Computers and Conversation

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Human memory is multilayered, partial, ephemeral, and fallible. Memory stored outside the person, as a photograph or in a computer, is quite different. Human memories change when retrieved, and new memories alter our perception of previous memories. Over time we forget, which can be a good thing. While human memory is a process, machine memory is a place. Its permanence can be an illusion (memory corruption). Its permanence can also become a problem, in that it does not fully allow for forgiveness and change. As we rely on computers more and more to be our external memories, we alter how we remember, what we remember, and our relationship to the past. Due to the differences in human and machine memory, outsourced memory should be seen as an aid rather than a replacement, and we should be wary of what we commit to digital storage.

> "Life is … what one remembers and how one remembers it in order to recount it."
>
> *Gabriel Garcia Marquez*

What is memory? In *À la Recherche du Temps Perdu*, a tea-soaked madeleine takes Marcel Proust back to a world he had largely forgotten, a world of sights, sounds, and experiences that was locked inside his memory, needing the sensory experience of the madeleine, its taste and smell, to unlock the door. Proust implies a conception that is commonly held, that memories are stored in our minds like a series of photographs. He writes,

> As soon as I had recognized the taste of the piece of madeleine soaked in her decoction of lime-blossom which my aunt used to give me (although I did not yet know and must long postpone the discovery of why this memory made me so happy) immediately the old grey house upon the street, where her room was, rose up like a stage set.[1]

Vladimir Nabokov, in his autobiography *Speak, Memory*, adds a detail both ironic and telling:

> I see again my schoolroom in Vyra, the blue roses of the wallpaper, the open window … Everything is as it should be, nothing will ever change, nobody will ever die.[2]

Memory makes the world eternal, unchanging.

Think of an early memory from your own childhood. What does it consist

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of—sights, sounds, smells, feelings, a narrative of what happened when? One of my earliest recollections is my third birthday. My parents gave a party, inviting a couple who were their best friends and who had children close to my age. I do not remember the party. What I do recall is the late afternoon, about an hour before they were to arrive, drifting about the house alone in my party dress. A late summer thunderstorm was being kicked up by a hot south wind, and the sky was slowly darkening with clouds. To this day, I recall the oddly mixed feelings I had of excited expectation and disquiet from the impending storm. But is that disquiet what I really felt that day, or what I have so often felt through the years whenever a storm approaches?

Recently a friend and I recalled our first meeting, more than ten years ago. We both agreed on the basic narrative. Nick was telling a somewhat off-color joke to Steve, another colleague, when I fell in step with them after a meeting. He fell quiet and Steve protested, "Well, don't stop now. What's the punch line?" Nick replied, "Not with a lady present." Steve glanced over at me and said, "But that's not a lady, that's just Noreen!" We both recalled Steve's comment word for word and laughed about it. However, when we moved to more detail of that meeting neither of us remembered the same things. He thought we were going down the stairway inside our Quadrangle building. I vividly recalled us in heavy winter coats, exiting the science hall and crossing a parking lot. He thought it was midday; I thought it was in the early dark of a Minnesota midwinter evening. Our memories were decidedly different, an experience much like that of two old lovers recounted in the musical *Gigi*: "That carriage ride. You walked me home—I lost a glove. You lost a comb. Ah yes, I remember it well."

What do these stories tell us about memory, specifically recollective memory? First, it is multi-layered, composed of elements of sensory experience, narrative, and emotion. Second, it is partial. It is ephemeral. Worse, it is fallible. In an effort to remedy the latter, we turn to technology to bolster our internal capabilities. Photos, recordings, books, memorials, memoirs, databases—each provides a way in which we outsource memory. And we rely on outsourced memory more and more in this age of ubiquitous computer technology. I cannot tell you how often I have a student tell me, "I don't need to know that. I can Google it."[3]

Though we have long outsourced memory, starting with the first Sumerian who kept a record on a clay tablet, our current greatest competitor in the memory arena is the computer. Our reliance on Google, on the web, on Flickr, and on social network updates suggests that the computer is interchangeable with our minds when it comes to memory—that it does the same thing, only better. But computer memory is not at all the same as embodied memory. As we rely on computers more and more to be our external memories, we alter not only *how* we remember, but also *what* we remember. And these alterations have ramifications on more than our recollection of the past. They change the present as well, affecting how we relate to one another and how we understand ourselves. In this article, I will explore how embodied human memory differs from digital memories and why these differences matter. While computers make good aids and additions to our memory, they are a poor substitution for it.

