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### MyLifeBits: the computer as memory machine

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**A**n old friend recently admitted, with a sense of understatement, that the size of his personal digital collection had outpaced his ability to keep track of its contents. Since acquiring a digital photo camera and a scanner in 1995, he had taken, stored, and scanned well over a hundred thousand pictures of his daily life, work, and family. His collection of DVDs and audio files also confronted the fate of infinite expansion, due to the increasing availability of peer-to-peer technologies. The act of recording and storing files, images, audio, and data, combined with occasional camcorder activity and heavy Internet use, absorbed almost every minute of his spare time. Space was no longer an actual or virtual constraint, since only my friend's film DVDs were still stored as material artifacts on the shelves, and computer RAM has become a bargain. His proposal to transfer the family's entire collection of old photographs and videotapes onto digital media had met some resistance from his partner, who expressed her attachment to the touch and feel of analog products. Digitization had also confronted him with issues of time and order: When would he have time to enjoy and relive all these recorded cultural and personal moments if he was constantly engaged in capturing and storing the latest experience? And what order would allow him to retrieve specific moments, since the danger of their getting lost in his multimedia repository of personal memories was growing by the day?

Digitization is surreptitiously shaping our acts of cultural memory—the way we record, save, and retrieve our remembrances of life past.<sup>1</sup> With the emergence of every new technology, from print to photography, and from the gramophone to the computer, people have hailed and despaired of new means of (self-)recording, storage, and retrieval. Since the 1960s, the shoebox with its variety of private documents (photos, letters, diaries, home videos, voice recordings, and so on) has expanded to a giant suitcase, or an attic. In addition, personal collections of

recorded cultural content (audiocassettes, videotaped films, taped television programs) are cherished as a formative part of autobiographical and cultural identity; they typically reflect the shaping of an individual within a historical time frame. Together, private documents and personal collections of cultural content constitute what I call “mediated memories”: memories recorded by and (re)collected through media technologies.<sup>2</sup> These technologies are never simply machines, since they are always firmly embedded in the contexts of cultural practice and defined by the cultural forms they engender. Few scholars have bothered to theorize the power of media technologies to shape the materialization of cultural memory, a shaping power that is particularly discernible in periods of technological transformation (Hoskins 2001; Gross 2000).

The gradual takeover of analog by digital technologies marks a new chapter in the mediation of cultural memory.<sup>3</sup> Digital technologies offer new opportunities but also introduce new complexities into people’s everyday lives; the computer, with its ever-expanding capacity for memory, is rapidly becoming a giant storage-and-processing facility for recording and retrieving “bits of life.” As more people discover the pleasures of digital recordings and presentations, many, like my friend, will also come to acknowledge the problems that accompany new technology, such as the issues involved in handling exploding quantities of personal data. The remediation of old and familiar forms or genres, such as family albums, handwritten letters, and scratched compilation tapes of favorite tunes, foregrounds the significance of materiality in the process of remembering. More implicitly, it raises questions about the various gendered roles in the collection and storage of a family’s heritage. To replace common analog forms, commercial enterprises are quick to offer such alternatives as family albums of digital photographs, or formatted weblogs (digital diaries, known as blogs) or scrapbooks, to facilitate storage and retrieval. Not surprisingly, these enterprises tend to focus on the products of memory, turning mediated expression into prefabricated exercises that are based on conventional analog genres. Software engineers and companies have recently started to address the question of storage by designing digital tools to accommodate the infinite expansion of our digital memories. Some projects simply promise to solve the urgent “shoebox problem”; others also purport to design completely new systems of memory storage and retrieval; yet others boast that their new software and hardware will revolutionize our very ability to remember.

Although we tend to attribute not just the bliss but also the dilemmas of expanding collections of memories to digitization, the dilemmas are neither completely new nor uniquely related to the computer age. A more interesting question, in my

view, is how digital technologies, by changing the material basis of our mediated memories, (re)shape the nature of our recollections and the process of remembering. Simply put, how do digital technologies affect acts of cultural memory? How do they frame new ways of collecting, storing, and retrieving mediated records of the past? How do they reshape the social, often gendered, use of memory tools? In this chapter, I argue that digital technologies, rather than revamping the products of memory, tend to change the performative nature of memory—that is, the way we create and deploy memories as a way of giving meaning to our lives. Digital technologies may introduce tentativeness as a stage in the memory process. They may prompt a multimodal sense of remembering. They may reconnect memories of the self to the reflections of others or to reports of events in the world at large. Finally, they may alter gender-specific roles in the creation of a personal heritage.

