Chapter 6 - Coda

> So the whole question comes down to this: can the human mind master what the human mind has made?[1]

1. Digital Text and the Order of the Book

In Chapter 3 I posited that we are still living in what I have called the Order of the Book. I suggested that the book, in its material form and its institutionalised social role, represents a particular way of regarding the world. The material form of the book makes it an instrument that naturally favours the creation of lasting records of human thought, and that naturally imposes a hierarchical, orderly, and linear order on those records. Books are self-contained, unchangeable, authoritative: monuments of achievement. By extension, in a literate society like ours, an education system based on books favours a hierarchical, orderly, and linear way of thinking. In this manner the Order of the Book strongly influences—even determines—our way of conceptualising the world.

In Chapter 5 I argued that the digital textual medium, by contrast, constitutes a more level form of cultural transmission: democratic, fluid, tending towards disorder, consisting of endless chunks of textual matter, connected actively and deliberately through links, and passively and potentially through search queries, allowing endless permutations and recombinations. Moreover, these text chunks also find themselves in the company of chunks of other modalities, in equally rich variety and quantities. The well-governed and orderly textual world in which everything has its place is being confronted by a docuverse of text and other modalities that is decidedly disorderly, even anarchistic. In this universe texts behave in ways never before encountered, defying our attempts at control—at least when we apply the methods familiar from the Order of the Book.[2]

That digital texts may be collections of ones and zeroes residing on a disk instead of being a pile of paper; that such a disk may be accessed from anywhere in the world now that it is connected to the digital network; that those texts remain in a permanent state of flux: the implications of the new, virtual nature of text are only just beginning to become clear. The docuverse is characterised by mushrooming quantity, but also by lack of recognisable standards to judge quality, and by impermanence. It is intensely connected and truly global, but also highly fragmented. It comprises not just text in the narrow old-fashioned sense defined in Chapter 2, but also 'texts' in the wider sense given to the word by Don McKenzie:

> verbal, visual, oral and numeric data, in the form of maps, prints, and music, of archives of recorded sound, of films, videos, and any computer-stored information, everything in

[1] Paul Valéry, quoted in Langdon Winner, *Autonomous Technology: Technics-out-of-control as a Theme in Political Thought*, Cambridge, Mass. and London, 1977, p. 13.
[2] See my article 'New Mediums: New Perspectives on Knowledge Production' in *Text Comparison and Digital Creativity*, eds. Wido van Peursen *et al.*, Leiden: Brill, pp. 253-68, forthcoming. In *Everything Is Miscellaneous* David Weinberger suggests useful strategies as an alternative to our instinct towards control.

fact from epigraphy to the latest forms of discography.[3]

In McKenzie's Order of the Book all of these heterogeneous categories of text forms—including, we note, the distinct category of 'computer-stored information'—remained neatly and meaningfully distinguishable. On the Internet, however, all such 'texts', regardless of modality, now assume the same ethereal form of ones and zeroes. The written texts that used to be read in dedicated concentration and silent union between writer and reader, separate from any engagement with other mediums, are now moving into a larger medial universe where they compete with all the other texts clamouring for attention. What is more, those competing texts are no longer content to lie waiting patiently till a curious human deigns to turn enquiring eyes to them, but they insinuate themselves continuously, through inviting hyperlinks, through trawling searches, and even through dancing icons and beeping alerts, through active rss feeds.

The absence of entrance barriers in this heterogeneous docuverse has thoroughly democratised the means of textual production and dissemination. Anyone may publish anything, of any quality or quantity, subject only to legal restrictions—and even these tend to be easily circumvented. When the need to select—which dominates conventional book production—falls away, writers and other information providers don't have to limit the extent or nature of the materials they publish in any way. Think of the way analogue photos involve film that needs to be developed, with prints made at a certain cost per photo. Compare that to taking digital photos, at virtually no actual cost, in quantities limited only by the capacity of storage memory, whose cost keeps dropping steadily.

The way these digital texts are consumed is very different too. Once networked, their full text can be searched as a body. This new form of access replaces the identification, location, and searching of relevant texts through the conventional bibliographical mechanisms that reigned the world of print and imposed a hierarchical order on them. It brings novel ways of finding, promoting serendipity, but it also stimulates a sampling and zapping manner of reading. This way of consuming text is not unlike the way image and sound are consumed in today's world of multichannel TV and the seas of 'songs' that have replaced the 'albums' of yore. The search algorithms employed by various search engines may order their results in any number of ways, but whatever that order may be, those results will in no way resemble the outcome of conventional analogue searching, using card catalogues, indexes, footnotes, and the browsing of physical books. Where the use of consciously designed hyperlinks is still vaguely reminiscent of the print practice of footnoting, search engines offer an entirely new experience, for which no ready parallel presents itself in the Order of the Book.