Embodied Memory

Computers are the reigning metaphor of our time. So it is natural to think of ourselves in their terms. Beyond popular parlance, scientists too have used the analogy of storage, retrieval, and information processing to describe the functioning of our memories. John von Neumann likened informational memory to a filing cabinet, one that could as easily be virtual as actual, though he noted with frustration that we could not, as yet, locate the position of any given file in the brain.[4]

Molecular biologist Francis Crick goes further with his understanding of a mechanistic brain:

> You, your joys and your sorrows, your memories and your ambitions, your sense of personal identity and your will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules … You're nothing but a pack of neurons.[5]

Daniel Dennett extrapolates:

> If all the phenomena of human consciousness are explicable as "just" the activity of a virtual machine realized in the astronomically adjustable

connections of the human brain, then, in principle, a suitably "programmed" robot would be conscious, would have a self.[6]

Implicit in what Dennett and Crick write is the conviction that, though emerging out of matter, what constitutes the essence of the human person is information, the pattern of one's neural connections.

Astronomer Robert Jastrow takes this thinking one step further, noting that such a pattern need not remain on a biological platform:

A bold scientist will be able to tap the contents of his mind and transfer them into the metallic lattices of a computer … liberated from the weakness of the mortal flesh.[7]

Inventor and programmer Ray Kurzweil expects computers to reach this capability by the 2030s. For each of these men we are, in essence, our memories (along with suitable retrieval programs). And these memories are concrete, discrete information entities located somewhere in the neuronal intricacies of our brain.

How good is the computer analogy for memory? Let us return to my story of meeting my colleague Nick for the first time. While we recalled the basic plot of the encounter similarly, our memories of the details were strikingly different. Why would this be so? First, most cognitive psychologists now believe that we do not store memories as complete discrete entities. We store only bits and pieces of an experience, fragments from which we later reconstruct the event. As Ulric Neisser puts it, "Out of a few stored bone chips we remember a dinosaur."[8] Nick and I each remembered Steve's unfortunate rejoinder and that we were coming from a meeting. Beyond that, we reconstructed the rest of the scene the way a movie director might add scenery and blocking to fill in a basic script.[9]

Which bits and pieces we store is largely determined by what is already in our memories. Durable memories have a meaningful association with something already there.[10] This is one reason why I caution my students not to get too reliant on Google. We need mental pegs on which to hang new information. Without such pegs, incoming information tends to land in a heap on the floor of our mental closets. I believe my memory is more accurate than Nick's because I had the advantage of his having

recently been introduced at a large faculty gathering, at which I had noted that he seemed an unusual and interesting person, one I would like to get to know. I already had a peg labeled "unusual new colleague" in my brain, whereas, to him, I was a total and unexpected stranger.

According to neurologist Antonio Damasio, there is no single location in the brain where the pieces of a memory are stored. Different aspects of a memory are stored in different locations—sensory data in the posterior cortex, other regions called convergence zones storing code that binds sensory fragments to one another and to preexisting knowledge, the right frontal cortex contributing to the sequencing, etc.[11] Some external cue, like Proust's madeleine, activates each of these regions to produce the final recollection.

In other words, far from being static engrams stored somewhere in our brains in whole-cloth, memories are bits and pieces, stored in multiple places, reassembled and filled out, as needed, to form a narrative. In the process of reassembly lies a second difference from the conventionally held impression of memory as a static file or photo, namely, the pieces are not reassembled in quite the same way each time we fetch them. Daniel Schacter notes the role played by the memory cue.