#### FANTASIES OF A UNIVERSAL MEMORY MACHINE

Fantasies of the perfect memory machine have always accompanied the invention of new media technologies. As McQuire (1998: 127–38) points out, the splitting off of living memory from so-called artificial or technological memory, first made possible by the invention of writing, engendered dreams of complete recordings as well as of systematic ordering and retrieval of lived experience. The German philosopher and mathematician Gottfried Wilhelm Leibniz (1646–1716) and the English mathematician Charles Babbage (1792–1871) are both credited with having envisioned mechanized memory tools, and these have been seen, in hindsight, as early precursors of the computer. Yet the most famous visionary of the modern memory machine was undoubtedly Vannevar Bush, former director of the American Office of Scientific Research and Development, whose fantasies had more than a slight impact on the ideas of contemporary engineers and scientific communities.

In his famous 1945 essay “As We May Think,” Bush expressed his fear that society would soon be bogged down by explosive growth in specialized publications, and he urged scientists and engineers to turn to the massive task of making our bewildering store of knowledge more accessible. Placing himself in the tradition of Leibniz and Babbage, who envisioned extensions of the mind in the form of calculating and arithmetical machines, Bush committed himself to designing a memory machine that would enable the storage and retrieval of various types of records: documents, photographs, films, television programs, and recordings of music and speech. He predicted the emergence of a new type of machine, one that would allow humankind to avoid repetitive memory tasks, and that would thus make room for

more creative thought. Analogous to the idea of a calculating machine was the “memex,” which Bush (1945: 14) defined as “a device in which an individual stores all his books, records, [and] communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility.” An essential feature of the memex was its ability to automatically select and retrieve any stored item swiftly and efficiently. Bush’s fantasy of the memex has been hailed as the greatest vision to have anticipated the computer age, but it has also been criticized for its ideological undercurrents of pioneerism and frontierism (Kitzmann 2001). For the purposes of my argument here, I am less concerned with Bush’s general ideas about science and progress than with his assumptions about the relationship between the human brain and the memory machine. Bush proposed to model his memex after the human brain, in order to artificially duplicate the mental process of memory retrieval, thus relieving the brain from a number of repetitive tasks. According to Bush, conventional systems for storage and retrieval, which classify data alphabetically or numerically, and in which one locates information by tracing it through subclasses and indexes, are cumbersome and counterintuitive. The human mind, he wrote, operates by association, and so should memory machines.

Bush’s concept of the memory machine is both mechanical and paradoxical. It is mechanical because he presumes an unambiguous vector between technology and the human mind: the memex ought to function as a human mind. Memory, to his regret, is fallible (“transitory”); therefore, a machine should take over part of the brain’s function, to prevent amnesia due to information overload. Ideas, memories, and thoughts are stored in documents or other recordings, and these recordings can be randomly retrieved. Writing about data, Bush equates “bits of information” with “ideas, memories, and thoughts” that can be put away in a repository and be retrieved randomly or by association. Nevertheless, the retrieval of documents from a database and the retrieval of memories from a human brain are fundamentally different processes with very distinctive goals. Documents or recordings can be stored in a database, and we want them to be there unchanged as we retrieve them and subject them to (re)interpretation; memories, by contrast, are never unchanging “data” that can be stored and retrieved in “original” shape. Or, as Winkler (2001: 103) puts it, “Material storage devices are supposed to preserve their contents faithfully. Human memories, on the other hand, tend to select, reconfigure, and forget their contents—and we know from theory that this is the real achievement of human memory. Forgetting, in that sense, is not a defect, but an absolute[ly] necessary form of protection.”