One of the less obvious, and therefore more insidious, effects of the digital medium on the consumption of text concerns the shift of the interpretative burden onto the shoulders of the ordinary reader/user. As a result of the lack of restraint on publication imposed by the digital medium the tendency is clearly towards the provision of ever more data, including notably also more raw, unpolished materials. For example, in addition to an authorial narrative, argument, or interpretation based on certain sources, the sources

[3] D.F. McKenzie, *Bibliography and the Sociology of Texts* (*The Panizzi Lectures 1985*), London, 1986; enlarged edn., CUP, 1999, p. 13.

themselves may be presented. Sources can be published in the shape of an addition to the authorial narrative,[4] but they may also, by extension, and more radically, take the place of the authorial narrative, leaving their interpretation to the reader. The cheapness of disk space and the absence of entrance barriers means that anyone may place anything online. The fact that something is 'published' on the web thus says nothing about its status in the range between what in the Order of the Book would be called, say, source, note, draft or polished final product. Moreover, not all final products will be polished and bear the seal of a publisher, library or other organisation which may be trusted to have applied certain known or inferable selection criteria to it. It is then left to readers to sift through the vast mass of materials available in the digital document space, with the help of any devices they can muster. The use of search engines or portals to *locate* resources is the easy part. The challenge begins when it comes to judging the status and quality of the material found. In the Order of the Book the distinction between materials 'touched' by the instruments of the actors inside the traditional knowledge system and those not so privileged always used to be a vital one. In the digital arena the distinction is harder to make, especially as the number of participants grows, but also more relevant. Here the familiar bibliographic aids (including the metadata that replace them in the digital realm) must be supplemented by—insofar as they don't give way altogether to—new ones, such as collective tagging, user commenting, or aggregating services. Ultimately the onus is on the individual, not just as a passive consumer, but also as an interpreter, for himself and others, of the nature and status of the texts he encounters and consumes.

Employing a single perspective (that of book history) to the sequence of textual mediums that has culminated in the internet has thrown into sharp relief–and due detail—the enormity of the medial shift that is going on right now. It shows that there is, in fact, considerable discontinuity between print and the digital textual medium. However, when imposing this single perspective at the outset of this book, I did so on the assumption that the shared textuality of MS, print and the digital textual medium would make for continuity before anything. And indeed, while I have been emphasising the discontinuity, there is undeniably continuity as well. The publication in a digital form of texts that used to be published and distributed as, say, printed journals or books surely constitutes an obvious case in point. Moving the contents of the *Encyclopaedia Britannica* online has perhaps changed how it may be used, but it did not fundamentally change the text itself. The resulting digital publication remains what it always was: an encyclopedia under strict editorial design and control whose contents are widely regarded as trustworthy. When a newspaper like the *New York Times* runs a website with the same content in parallel to its printed edition, the impressive digital archive spinning off it represents a fantastically useful additional resource, but the articles presented to readers every day on the web are still largely the same as the ones delivered to the subscriber's doorstep. Books increasingly have a hybrid existence in paper and as a digital file for download, as, for example, the

[4] See the idea of a 'layered' book developed by Robert Darnton in 'The New Age of the Book', *New York Review of Books*, 18 March 1999, http://www.nybooks.com/articles/54. In scholarly publishing this has recently been conceptualised as enhanced or enriched publication (see William W. Cope and Mary Kalantzis, 'Signs of epistemic disruption: Transformations in the knowledge system of the academic journal', *First Monday* 14, 4 (April 2009), http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/2309/2163.

titles Amazon.com offer for their Kindle e-reader. (All this is apart from the fact that most printed books today start out their lives as digital files. That, regardless of how they end up being consumed, all texts are derived from digital files is a crucial aspect of that part of the digital 'revolution' that is not immediately obvious, and perhaps still largely remains a potentiality. Remember the example of the music industry mentioned in Chapter 1.)

A more fundamental continuity lies in the fact that the digital textual medium in being textual depends on the same dual skills of reading and writing as do manuscript and print. Text is processed in the brain differently than the (moving or still) images that we watch and the sounds (speech as well as non-speech) that we listen to, even though all now find themselves in what looks like one homogeneous medial space. This distinct form of cognitive processing is why I placed the textual mediums together in a category of their own. Whether by stylus and clay tablet, pen and paper, or keyboard and screen, writing means committing thoughts in the form of readable characters, which enable those thoughts to fly out over time and space to be read. It is the same writing and reading skills—taught in schools using manuscript and print—that are carried into the digital realm. Thus text, regardless of medial form, remains the chief way in which knowledge is transmitted. This must rank as a powerful manifestation of continuity surely.[5] In view of the fact remarked earlier, in Chapter 2, that reading is a far from natural brain activity, however, it is worth contemplating that, if it wasn't for the fact that our education system remains firmly based on books and literacy, the digital medium would probably be a great deal less textual in nature.[6]

On a meta level, too, there is a particularly noteworthy form of continuity. This is the fact that mediums themselves foster social and technological change. It should not be surprising, therefore, that mediums themselves are not immune either to mediums as agents of change. Among the more gradual changes the book has brought about is, for example, the almost imperceptible shift over the centuries in the social position of the book itself. As the Order of the Book established itself, the book's interface remained hierarchical, orderly, and linear throughout. The contents and appearance of books, their quantity and prices, meanwhile underwent drastic changes. In their wake, the book's position in society transformed subtly but inexorably. That the Bible was the first product of the printing press was nicely symbolic of the book's social status in the mid-fifteenth century. Since all knowledge, and so in a sense every book, was claimed to derive ultimately from that one first source, the first generations of printed books could be said to bask in the light of The Book. When by the time of Copernicus humans were losing their unique place in the cosmos, people had to get used to the notion that the world could not