The cue combines with the engram to yield a new, emergent entity—the recollective experience of the rememberer—that differs from either of its constituents.[12]

The brain stores information by increasing the connectivity between different neurons. When we recall an experience, the cue itself activates its own set of neurons. Thus the very act of remembering induces a new pattern of activity in the brain. This explains certain experiences. For example, when people are asked to recall an event as if they were a third-party observer rather than a participant, they recall that event with fewer emotional overtones.[13] And this change in the feeling of the memory may be permanent (making such a retelling one method in helping a person lessen the impact of a remembered trauma). Like an image that is traced and retraced, or a story told over and over again, each time we retrieve a memory, we change it slightly, and what we re-store is rarely quite the same. Psychologist Dan McAdams notes:

The unfolding drama of life is revealed more by the telling than by the actual events told. Stories are not merely "chronicles" like a secretary's minutes of a meeting, written to report exactly what transpired and at what time. Stories are less about facts and more about meanings. In the subjective and embellished telling of the past, the past is constructed—history is made.[14]

The interaction of time and memory adds new layers of complexity. New experiences may interfere with our ability to recall previous ones. At best, they color our remembrance of the past with their own tint. For example, a serious argument with a person alters not just our present interaction but also our recollection of previous encounters. Walter Benjamin wrote, "The work of memory collapses time." He does not mean by this that memory makes the past present, though it does, but that the way our memories function makes the present part of the past.[15]

As experiences recede into the past, we find that fewer and fewer cues are sufficient to bring them back again. We forget. And while this bothers us, particularly those of us who have reached a certain age, forgetting plays a remarkably important role in our thought processes. Jorge Luis Borges illustrates the necessity of forgetting in his story "Funes, the Memorious," in which a young man, due to a fall from a horse, gains the skill of remembering everything, down to the least detail—the shape of every cloud he has ever seen, details of every leaf of every tree he has ever looked at. For such a perfect memory, he pays a very high price. He cannot, so to speak, see the forest for the trees. Because he remembers the details, he cannot categorize or generalize; thus he cannot think, for as Borges puts it, "To think is to forget a difference."[16]

Information that is not frequently accessed loses the strengthening effects of retrieval and re-storage and thus fades over time. This is a good thing. You do not need to know what you had for breakfast a year ago, nor do you need to recall exactly what the clouds looked like yesterday. To see the importance of letting go of detail, consider learning to drive a car. At first you worried about everything—press the accelerator, check the rear-view mirrors, turn the steering wheel, check the mirrors, look at the road, shift gears. After sufficient practice, you ceased thinking about the details—you just drove.

Forgetting plays a second role. With the exception of traumatic events, we forget unpleasant memories more easily than pleasant ones. We also tend to remember our accomplishments or roles in various experiences with an egotistical bias toward the positive. As Nabokov puts it, "I think it is all a matter of love: the more you love a memory, the stronger and stronger it is."[17] Studies have shown that this is good for our mental health; indeed, one symptom of clinical depression is a lack of these positive illusions, a tendency to recall one's failures rather than one's strengths.[18] A certain amount of forgetting is an adaptive trait.

In summary, we store pieces of an experience in various parts of the brain through strengthened neural connections. When a sufficient cue appears, we collect those pieces and use them, together with information present in the cue, to construct a narrative. We re-store the important bits of this new narrative, often with subtle changes. Our memory is a storyteller, strengthening or weakening the story relative to the frequency of its telling, and changing the story as needed to fit the present context. In this, we have a two-way dialectic. Our memories of the past form who we are in the present, while our present selves form and reform our memories of the past.

Outsourced Memory

How does this compare to memory outsourced to the computer? Memory is foundational to the structure of the computer. The first computers had to be rewired for every computation they were to perform. Obviously, this was a clumsy and time-consuming task. The great step forward, envisioned by Turing and achieved by von Neumann, was the move to stored programs, in which the instructions for performing a computation are encoded and stored in the computer's memory in the same way as data. Computers are all about memory—data and programs are stored in memory, and only a very few operations are necessarily wired into the processor (the very smallest processor can get by with two operations—addition and equivalence). Even the most sophisticated tasks accomplished by artificial intelligence are memory based—large databases of facts are quickly searched for patterns and precedents.

When we speak of memory in regard to the computer, we are using the term in a different sense. Computers reduce memory to storage, turning it into a place rather than a process. A computer's memory is closer to von Neumann's filing cabinet than it is to a storyteller. And we want it to be so. Computer memory gains its utility precisely from the two ways in which it differs from embodied memory, namely, that it is both static and large.