And Bush’s concept of the memory machine is also paradoxical. He states that

machines should be modeled after the human brain, but he does not account for the fact that the brain interacts with a machine, and vice versa; therefore, in Bush’s vision, there is no room for the logic that technology structures as well as reflects cognition—a serious flaw echoed in quite a few contemporary hypertext theories. Kendrick (2001: 231) has critically analyzed how notions of hypertext are structured analogously to the mind, thus promoting the “connection between a technology of links and nodes and the presumed associative ability of the mind.” Hypertext enthusiasts also proclaim that interactive software programs erase mediation, liberate the writing subject, and empower writers who were formerly restricted by the constraints of narrative discourse. Kendrick counters the commonplace notion that hypertexts, being more like the human mind, are more natural (hence better) with the notion that technologies of inscription actually shape human cognition. Hypertext gurus, however, like Bush, regard the human mind as the model for the machine rather than seeing the mind in interaction with the machine.

The presumed division between memory and machine—between lived experience and mediated experience—finds fertile ground in a notion popular among cybergurus: that brain functions can be taken over by digital equipment, thus disembodied the mind. As Smelik points out in chapter 9 of this volume, the masculine fantasy of transgressing physical boundaries to achieve the ultimate heights of virtual reality underlies the plots of quite a few cyberspace movies. Such a desired state of immateriality and disembodiment can also be traced in Bush’s notion of the perfect memory machine: detached from the body, the memory machine becomes a masculine model for total recall and, at the same time, for total control. The disembodied memory machine stands in unarticulated opposition to the “embodied” notion of remembering, according to which the use of memory devices is seen as one part of the very personal act of creating, storing, and retrieving memories. Not coincidentally, the activity of making family albums, storing pictures, and updating the family’s records is typically a female activity that calls for a personalized, embodied take on our conceptualization of memory and memory machines.

Bush’s fantasy of the universal memory machine, the memex, has inspired many recent projects concerning the inscription, storage and retrieval of personal memories or “bits of life.” In its 1945 utopian form, Bush’s concept prefigured the need for an exterior digitized memory with unlimited capacity. It anticipated the transformation of personal collections into multimedia compilations of images, text, and sound—technical tools for evoking memories. And, most of all, the memex foreshadowed the need for automated retrieval systems as a consequence of exploding quantities of information. In sum, the memex fantasy contained everything

needed to solve the “giant shoebox” problem, and so it is hardly surprising to find that many recent projects have been inspired by Bush’s fantasy. More important, though, is the fact that his mechanical and paradoxical assumptions about the machine’s resemblance to the brain are echoed in contemporary digital projects, although the terms of this proposition have been reversed. In the pages that follow, I discuss a specific contemporary project for designing a digital memory machine, a project that illuminates how the brain is no longer envisioned as the functional model for the computer, and how the computer now serves as a standard for the workings of human memory.

#### OF DIGITAL SHOEBOXES AND JUKEBOXES

The past decade has witnessed the emergence of various initiatives, commercially as well as privately funded, to address the complex management of digital personal collections. Despite differences among the goals and outcomes of these various projects, their common assumptions, which involve the functioning of personal digital collections in relation to memory, betray a peculiar desire to control and manage the human brain as if it were a computer system. These assumptions also demonstrate how the software design is inimical to any view of computers and the organization of personal memory as being interconnected. An extensive description of the various projects would be beyond the scope of this chapter; instead, I will concentrate on the analysis of one specific project, MyLifeBits.<sup>4</sup>

MyLifeBits was launched in 2002 by the Media Presence Group, led by Gordon Bell, at the Microsoft Bay Area Research Center, San Francisco.<sup>5</sup> The project leaders work on a comprehensive software system while simultaneously communicating their goals and mission to a broad audience.<sup>6</sup> The Microsoft engineers aim to build multimedia tools that allow people to chronicle the events of their lives and make them searchable, since memories deceive us: “Experiences get exaggerated, we muddle the timing of events, and simply forget stuff,” says one of the project leaders. “What we want and need is a faithful memory, one that records and builds on the reliability of the PC.”<sup>7</sup> In the many interviews that Gordon Bell has given to the news media, he pitches MyLifeBits not only as the solution to the “giant shoebox” problem but also as an organizer of life: everyday events will be fully recorded in text, images, and audio and stored in an orderly fashion on a computer. Each item will be tagged by audio or text annotation, and the tags themselves may also be cross-linked. Since 1999, Bell has been placing all his personal “bits of life,” including his parents’ photographs, onto a hard drive, to test the program. MyLifeBits,