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[5] Although the current state of affairs may be transitional (with a natural generational growth of the number of 'digital natives') there are suggestions that the multimedial and distractive context of digital reading, and the very different haptic experience, make for cognitively significant discontinuity. See, for example, Anne Mangen, 'Hypertext Fiction Reading: Haptics and Immersion', *Journal of Research in Reading* (2008), pp. 404-419, and Terje Hillesund, 'Digital Reading Spaces: How Expert Readers Handle Books, the Web and Electronic Paper', *First Monday* 15, 4 (5 April 2010).

[6] 'We humans were never born to read. We learn to do so by an extraordinarily ingenuous ability to rearrange our "original parts" — like language and vision, both of which have genetic programs that unfold in fairly orderly fashion within any nurturant environment. Reading isn't like that. Each young reader has to fashion an entirely new "reading circuit" afresh every time. There is no one neat circuit just waiting to unfold', Maryanne Wolf is cited as saying in the thought-provoking contemplation 'Does the Brain Like E-Books?' (*NYT*, 14 October 2009).

only be explained and understood, but actually be *made* by humans. Vice versa, if the world, and humans' place in it, was not fixed, people had increasingly to rely on their own observations and rational thought. Scientific explanation began to rival religious truths. The instruments humans were building were capable of showing them how things worked, taking the mystery of God out of the equation. The products of the printing press no longer had to be sanctified by divine authority, and knowledge was no longer sacrosanct. In effect, as knowledge became humanmade, it became ever more subject to change. The digital medium, which enables more people to participate in the production of knowledge, has further accelerated this process.

It was the invention first of writing, but more so of the printing press, that speeded up the process that ousted religion from its controlling and secure place at the apex of human knowledge, and encouraged its replacement by the combination of scientific observation and human reason that we have come chiefly to depend on since the Enlightenment to make sense of the world and our place in it. In writing and printing we created instruments that allowed us to create an unlimited range of further instruments of exploration and creation, fostering the illusion that we have control over the world. Paradoxically, by the late nineteenth century the sheer quantity of books, and their common availability in smaller, lighter, cheaper, and thus ever more ephemeral formats, had begun to undermine their own authority. This was the case even if they continued to present the same kind of content, which increasingly of course they did not. In addition to books as products of the eternal search for truth—whether that was scientific, philosophical or religious—more and more books became sources of fleeting entertainment. As the majority of books that came on the market moved into the realm of recreational reading they were ready to be treated more casually.

In this process of democratisation of knowledge, some of the qualities that I have just attached to the digital medium were already prefigured. The book's ubiquity had made it a democratising force, as well as imbued it with the same sort of recombinatorial potential that characterises the digital medium. The more books were being produced, and the more widely they were available at affordable prices, the more they represented a fount of knowledge to anyone with the inclination and intellectual ability to improve their understanding of any field of human endeavour. The same changing circumstances allowed readers all the more readily to find their own, uncanonical, way through that knowledge.[7] As in the case of the digital medium, not all that was made public deserved the label of 'knowledge'. The deluge of reading matter, popular or otherwise, was a concern to people around the turn of the twentieth centure no less than is to us the uncontrolled information explosion of the turn of the twenty-first.

The changes in the place of the book in society took place gradually, in some cases over a period of centuries, and their impact is not comparable to the immediacy of the transformations in the field of dissemination and consumption that the digital medium has brought with its two-way internet traffic, its ready accommodation of the smallest and most widely dispersed communities of likeminded souls, its wealth of free access to the widest range of products of the human mind. However, even if the *nature* of the changes in

[7] Jonathan Rose documents many, some very moving, cases in *The Intellectual Life of the British Working Classes*, New Haven and London, 2001.

the Order of the Book did not resemble these digital transformations, and even if they were only slow and incremental, yet underneath the semblance of order still exuded by the book's unchanged interface and reinforced by the long-established infrastructure of bibliographical control, the transfiguration of the textual world had already begun. Certainly the precipitation of the *rate* of change from the end of the nineteenth century prefigured the turmoil of twentieth-century developments in the sphere of new mediums.

2. The transformativity of the digital medium

> 'When technology extends one of our senses, a new translation of culture occurs as swiftly as the new technology is interiorized.'[8]

Over the course of the preceding chapters it has become clear that more than merely attend on social change, medial change facilitates, and even actively initiates it. Visionaries like Vannevar Bush and Douglas Engelbart saw a role for technology in enabling new ways of information processing. They were clearly aware that this amounted to more than just another, more convenient, way of arranging the same information. It is obvious, for example, from the title of Bush's essay 'As We May Think' that Bush regarded his Memex as enabling different ways of thinking, which was also what Engelbart thought of his revolutionary text processor. In Chapter 1 I declared it my working hypothesis that, like language, mediums have an influence on the way we think and, by extension, on our construction of the world. It was in search of the causes of this influence that I wanted to explore the salient features of the textual mediums. In Chapter 5 I argued that a large number of social effects can be attributed to secondary, and these in turn to primary, properties of the digital medium. The detailed analysis of these effects has provided a great deal of evidence for the notion of medial transformativity.