That computer stored data is largely static is both a strength and a weakness. Details that would fade quickly from the human mind—complex texts, lists, and processes—are all available at the push of a button. In the words of MIT computer scientist Wendy Chun, with the advent of the computer "the ephemeral has become the enduring."[19] But not so enduring as all that. Computer memory promises to last forever, but unless it is frequently updated, it rapidly becomes obsolete. How many of us have a forlorn stack of disks gathering dust in some corner of our desk? Nor does the data that remains accessible always stay the same. Files can be unintentionally corrupted over time, and multiple transmissions can easily be intentionally corrupted (as I noted with a chuckle on seeing two published pictures of the patriarch of the Russian Orthodox Church; in one, his very expensive gold watch had inexplicably disappeared). But most computer-stored data remains unchanged in nature or content from the moment it was stored until it is overwritten by something else. There is no subtle or incremental change, as with human memory. The present does not influence the past.

Our databases are also much larger than human memory. Large databases and the ability to search them quickly underlie the most recent developments in computer technology—the wisdom of the Jeopardy!-playing program Watson, the cracking of the human genetic code, the uncanny way in which Google or Amazon.com seems to know exactly what you want. Artificial intelligence programs exploit the size of memory and speed of current processors to accomplish human tasks in a very different manner. One factor that helped Deep Blue beat Garry Kasparov was having on hand a record of all his past games, clearly more information than any human could recall. New language-recognition programs, such as the iPhone's Siri, have large databases of phrases and sentences. Cheap large memory underlies many of our recent advances in computing.

Without sophisticated data-mining techniques, computer archives mirror the detailed memory of Borges's Fuentes. Consider the task of backing up the Internet. This is done periodically by the Internet Wayback Machine (IWM). Since it would be both time consuming and controversial to winnow the enduring from the ephemeral, the IWM simply backs up everything, all accessible sites. The sheer volume makes this archive, at least at present, close to useless. But that may soon change, and this change could have major ramifications on our lives.

Implications of Outsourcing Memory

The size and stability of outsourced memory, essentially a new kind of memory, matter. To borrow a phrase from Gregory Bateson, the difference between embodied memory and outsourced memory is a difference that makes a difference.

There is a concept in the Rule of St. Benedict that can help elucidate the implications of this difference. Benedictine monks take three vows when they enter the order. These are not the vows of poverty, chastity, and obedience made popular by the later mendicant orders. Benedictines pledge themselves to stability of place (that they will search for God in this community, with these imperfect people) and obedience to their abbot, and to the Rule of St. Benedict. Their third vow in the Latin of that Rule is one of *conversatio morum suorum*. It does not translate easily. The phrase literally means "the way of life of his behavior." *Conversatio* has been variously described as "conversion of life," "transformation of mind and heart," "continual conversion." Early commentators emphasized repentance, partly due to confusion in medieval editions of the Rule between *conversatio* and *conversio*. Recent commentators describe the vow as "fidelity to the monastic way of life" and see it as a reinforcement of the other two vows of stability and obedience.[20] However, older monks say they understood something much more radical in this vow—a call to a life of continual change. While stability emphasizes finding God in the constant,

conversatio finds God in change. Esther de Waal describes *conversatio* as the recognition that God is not only eternally faithful and dependable but also eternally unfathomable and unpredictable.[21]

An old Irish monk, when asked "What do you guys do in that monastery, anyway?" replied, "We fall and get up, we fall and get up, we fall and get up again." More than one monk has said to me, with a rueful smile, that the monastic life at times seems custom built to underline Sartre's comment that hell is others. But this applies to all our lives, not just the monastic. We fall. Others fall, and in their falling sometimes knock us down. At the center of the Christian life, whether monastic or lay, is the call for forgiveness. *Conversatio* implies that we must recognize change in others. Outsourced memory makes this much harder, both individually and socially.

A memory that is outsourced is no longer ours. We cannot control its availability nor who has access to it. We cannot control its forgetting. For most of us, this lack of control is problematic precisely when the computer forgets something we want remembered. We have all had the frustrating experience of returning to a useful web site only to see the words, "This page is no longer available." Users of "the cloud" may find their data inaccessible at any given moment due to server outages, overload, or even legal issues, as users of the Australian service Megaupload learned, to their chagrin, when the service's servers were shut down due to copyright infringement and racketeering charges. Outsourced memories may be lost.