he claims, is more than a memory; it’s “an accurate surrogate brain,” the realization of Vannevar Bush’s memex machine, which, like MyLifeBits, also featured automated retrieval as its highest ambition. In the future, Bell imagines, a compulsive recorder will be able to call up a single day in her life and get an hour-by-hour breakdown of what she did, said, and saw. One major advantage of the MyLifeBits software, in addition to its power of chronological retrieval, is its ability to allow a “Google-like search on your life,” Bell says—to enable retrieval of random memories via typing of a verbal tag.

The MyLifeBits software starts from the notion that stories based on artifacts (for example, photos) are tools for personal memory. The “shoebox” of digital items is viewed as a nonhierarchical repository of annotated data from which the user constructs a story every time she or he retrieves a single bit. Annotated stories can be browsed in the same way that material on the World Wide Web is browsed; that is, the user, by means of one or more keywords, simply follows the links connecting one resource to another. Thus memory is conceived as an associative journey through linked “bits of life,” which later can be re-presented in any mediated form (for example, as a PowerPoint presentation, a slide show, or a photo album). It is not the stored items themselves, but rather the story presentation enabled by item retrieval, that comprises the conceptual heart of this project. Our children’s or grandchildren’s most valuable inheritance, Bell claims, is not a shoebox of assorted items but a selection and representation of annotated stories. As one of his interviewers concludes, “Your cinematic deathbed flashback will already be uploaded to your hard drive.”<sup>8</sup>

In MyLifeBits, we see the idea of the computer as a model for the brain extended from the computer’s storage capacities to its capacities for retrieval and presentation. According to this model, not only does the human mind work like a computer, it ought to work like the World Wide Web, presumably the most efficient and effective navigation environment to have emerged in the digital age. Google, the celebrated Web-based search engine, becomes the prime conceptual model for running and activating the human mind; the Googlization of memory turns a brand name into an everyday practice. It is also interesting to notice how the Microsoft engineers construct the notion of life as a story and simultaneously equate life stories with mediated formats: personal memories cast as narratives, using images as material signposts, conceptually morph into preformatted media presentations—preferably copyrighted by Microsoft, of course. But the understanding of memory in terms of media formats is by no means an invention of the digital age. Ever since the late nineteenth century, we have been using the metaphor of the panoramic flashback to indicate a person’s hovering in the twilight zone between life and death;

in so doing, we have actually been projecting a cinematic *procédé*, including montage, slow motion, and black-and-white shots, onto a presumed physical-psychological process (Draaisma, 2002). The metaphor of film organizes its own perspective on the construction of memory, and so does the preformatted “cinematic deathbed flashback” that the MyLifeBits software has already placed on your hard drive. In the funeral business, not surprisingly, it is no longer a novelty to use a PowerPoint slideshow in presenting a review of the deceased’s life (Moran, 2002: 89–93). The digital secularization of memorial rituals could become much easier if you anticipated your life’s end by annotating its prelude in the course of living.

The design of MyLifeBits deftly reflects (and smartly caters to) two contemporary anxieties—about managing one’s life, and about amnesia. For an upscale Western audience, the notion of managing data has become an attractive metaphor for controlling life. To have an experience at a date and time of one’s choosing—rather like watching a television program that has been recorded on a VCR—takes some pressure off life’s fast pace, regulated by the clock. What could be more appealing to a contemporary user, struggling with time constraints in an experience economy, than the storage of events in the form of mediatized, retrievable memories? Anxiety about missing the experience of seeing one’s children grow up can be assuaged by the thought of a personal memory machine that allows precious moments to be replayed at a time more convenient than the ever-demanding present. Thus experiences etched in the dimension of time become a timeless repository of reruns. As for amnesia-related anxiety, it feeds on the prospect of such harrowing memory disorders as Alzheimer’s disease. Complete storage of one’s personal memory and collections should prevent the erasure of one’s unique identity. And if anxiety about forgetting is inextricably intertwined with anxiety about being forgotten, then, as MyLifeBits insists, the major beneficiaries of the software are one’s descendants. Immortality through software cultivation seems like a sound investment.