In the meantime of course, the transformative potential of the digital medium has by no means been exhausted. The number of digital-born documents has grown exponentially, and many analogue texts have already been turned into digital ones, extending the way they can be used. But it is still a relatively new realisation that some of our ingrained typographical habits are not standing us in the best stead in a digital environment. As more digital texts are created they will increasingly come to reflect their digital nature. That is to say, we will write differently, and we will write different things. In addition, the development of the medium has not come to a close. Like the Universal Machine, whose expansive nature they inherit, digital text and the digital medium will develop further. (How, we cannot know, but in 'The textual future' below I will hazard a guess or two.)

Since we find ourselves in the midst of these changes it is too early for any pronouncements on how the digital medium's transformative properties will affect the way we maythink in the longer term. As a matter of speculation it is not really part of the subject of this book. But that does not mean that nothing can (or should) be said about it.

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[8] Marshall McLuhan, *The Gutenberg Galaxy*, p. 40.

A few commonsense inferences can be made based on the observations made so far. That a shift in textual discourse is taking place from an author-centred to a reader-centred orientation, for example, seems incontrovertible. The trend towards the production and consumption of shorter units of text also seems unmistakable. The digital medium is a way of transmitting knowledge about the world that is inherently unstable, is not ruled by discursive logic, and is informed by a democratic temper. These characteristics have already changed our ways of thinking—and our concept of the world—in various ways. The way we construct knowledge, for instance, is rapidly becoming more social and more democratic, and so in the short run less fixed. This 'flattening' may well represent the next paradigm shift in our way of knowing. After the shift from knowledge based on religious authority to knowledge based on scientific authority we appear now to be moving to a sort of social knowledge based on personal convictions.

In an article entitled 'Is Google Making Us Stupid?: What the Internet Is Doing to Our Brains', Nicholas Carr has described how his use of the internet has affected the way he works and thinks thus:

> Over the past few years I've had an uncomfortable sense that someone, or something, has been tinkering with my brain, remapping the neural circuitry, reprogramming the memory. My mind isn't going—so far as I can tell—but it's changing. I'm not thinking the way I used to think. I can feel it most strongly when I'm reading. Immersing myself in a book or a lengthy article used to be easy. My mind would get caught up in the narrative or the turns of the argument, and I'd spend hours strolling through long stretches of prose. That's rarely the case anymore. Now my concentration often starts to drift after two or three pages. I get fidgety, lose the thread, begin looking for something else to do. I feel as if I'm always dragging my wayward brain back to the text. The deep reading that used to come naturally has become a struggle.[9]

Carr found his own experiences to chime with those of many of his friends and acquaintances. Certainly his description of these effects, though dramatic, does not sound entirely unbelievable. If Carr's article can perhaps be dismissed as a merely personal anecdote, others have invested considerable time and effort in analysing the way mediums are affecting our brain. In *Everything Bad Is Good for You: How Popular Culture Is Making Us Smarter* Steven Johnson provides a persuasive account of how over the last few decades mediums (games, television, the internet, and film) have changed the nature of our intelligence. Remarkably, this change is towards forms of intelligence that are especially amenable to being detected by conventional intelligence tests, hence appearing to make us smarter. Despite the good news heralded by the subtitle of his book, however, Johnson admits that there are 'hidden costs' to the achievement of the particular kind of smartness he describes:

> [I]t is true that a specific, historically crucial kind of reading has grown less common in this society: sitting down with a three-hundred-page book and following its argument or

[9] Nicholas Carr, 'Is Google Making Us Stupid?: What the Internet Is Doing to Our Brains', *Atlantic Monthly*, July/August 2008, http://www.theatlantic.com/doc/200807/google.

> narrative without a great deal of distraction. We deal with text now in shorter bursts, following links across the Web, or sifting through a dozen email messages. The breadth of information is wider in this world, and it is far more participatory. But there are certain types of experiences that cannot be readily conveyed in this more connective, abbreviated form. Complicated, sequential works of persuasion, where each premise builds on the previous one, and where an idea can take an entire chapter to develop, are not well suited to life on the computer screen.[10]

Prominent British cognitive scientist Susan Greenfield comes to very similar conclusions. Greenfield has made a number of intelligent predictions about the cognitive future of the human race in *Tomorrow's People*. In this book-length essay she projects effects of technology, departing from clearly established present trends. Since the mind is in a two-way relationship with technology, Greenfield writes, '[j]ust as we can ponder on how we will view new technologies, so those new technologies will impact on how we view the world' (p. 63). The technology Greenfield zooms in on in the chapter on education is, not surprisingly, the computer. She predicts a more immersive IT-based learning environment, suggesting that as a result perhaps 'future generations will no longer have the attention span or cognitive skills to follow the narrative of a story' (p. 167). She admits that 'we have no idea whether this new type of environment will be ultimately beneficial or deleterious. It could be the case that multimedia stimulation, assaulting the senses, hard-wires the brain for faster cognitive processing. On the other hand, what about reflection and imagination?' (p. 169).