However, worse than this, they may not be lost. Viktor Mayer-Schönberger suggests that the loss of forgetting is the more dangerous consequence of outsourced memories. He cites the experience of Stacy Snyder who posted a picture of herself as a "drunken pirate" on her MySpace page, only to find that it was accessed by university officials who subsequently tried to deny her teaching credential, citing conduct "unbecoming of a teacher." Andrew Feldmar, a psychologist who wrote about his experimentation with psychedelic drugs in the 1960s in an obscure professional journal, subsequently found himself barred from entry into the United States, though he had broken no law and had not used

drugs since.[22] What we cannot forget, we cannot forgive. A person may find himself or herself determined by a single action, as in Snyder's case, or by something committed long ago, with no redress. Mayer-Schönberger worries that our fears of such an occurrence could lead to overly careful self-censorship. Too much data can also lead to prejudice. Until now, forgetting has been the norm, not the exception. Forgetting allows us to see others as they are now, not as they may have once been. It allows us to start again. Internal memories are tempered over time; external ones are not.

Conversatio also implies that we see ourselves as living out a process of continual change. While *conversatio* may speak first and foremost to the monk's habits and behavior, it is the internal narrative surrounding that behavior that shapes one's sense of self. Sociologist Anthony Giddens writes:

> A person's identity is not to be found in behavior, nor—important though this is—in the reactions of others, but in the capacity *to keep a particular narrative going*.[23]

We know ourselves as more than a collection of isolated sensory experiences through the construction of a story that links our memories into a larger whole. This story tells us who we have been and informs who we are now. It is a story that we continually revise as new experiences lead us to reinterpret older memories.

The postmodern world makes keeping a self-narrative going an increasingly complex task. Our lives are no longer lived out in a single normative social context. According to Dan McAdams, the certainties of modernity—

> faith in science and technology, assumptions about objectivity and rational discourse, belief in progress, the assumed coherence of political/economic systems such as capitalism and Marxism—have been severely undermined, leaving a confusing multiplicity of power discourses.[24]

Outsourced memory reinforces these conflicting voices. Information, interpretation, and increasingly, our own history become fragmented in external storage, making us less self-defined constructs within our own minds and in more "locations," where a variety of intersecting forces and interacting voices determines who we are at any given moment.[25]

We come to see ourselves not as a story, with a structured plot and character development, but as a scrapbook filled with disconnected status updates, tweets, and images.

Perhaps one reason the memoir has become the primary literary form of our time is that it attempts to recapture the centrality of narrative as the source of self-understanding, albeit in an externalized form. Madan Sarup writes:

> I have always felt lonely, and, even when I married, ten years later, I continued to have feelings of loss, feelings I have never understood. And now that I think I am beginning to understand, the people that I want to talk to have died. Perhaps it doesn't matter now. But then, why am I writing? Is my writing an attempt to put it all together? Does one have to rewrite the past in order to understand it?[26]

For Sarup, it is the process of writing that gives him insight into his past. It is the process of recollection that enlarges our narrative of the self and helps us make a coherent story of who we are, where we have been, and where we are going. In memory as process, we find the means for *conversatio.*

Once the memoir is written, the process ends—at least for those particular memories. Outsourcing memory makes us all, in a way, involuntary memoirists. Neuroscientist Warren McCulloch writes, "As our memories become stored, we become creatures of our yesterdays."[27] Nowhere is this so true as with computer memory. Expanded memory makes prediction possible, giving Amazon and Google their utility, but it also risks crowding out new experience. In his essay "The Storyteller," Walter Benjamin suggests that the information glut made possible by modern technology causes us to devalue direct experience. He believes that

> the art of storytelling is coming to an end. Less and less frequently do we encounter people with the ability to tell a tale properly. More and more often there is embarrassment all around when the wish to hear a story is expressed. It is as if something that seemed inalienable to us, the securest among our possessions, were taken from us: the ability to exchange experiences.[28]

We labor mightily to exchange experiences electronically. As one student said to me, "If I don't write about it on Facebook, or post a photo, it doesn't seem real." This is a life lived looking backwards, even in the very moment of experience. Yet all that gets exchanged are bits and pieces. The narrative work of our internal memory, the work Benjamin so prizes, is missing.

Each of us must decide how many of the tasks of memory we will outsource. Our current understanding of embodied human memory, not as the past stored, but the past woven into a continually changing narrative, suggests that a total outsourcing of our memories, as Jastrow and Kurzweil dream of, is both unlikely and undesirable. We are more than information. Even were a total downloading of our neuronal patterns possible, it would serve only to freeze us in time. A computer without a human body, and thus without continuing human experiences and physical cues (no madeleines for the computer), would either hold our memories static or begin to alter them in a completely different and nonhuman fashion. You, downloaded, would at that moment cease to be you.