Projects like MyLifeBits capitalize on the digital enhancement of limited human memory. Because they view human memory as profoundly lacking in its prime function—to remember in full, and exactly, registrations of past events—they tend to focus on those products of memory that presumably repair that fallibility. In so doing, however, they fail to acknowledge a far more important function of digital media in the realm of human memory. If we consider media technologies as tools for selecting, framing, and encapsulating, rather than as mechanical devices for recording and storing, then media technologies play a constitutive role in the production of memories, and hence in the continuous (re)construction of our selves (Kuhn 2000). “Technologies of the self,” as Foucault (1972) calls them, involve a

relation to the past; events and reflections are encrypted by technological and discursive devices that actively locate our experience in time and space. To most software designers, human memory looks like a “natural” cognitive process that stands ontologically apart from the machine; it is abundantly clear, however, that brain and machine are mutually constitutive forces. Hayles (2002) has characterized the presumed division between the human and the technological in terms of an origin story; she urges critical understanding of the interactions between the materiality of inscription technologies and the contents they produce. Since this is precisely the aspect that is missing from the design of contemporary projects like MyLifeBits, I will elaborate on such interaction in the following section.

#### DIGITIZATION, (MULTI-)MEDIATION, AND THE GOOGLIZATION OF CULTURAL MEMORY

The question of how digital technologies affect the nature of our remembering processes deserves more philosophical contemplation, ethnographic research, and psychological theorizing than I can possibly offer in the limited context of this chapter. Nevertheless, considering the illustrative example of MyLifeBits, I suggest turning our attention to three areas that have rightly caught the imaginations of contemporary software engineers: the digitization, multimediation, and Googlization of memory. The material inscription of signifiers in bits, the convergence of singular media in multimedia machines, the embedding of personal collections in global networks—all these possibilities and technologies confront users with profound changes in their conventional cultural practices. How do the processes of digitization, multimediation, and Googlization affect the construction of memory? In the transformation from analog to digital technologies, some facets or stages in the act of remembering seem to get lost or be replaced by new ones, whereas others appear robust in the face of change. A new digital materiality is defined both by effacement and by innovation. In other words, we should pay attention not only to what digital (as opposed to analog) technologies erase in the process of mediating memory but also to what transformations of memory they allow.

##### Digitization of Memory

The digitization of memory tends to erase the materiality of inscription, but it gives rise to a new materiality that may affect cultural forms as well as (gendered) practices of remembering.

We are used to having a variety of objects in our shoeboxes, each one carrying a distinctive meaning by virtue of its materiality. Photos, diaries, home movies, tapes, and clippings represent particular content, but each also refers to a particular cultural form. The tactile qualities of photographic paper, the succinct style of a child's handwriting on the faded pages of a diary, and the audible ticks on an old audiotape have all become part and parcel of content. The material qualities of inscription and storage are inherent in the "sensation of memory," as Proust would call it, and we sometimes tend to overlook the significance of these qualities for the recollection process. People like to hang on to their analog shoeboxes and family albums, partly out of reverence for or attachment to these material sensations, whether the sensations are produced by fading photographic paper or scratched tapes.

Material forms are intimately related to cultural practices—to specific rituals, and to the circumstances in which objects come into being. In case of family photographs, for example, the process of storing pictures in a shoebox or in a photo album forms a constitutive part of the memory process, including the apparent order or disorder of the collection. It may be no coincidence that many people who buy digital devices refuse to bring their past collections into digital form. Such refusal does not necessarily mean that they are resistant to digitization; they may merely be reluctant to change the habits ingrained in their analog material practices. The cultural practices involved in producing and storing memorial artifacts are also gendered practices; in many families, the male role is often to produce the photographs or wield the video camera (acts of memory production that involve the handling of equipment), and the female role, conventionally, is to collect the photos or tapes, manage the shoebox, and organize the family albums. There seems to be an almost invisible division of tasks inscribed in the social production of memory, whereby producing, ordering, and storing are distinct stages defined by traditional gender roles.