> As children and adults alike participate in novels and games, and as those same users have less and less practice at abstract thought, less imagination and less time for reflection, so there is a risk that the significance of facts and the desire to understand what is happening to and around you may diminish. (p. 174).

In the longer term, will our potential—and our willingness—to engage with the world analytically be affected?

Greenfield's exploration is of course speculative. However, being based on a thorough neuroscientist's understanding of the working of the human brain, it ought to give us some pause. Is the scenario she sketches a cause for alarm? Only if we presume to 'judge new minds by old values. Since the essence of the human brain has been, for tens of thousands of years, adaptability to new external demands, perhaps we should simply face the fact that the new generation of brains will be fundamentally different from ours, in that they will be specifically suited, cognitively and physically, to computers and a cyber-world' (p. 169). The immersive and fast world of text messaging and computer games is a long way from the contemplative intensive reading of the pre-industrial era, even if the first signs of a less contemplative and more information-gathering and learning type of reading

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[10] Steven Johnson, *Everything Bad Is Good for You: How Popular Culture Is Making Us Smarter*, Penguin, 2006, p. 185. Carr and Johnson have been joined more recently by many other commentators. See, for example, the contributions to a section on 'The Future of the Book' in the Autumn 2009 edition of *The Wilson Quarterly*, pp. 47-64.

behaviour go back to the twelfth century.[11] McLuhan's style may have rubbed too many scholars up the wrong way, but he was nothing if not a visionary first of all in recognising the insidious effects of medium technologies and secondly in surmising how they affect human cognition. Once again (and I will dwell on this phenomenon a little longer in the next section) the accelerating *rate* of change since McLuhan has intensified the effects.

3. The mechanisms of change

I have demonstrated how social effects were derived from technological properties. Does that mean that it is possible to conclude that these effects are wholly determined by technology? Of course not—at least not on the basis of the evidence collected so far. I have confined myself to social factors that had their origin in technological properties; I did not examine any *external* social factors. For example, I did not address the issue of the penetration rate of the digital medium. The rate at which new technologies are adopted is affected by a variety of external factors.

A prime factor is consumer motivation. Depending on its perceived practicability, pleasure, and pay-off, willingness to try new technology may range from eagerness to active resistance. A powerful role is also played by the amount of persuasion, or even downright pressure, exercised by commercial interests on consumer motivation. An instructive comparison is with the way the chipcard is being pushed by banks eager to reduce the cost of cash payments. Consumer resistance has not stopped banks from closing deals with government and business to stimulate its use.

The 'accretion' effect here plays a significant role. Invariably, a point is reached in the adoption process when it is speeded up, not necessarily voluntarily but as a result of the fact that the alternative is to be stuck with a dying technology or service. Here an instructive parallel is with mobile phones. After the critical point was reached when voluntary adoption of mobile phones had made the provision of public phones uneconomical, the remainder of the public was forced to adopt the mobile phone by the lack of a public alternative. The same looks set to happen in the case of the increasing online consumption of scholarly publications, initially journals, but eventually also monographs. Online consumption will drive up the price of their printed counterparts until the critical point is reached when it is no longer economical for publishers to produce them. There are clearly advantages to the academic community in having digital journals, but commercial interests are likely to be the prime driving force behind digitisation. Either way the driving force is social rather than technological. In this respect it is worth considering a similar scenario for the case of ordinary books. Supposing that e-book readers are going to be widely adopted, there will inevitably come a moment when the number of people who choose a digital download instead of buying the paper edition reaches a critical level. This is the moment when demand for the physical product drops

[11] Citing Ivan Illich, *In the Vineyard of the Text* (1993) W.P. Gerritsen has suggested that such information-gathering and learning type of reading behaviour is described in the twelfth-century *Didascalicon* of Hugo of Sint-Victor (W.P. Gerritsen, *Het alfabet als zoekinstrument: Een beschouwing over de geschiedenis van de alfabetische index*, Leiden, 2003, pp. 18 ff.). This fits neatly with the renewed application of word spacing and the growth of silent reading at that time (see Chapter 3 above).

below the point where a paper edition can be economically produced. Below a certain print run the book's retail price will simply become so high that people will elect to buy the digital edition instead, effectively putting an end to the print format (except in the more expensive print-on-demand form).

Not least, there is the goverment's role in speeding up or slowing down the adoption rate of digital alternatives to print. Governments at many levels may do so through any number of formal and informal policy instruments, such as the level of investment in infrastructure, the choice between providing digital or paper-based information and services, proffering or withholding digitisation subsidies, sales tax regimes, and so on.

The links I established in Chapter 5 between social change and the medium's technological traits made a strong case for technology-driven social transformation. Technology appeared to have a tendency to impose its own agenda on society. However, technological change is not autonomous, and many social factors play a role. By and large though, all of these social factors would affect the *rate* of change more than the nature of the changes. While social factors may affect the adoption rate of the digital medium, it is that medium itself that causes the social changes, not we. Even inventors and creators of technology have little influence. A direct link between effects projected by inventors of technologies and actual social effects, for example, is missing, or at best extremely tenuous.