Each of us will continue to use computers as an aid to memory. I, for one, do not want Google to go away. Perhaps the best advice is analogous to that given by Jesus long before the computer age: *"Render unto Caesar the things that are Caesar's and render unto God the things that are God's"* (Mark 12:17). Render unto the computer the things that are the computer's, but no more. Again and again, we make the mistake of conflating mind with computer, of trying to find in the computer a surrogate rather than a partner. I have written elsewhere of the problems this engenders in relation to artificial intelligence.[29] Memory presents a similar case—a database is a poor analogy for memory. An aid to memory—yes, but it is not a replacement for it.　　　　　　　○

Notes

[1]Marcel Proust, *Remembrance of Things Past,* vol. 1, *Swann's Way* and *Within a Budding Grove*, tran. C. K. Scott Moncrieff and Terence Kilmartin (New York: Vintage, 2002), 48–51.
[2]Vladimir Nabokov, *Speak, Memory* (New York: Vintage, 1989), 77.
[3]A recent study shows that when subjects are told they can find information on the web they are less likely to remember it. See Betsy Sparrow, Jenny Liu, and Daniel M. Wegner, "Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips," *Science* 333 (August 5, 2011): 776–8.

[4]Wendy Chun, *Programmed Visions: Software and Memory* (Cambridge, MA: MIT Press, 2011), 160.

[5]Francis Crick, *The Astonishing Hypothesis: The Scientific Search for the Soul* (New York: Scribner, 1994), 3.

[6]Daniel Dennett, *Consciousness Explained* (New York: Little, Brown, 1991), 431.

[7]Robert Jastrow, *The Enchanted Loom* (New York: Simon & Schuster, 1983), 168.

[8]Ulric Neisser, *Cognitive Psychology* (New York: Appleton-Century-Crofts, 1967), 285.

[9]As Walter Benjamin notes in *Berlin Childhood*, "Memory is not an instrument for surveying the past but its theatre."

[10]Daniel Schacter, *Searching for Memory* (New York: Basic Books, 1996), 43.

[11]Ibid., 66–7.

[12]Ibid., 70.

[13]Ibid.

[14]Dan McAdams, *The Stories We Live By: Personal Myths and the Making of the Self* (New York: Guilford, 1993), 28.

[15]Walter Benjamin, *Illuminations: Essays and Reflections* (New York: Schocken, 1969).

[16]Jorge Borges, *Ficciones* (New York: Grove, 1994). The Russian journalist Shereshevskii, described by Alexander Luria, had a Fuentian memory and could recall virtually everything that had happened to him. This did, indeed, prevent him from being able to think on an abstract level.

[17]BBC interview, 1962, http://lib.ru/NABOKOW/Inter02.txt.

[18]Shelley Taylor, *Positive Illusions* (New York: Basic Books, 1989).

[19]Chun, *Programmed Visions: Software and Memory*, 133.

[20]See *RB 1980* (Collegeville, MN: Liturgical Press, 1980), 459–63.

[21]Esther de Waal, *Seeking God: The Way of St. Benedict* (London: Fount Paperbacks, 1984), 70.

[22]Vickor Mayer-Schönberger, *Delete: The Virtue of Forgetting in the Digital Age* (Princeton, NJ: Princeton University Press, 2009), 1.

[23]Anthony Giddens, *Modernity and Self-Identity: Self and Society in the Late Modern Age* (Stanford, CA: Stanford University Press, 1991), 54.

[24]Dan McAdams, "Personality, Modernity, and the Storied Self: A Contemporary Framework for Studying Persons," *Psychological Inquiry* 7, no. 4 (1966): 298.

[25]Ibid.

[26]Madan Sarup, *Identity, Culture and the Postmodern World* (Athens, GA: University of Georgia Press, 1996), 92.

[27]Warren McCulloch, "Why the Mind is in the Head," *Dialectica* 4, no. 3 (1950): 192–205.

[28]Walter Benjamin, "The Storyteller," http://slought.org/files/downloads/events/SF_1331-Benjamin.pdf.

[29]Noreen Herzfeld, *In Our Image: Artificial Intelligence and the Human Spirit* (Minneapolis, MN: Fortress, 2002).