What does digitization allow, and how does it potentially change the way people inscribe, collect, or (re)store memories? Digital cameras, to take one example, tend to increase the volume of pictures because taking and erasing a shot are now equally valid options; decisions about selection, presentation, and storage can be postponed. Photographs stored inside cameras or computers, where images may sit pending their erasure or materialization, represent a new type of materiality, a limbo between remembering and forgetting. Digital technologies, rather than encouraging completeness—the storing of every single aspect of life—may actually encourage a certain tentativeness as a stage in the act of memory. Indeed, if the distinct material conditions of analog photography should disappear, the digitization of photography may lead to new cultural forms and habits.

For one thing, digital cameras may develop the photographer's ability to manipulate memories. Since pictures are stages in a process of remembering, their new materiality is bound to affect their status as mnemonic aids. Instead of reinforcing the modernist belief in a division between "authentic" and "manipulated" memories—a division firmly held to by MyLifeBits—digital technologies may help reconceptualize memory as a process etched in time, as a mutating sequence of objects to be worked on, continuously subject to the vagaries of reinterpretation and reordering. For another, digitization may seriously affect the gendered practices of memory production and storage. Since the ordering and storing of memories no longer participates in a different "materiality" but is now an inherent extension of digital production, the conventionally female domain may attract the interest of males. There is a historical precedent for this reshuffling in the gendered use of media technologies. As Douglas (1999) has so beautifully documented, a radio set in the 1920s required the use of quite sophisticated technical skills (commonly the province of males) before it could be made to function as a media technology in a private home, and yet the primary function of this new appliance—allowing users to listen to music—attracted more men to what used to be a typically feminine cultural practice. The new "listening box" provided a perfect vehicle for men to explore emotional and social realms, but their tinkering with the machine still affirmed their masculinity. Thus the radio, as Douglas (1999: 14) states, played a central role in "tuning and retuning certain versions of manhood" (*ibid.*: 14). By the same token, it may happen that the digitization of memory tools will play a pivotal role in the renegotiation of "feminine" and "masculine" traits in memory production, storage, and (re)presentation.

#### Multimediation of Memory

The multimediation of memory tends to erase the specificity of particular media, and yet multimediation may also allow for a new synesthetic quality of memory.

People's individual memory objects and acts are structured by the logic of singular media types, woven into specific singular practices such as taking photographs, making home movies, or recording audiotapes. Most ordinary users exhibit an unarticulated preference for one medium over another—for instance, preferring photography to the taping of moving images. The cultural forms and practices inherent in these singular media technologies unconsciously shape the recording of experiences and thus profoundly affect later acts of remembering. We may not always be aware of how the choice of one medium over another quintessentially defines the

content of mediated memories, let alone of its impact on the construction of self-identity over a lifetime. The fact is, however, that the availability or coincidental presence of certain media technologies in one's life often determines one's preference for preserving memories in the form of text, audio files, or still or moving images.

How can the new multimedia equipment engender transformation in the process of remembering? It is peculiar that software project engineers take for granted people's desire to store "experiences" via exhaustive inscriptions of all their sensory facets so as to remember them "correctly" and "completely." But mediated memories usually serve not as exact recordings but as evocative frames. People want a representation that triggers particular emotions or sensations, not one that reinvents the experience as a whole. The recording medium once dictated one's choice of sensory inscription, but the question now is the extent to which the multimedia computer will change that choice, since digital cameras, in combination with software packages, can now be promoted as recorders not just of still pictures but also of moving images, sound, and text. I don't think that people have suddenly conceived a desire to use digital equipment in recording "complete" sensory experiences, but people may begin to experiment with the synesthetic qualities of the new machines. Just as parents used to preserve a toddler's first words, her cute hairdo, and her nonfigurative artistic expressions as separate paper or taped records, digital equipment now enables postmodern parents to comprehensively document a child's world in all its visual, auditory, and textual dimensions, and in one take. The ability to capture—perhaps inadvertently—multiple dimensions may shift a person's propensity to privilege one sense over others in the process of remembering. In other words, new digital technologies, by appealing to a variety of senses, potentially change the way we choose to frame the past in multimedial modes.