The preceding chapters presented a number of great thinkers and innovators who consciously attempted to influence the social construction and use of knowledge through their ideas and inventions concerning mediums and medium use. In that role Paul Otlet, Vannevar Bush, Ted Nelson and Douglas Engelbart made a personal appearance, but there are of course countless others whose individual contributions I did not pause to consider. Indeed of many individual contributions there is probably no record at all. Ultimately, though, the different way of thinking engendered by the digital way of representing text and the knowledge it contains can only very rarely be pinpointed to a particular inventor or the intentions behind a particular invention, and no projected trajectories were being followed. Rather, different ways of constructing and using knowledge, and different ways of thinking, have emerged as unintended effects of the joint workings of a number of technological properties.[12] The list of historical examples of inventors who envisaged entirely different uses for their technologies from the ones that were eventually condoned socially is endless.

The conclusion that the role played by technology is indeed larger than that played by social factors seems inescapable. The limited extent of human control over technology is clearly a major issue. It is one thing to create technologies that work. The real challenge is how to control them. Not only do they not necessarily turn out the way their inventors had envisaged, but they are put to uses no one had foreseen. In that sense technologies can be said to have more 'side effects' than intended effects. Moreover, once a technology has been devised it cannot be put back in its box. If people see a certain use for a technology,

[12] As Mark Poster has phrased it: 'I maintain that technologies are no more monosemic than language or action, that the impact of technologies is never the linear result of the intention of the creators or of their internal, "material", capabilities' (in 'The Digital Subject and Cultural Theory', in *The Book History Reader*, eds David Finkelstein and Alistair McCleery, London, 2006, pp. 486-93, on p. 492).

that is how that technology will be used. The mere realisation that a certain technology is capable of being created will, more often than not, lead to its eventual creation, regardless of social desirability. Similarly, the realisation that an existing technology has a certain potential, tends to lead to that potential being realised, regardless of the intention of any inventor or creator. This lack of control over technology has far-reaching effects in the case of medial technologies because mediums play such a central role in the social construction of knowledge. Those effects are the more insidious because, as we saw in Chapter 1, the human brain has a habit of trying very hard to make mediums invisible.

The basic imbalance between the social and the technological roles in the sociotechnical mechanism first posited in Chapter 1 can also be explained by a 'memetic' view of cultural transmission. In *The Selfish Gene*[13] Richard Dawkins first introduced the concept of the meme as a unit of cultural transmission in analogy to the gene as the unit of genetic transmission. He based his concept on the more fundamental notion that 'all life evolves by the differential survival of replicating entities' (p. 192). With this notion Dawkins laid the foundation for a universal Darwinism, which applies the Darwinian view of biological evolution to other disciplines:

> The gene, the DNA molecule, happens to be the replicating entity that prevails on our own planet. There may be others. If there are, provided certain other conditions are met, they will almost inevitably tend to become the basis for an evolutionary process.
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> But do we have to go to distant worlds to find other kinds of replicator and other, consequent, kinds of evolution? I think that a new kind of replicator has recently emerged on this very planet. It is staring us in the face. It is still in its infancy, still drifting clumsily about in its primeval soup, but already it is achieving evolutionary change at a rate that leaves the old gene panting far behind.
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> The new soup is the soup of human culture. We need a name for the new replicator, a noun that conveys the idea of a unit of cultural transmission, or a unit of *imitation*. 'Mimeme' comes from a suitable Greek root, but I want a monosyllable that sounds a bit like 'gene'. I hope my classicist friends will forgive me if I abbreviate mimeme to *meme*.[14]

Memetic cultural transmission then is the transmission, through imitation, of units of culture, or memes, by human brains functioning as their vehicle. The memes obey their own evolutionary imperatives. As 'selfish' replicators, like our genes, the memes we create are bent on achieving longevity, fecundity, and fidelity of reproduction. However, just as genes adapt to the material and social conditions of their organisms in order to maximise their chances of survival, the memes, too, adapt to the circumstances of their human hosts.[15] In the sociotechnical mechanism of cultural transmission, technology, like nature, has the upper hand over social influences, or nurture.

The obvious example of memes in the present context is medial technologies. As

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[13] Dawkins, *The Selfish Gene*, Chapter 11, 'Memes: The New Replicators'.
[14] Dawkins, *The Selfish Gene*, p. 192.
[15] As Daniel Dennett has phrased it, 'a human mind is itself an artifact created when memes restructure a human brain in order to make it a better habitat for memes' (quoted by Susan Blackmore in *The Meme Machine,* OUP, 1999, p. 207).

memes, medial technologies are of an unusual type in the sense that, while being memes themselves, they are also implicated in the process of copying other memes from one human host to another. They could be called 'meme-replication technology'. The longevity, fecundity, and fidelity to which memes aspire is aided signicifantly by the longevity, fecundity, and fidelity that can be bestowed on them by the various mediums employed in the copying process. An important characteristic of mediums as memes is that not only do they aid the dissemination of memes vertically (i.e., diachronically through time), like genes, but also horizontally (i.e., synchronically, through space).[16] This dual role of being themselves memes that want to be transmitted while at the same time assisting in the transmission of other memes is a characteristic they share with language. It is part of the parallel between mediums and language I posited in Chapter 1. Indeed, regarded as a meme, language has been called a parasite or, more sympathetically, a symbiont in its relationship with the human brain.[17] This is a useful way to look at mediums too.

Both the sociotechnical mechanism and the memetic theory suggest the evolutionary nature of the transformative process that mediums engender. As an evolutionary necessity, continuity is a social intuition. This is illustrated, for example, by the way we try to adapt many digital practices to our longstanding analogue habits. Why then do we nevertheless tend to experience the development of the digital medium as revolutionary rather than evolutionary? One reason may be the lack of control implied by the memetic view of mediums and technology, of which we become more aware as society comes to depend on them more. Another reason is the impact and scope concerned. Already the consequences of the digital medium are greater than those of the coming of the book. Compared to the manuscript, print offered greater convenience of reproduction in the sense of improved speed and reliability. But the scope of the digital medium has widened tremendously compared to writing and print. The digital medium covers in addition the writing, distribution, and consumption of text, making it much more comprehensive as a medium.

But what is making the effects of all this truly intrusive and revolutionary is the increasing speed of the changes. That the rate of cultural and social evolution is speeding up,[18] leaving 'the old gene panting far behind', is explained well by memetic theory. Here the dual role of language and mediums is particularly obvious: writing, and *a fortiori* printing and the digital textual medium are themselves causing the acceleration of change by helping the replication of new products of human culture. Small wonder then that books are beginning to be perceived as too slow for effective communication compared to the digital medium. Much of the most relevant thinking on digital culture happens on the web, which in turn accelerates change. In fact the speed of change is so fast that we are almost beginning to experience a generation gap, with younger generations thinking and

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[16] Susan Blackmore made a first attempt at applying memetic theory to mediums in *The Meme Machine*, especially in the chapter 'Into the Internet'.

[17] By Terrence Deacon in *The Symbolic Species: The Co-evolution of Language and the Human Brain* (Penguin, 1997, pp. 110-15). See also George van Driem, *Languages of the Himalayas* (2 vols.), Leiden, 2001, vol. 1, pp. 33ff.

[18] This is in itself not a new observation; cf Alvin Toffler, *Future Shock*: 'compared with the biological evolution of the species, cultural and social evolution is extremely rapid' (p. 21). Citing Julian Huxley, he goes on to say that 'The tempo of human evolution during recorded history is at least 100,000 times as rapid as that of pre-human evolution' (p. 22).

working on this side of the divide, leaving older generations, brought up on a strict diet of print, feeling out of the loop on the far side.

As a consequence, the very concept of literacy appears to be in need of adjustment. Children appear to be comfortable with multimediality, non-linearity, and multi-tasking, processing streams of discontinuous information in which iconic and linguistic information are intermixed in a radically new way. It has even been suggested by some that they are able to follow—as well as reproduce—the narrative lines of a number of television programmes they watch simultaneously, and do their homework while maintaining their social network.[19]

If not our scientific understanding of the Darwinian nature of most social as well as natural processes, then our day-to-day experience ought to have taught us by now how little control we have over the technologies we invent—and that includes mediums emphatically. Though we may *know* that our tools make us as much as we make our tools, in reality that notion, insofar as the realisation has hit home at all, has become a sort of new piety—all but an abstract thought. Curiously we continue to behave as if we were capable of creating technologies as straightforward tools with which to mould ourselves and society as we wish. There is a certain amount of cognitive dissonance in the way we continue to believe that we can have everything under control at the same time as we know that we cannot. Humans continue to play lord and master over nature and society, even as scientific research yields ever more evidence that free will is largely if not wholly illusionary.[20] Yet somehow this fails to instill the necessary humility in our thinking. The risk that indeterminate and indeterminable long-term consequences of nanotechnology and bioengineering may affect us adversely is obviously huge. From time to time the obvious lack of control we have over them raises concern that we are possibly insufficiently equipped 'to come to grips with the ragged fringes of human understanding—the unknown, the uncertain, the ambiguous, and the uncontrollable.'[21] Yet even then all attempts to regulate the development and application of technologies with such obviously far-reaching consequences and their attendant risks fall spectacularly short.[22]

Mediums, by contrast, are barely even regarded as technologies. Especially the textual ones singularly fail to raise any concern, let alone alarm. Even most social scientists focus their interests on the human agents *behind* medium use, rather than on mediums as agents in their own right. True, as a technology mediums must be denied a *motive* to change their users. But that does not mean that their use doesn't have any effects on their

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[19] See, for example, the inaugural lecture of Wim Veen as professor of Didactics and Curriculum Development, *Flexibel onderwijs voor nieuwe generaties studerenden*, p. 5. Newer research suggests that such multitasking is much less efficient than has been thought; for example, Eyal Ophira, Clifford Nass, and Anthony D. Wagner, *op. cit.*

[20] The more our scientific knowledge about the way the human brain functions grows, the greater the evidence that Spinoza was right, and it is merely a mistaken belief that our will is free.