#### Googlization of Memory

The notion of Googlization tends to emphasize the idea of memory as a process of searching a fixed database, whereas the emphasis should be on the inherent connectedness of individual memory to a constantly evolving social context. When the model of an intelligent software agent (Google) is projected onto the process of remembering, the inherently transgressive and transformative qualities of human memory are effaced in a remarkable way. Memories, in the model that projects Google onto the process of remembering, are fixed entities on the shelves of the mental library, patiently awaiting a retrieval that will be triggered by a thought, con-

scious or coincidental. The digital imperative to "capture," "store," and "retrieve" personal memories conceived as fixed items seems to be based on outmoded notions of memories as mnemonic imprints and of the mind as an immense warehouse. Such notions have been discredited in favor of conceptions of a complicated encoding process whereby memories are preserved through elaborate mental, social, and media schemata. These schemata rework what the minds retains, "thereby shaping memory according to shifting forms, scripts, and patterns which themselves mutate along with changing social circumstances or according to the nature of the information received" (Gross 2000: 3). The content of a memory is significantly structured by specific needs, interests, or desires on the part of the one who remembers, just as it is also structured by collective experiences and technologies. It is my contention that human memory is not a fixed object but is instead a flexible agency through which identity development, and thus personal growth, is made possible. The power of Google lies not in its ability to search fixed sets of databases but in its ability to guide a person through a vast repository of ever-mutating items, yielding different content according to when and how these items are retrieved. Two unique qualities of Google—its connectedness to the Internet, and its ability to track and reproduce continuous mutations—are notably absent from MyLifeBits's projections onto human memory.

The denial of human memory's inherent mutability may seriously hamper the high ambitions of software designers. Projects like MyLifeBits tend to regard software programs as self-contained nostalgia machines—jukeboxes of individual memory—rather than as instruments of creative production that are continuously connecting the self to the larger contexts of community, society, and history. Memory, as recent theories propose, is not exclusively cemented either in the recall of individual experiences or in that of collective experiences, but a human being has a vested interest in connecting the two if she wants to pursue personal growth. As Thompson (1995: 209) concludes in his study on media and modernity, "Self-formation has become increasingly interwoven with mediated symbolic forms, and therefore mediality is a defining factor in the construction of self as a symbolic project." Digital technologies, particularly those based on use of the Internet, have the ability to link personal memory with publicly mediated materials, thus eliciting insights into the interconnections between self and world. For example, a diary or a scrapbook, in analog form, serves as a reflective instrument within the contained universe of a person's life (Mallon 1984; Katriel and Farrell 1991), but the new potential of networked computing is not, as Gordon Bell would have it, to scan all words into the computer in order to render one's personal testimony searchable



via keywords; rather, the real innovation is the computer's ability to allow a new type of diary (for instance, a weblog), a networked materiality that serves as the precondition for linking private reflection with public events, for opening up one's personal reflections to reciprocal reflections by others. The Googlization of memory is a callow conceptualization of what networked modalities can produce: true innovation in a digital memory machine would enable the emergence of new genres for connecting personal memories to others' reflections or to public resources. Needless to say, such a transformation calls for renewed awareness of the relationship between personal and collective memory; the Googlization of memory has substantially larger consequences than Gordon Bell and his associates want us to believe.<sup>9</sup>

Let me return, finally, to the problem of my friend who was facing the storage and retrieval of innumerable memory-infested digital files. Would he be significantly helped by a project like MyLifeBits? Would this software help him restore order to his plethora of digital memorabilia and give him time to relive the captured moments? My friend, confirming my hypothesis, told me that he was not exactly waiting for a sophisticated program or an intelligent agent to help him find particular items and turn them into smooth multimedia presentations. "The funny thing is," he said, "I am not very keen on retrieving the experiences I recorded. The value of my personal digital collection is situated first and foremost in the fun of recording and collecting, and perhaps second in knowing that these files are somehow stored, in coding, even if I will never retrieve them." His conclusion—that he treasures the act of collecting more than his actual collection—is not unique to those who record the events of their lives in the digital age; rather, it is quite analogous to the situation of a woman who keeps her love letters wrapped in ribbon in an attic but never, or almost never, looks at them. Apparently my friend's digital recordings had already served their purpose in the act of memory, even though, as objects of memory, they may never materialize beyond the virtual stage. While building his new digital environment, he had noticed how the new tools helped him arrange his everyday world and find new ways of inscribing his personal life in the dimension of time, in an orderly way.

And yet it was not simply or purely his own personal life that he wrapped in bits and bytes—it was the life of his family. His partner had protested his proposal to digitize the entire family's shoebox, and he respected her different take on preserving their common analog heritage. His technological tinkering had taught him the value of their collection as a communal resource, and her decisions about storage made him aware of their collection's preciousness. The last

thing he wanted was a single technological system that would erase these idiosyncratic preferences for storage and retrieval. Acts of memory, in short, are reified in practices that are material as well as sociocultural, and these in turn affect our understanding of ourselves and of our relationships with others and with our own past and present. It is the very thing that we love and look for in the digital—its morphing, flexible capabilities—that will have the biggest impact on what our memories will become.

Memory never has been quite what we remember it to be, since its mechanics, its materiality, and its social use change along with its technologies. The performative nature of memory is, I believe, very much underemphasized in the current research on memory tools. Engineers and visionaries, in their search for the perfect digital memory machine, have focused systematically on the products of memory and ignored the role of technologies in the active staging of memory—in the mutual shaping of memory and machine. Designers of digital tools could profit from more expansive ethnographic research—inquiries into the individual's creation and use of material as well as digital memories, and into processes for collecting, storing, and retrieving them. There is already an interesting body of research on the cultural meaning of material types of collecting and storing objects for later remembering (Muensterberger 1994; Pearce 1999; Danet 1997). Building on this research, we can try to find out more about the new digital materiality and about how it affects our everyday habits of constructing a personal and family heritage. Digital technologies seem to promote a different materiality, one that both complements and partially replaces analog objects embodying memory. Most important, these technologies shape the very nature of remembering as they become (literally) incorporated into our daily routines of self-formation. Contrary to contemporary software designers' assumptions, I think the ultimate goal of memory is not to end up as a PowerPoint presentation on a grandchild's desktop. The ultimate goal of memory (and of memory machines) is to help us make sense of our lives, to create our own "living" meanings of life.

#### NOTES

1. "Cultural memory" is a rather broad term that I find most satisfactorily explained by Bal, Crew, and Spitzer (1999), who define it as a process that can be understood both as a cultural phenomenon and as an individ-

ual or social one. Cultural memory inherently involves the mutual shaping of individual and collective, of self and community, through various products and processes of culture.

2. Mediation of memory is a concept that

I loosely derive from Thompson (1995), who theorizes the role of media in the construction of social and personal experience. See van Dijck (2004) for further explanation of this concept, which also forms the conceptual heart of my book on the use of digital technologies in personal cultural memory (van Dijck 2007).

3. When I speak of “media technologies,” I actually mean the intricate connection between technologies (hardware and software), cultural forms, and cultural practices. A photograph, for instance, encompasses the apparatus of the photographer, the cultural practice of (amateur or professional) photography, and the ensuing forms in which the picture materializes (for example, in a family album). In other words, the instruments, acts, and products of photography constitute the framework of memory.

4. See van Dijck (2005b) for a more extensive description and comprehensive compari-

son of various types of projects devoted to digital memory machines.

5. The scientific premises of the MyLifeBits project can be found in Jim Gemmell, Gordon Bell, Roger Lueder, Steven Drucker, and Curtis Wong, “MyLifeBits: Fulfilling the Memex Vision,” downloadable from <http://research.microsoft.com/barc/MediaPresence/MyLifeBits.aspx> (retrieved March 17, 2007).

6. See, for instance, Scheeres (2002). See also Hissey (undated).

7. I take most quotations from “Software Aims to Put Your Life on a Disk” (2002).

8. Scheeres (2002).

9. Google’s algorithms will never be instilled in human memory, but the fact that Google recently bought Blogger.com, one of the first weblog-software start-ups, indicates the company’s sharp eye for the individual’s potential to navigate the baffling complexity of the public and private roads crossing the digital world.