[21] Sheila Jasanoff, 'Technologies of Humility: Citizen Participation in Governing Science', *Minerva* 41 (2003), pp. 223–44. See also Edward Tenner, *Why Things Bite Back*, and Cornelia Dean, 'Handle With Care', *NYT*, 12 August 2008.

[22] At least Jasanoff proposes taking a position of humility against a long history of positivist optimism about our ability to calculate, and thus control, technological risks. Yet in the final analysis her assessment of the problem remains essentially positivist and optimistic, too. Given a more humble attitude on our part, she suggests, we should be able to make a better job of asessing risks and be able to prevent disaster. I doubt that the history of technology justifies such optimism.

users. They are all the more insidious in their consequences for their innocuous appearance as neutral conduits.

It is not at all certain that such attainments of conventional literacy as rational discursivity and the analytical habit *are* set to disappear as the digital textual medium gains ground. Moreover, it is not necessarily problematic should they disappear. As Susan Greenfield suggests, the new generation of brains may simply adapt to this new reality. But it is important to realise that, should they disappear, then no one has willed that to happen and, what is more, no one would be in a position to stop that from happening.

4. The textual future

> No man of intelligence will venture to express his philosophical views in language, especially not in language that is unchangeable, which is true of that which is set down in written characters. [23]

The death of the book has been announced countless times. That prolific French man of letters Octave Uzanne is on record with the following prediction in a story entitled 'Le fin des livres' (The End of Books):

> I do not believe (and the progress of electricity and modern mechanism forbids me to believe) that Gutenberg's invention can do otherwise than sooner or later fall into desuetude as a means of current interpretation of our mental products ... our grandchildren will no longer trust their works to this somewhat antiquated process.[24]

As the slightly antiquated wording of this quotation already suggests, Uzanne is here not assessing recent digital developments. In fact his story, from the collection *Contes pour les Bibliophiles* which he produced with his friend Albert Robida who made the magnificent drawings for it, dates from 1894, and the 'modern mechanism' in question was phonography. Though the entire piece is very tongue in cheek, it evinces a technological optimism that is still very much alive. The now almost forgotten Uzanne (1851-1931) got much of his vision of the 'intellectual life of Tomorrow' wrong. The 'highest situations' in journalism have never become 'reserved for robust young men with strong, resonant voices, trained rather in the art of enunciation than in the search for words or the turn of phrases', and 'literary mandarinism' has not disappeared.

So why do we persist in this game of fortune-telling if it is clearly so hazardous? That is of course less because we are so interested in the future of our technologies than because we continue to be fascinated by, if not obsessed with, our own future. In that regard, Uzanne got it a lot less wrong. He believed in 'the success of everything which will favor and encourage the indolence and selfishness of men'. This includes the replacement of writing by sound recording:

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[23] Plato, 'Seventh Letter' 343a, in *The Platonic Epistles*, tra. J. Harward, CUP, 1932, p. 137.
[24] Octave Uzanne, 'The End of Books', *Scribners Magazine* 16 (August 1894).

> Hearers will not regret the time when they were readers; with eyes unwearied, with countenances refreshed, their air of careless freedom will witness to the benefits of the contemplative life. Stretched upon sofas or cradled in rocking-chairs, they will enjoy in silence the marvellous adventures which the flexible tube will conduct to ears dilated with interest.
>
> At home, walking, sightseeing, these fortunate hearers will experience the ineffable delight of reconciling hygiene with instruction; of nourishing their minds while exercising their muscles for there will be pocket phono-operagraphs, for use during excursions among Alpine mountains or in the cañons of the Colorado.

It may not be the iPod's main claim to fame that it favours and encourages 'the indolence and selfishness of men', but that we can observe its fortunate owners listening '[a]t home, walking, sightseeing' with an 'air of careless freedom' is beyond doubt. It just took a little longer than he was imagining, but in the age of personal audio systems podcasts and audio books have certainly begun their triumphal march on our car stereos and personal audio systems.

So let me indulge in a little speculation. And let Octave Uzanne's failure to predict the future correctly not lull us into a false sense of the book's impregnability. The phonograph was not a textual medium: the computer is. The computer's role in shaping us into what we are going to be cannot easily be underestimated. Its transformative properties as more and more textual traffic is moving from analogue to digital channels have already been spelled out. The speed at which the transformations are taking place has accelerated beyond anything we have seen before. To add to that, if the developments of the last century and a half are anything to go by, the future is going to be increasingly mediated overall. That is to say that mediums will be used for ever more social purposes. Take the examples of the recent mediatisation of, say, shopping, making airline reservations, or sharing photographs. Whether in the form of the invention of new mediums, or through novel uses of existing mediums, the mediatisation of the future is likely to be mostly digital. Not only is the digital medium as we know it being used for entirely new forms of mediation, this also involves new modalities being added to the existing range of the digital medium. The current experiments with cyber sex may serve as a case in point. If successful they would add the modality of touch, leaving smell and taste the only senses that cannot yet be mediated, but as observed in Chapter 2, neither is a dominant force in objective (repeatable) social communication.

Transformations in medium use have been going on for centuries, but towards the end of the nineteenth century their speed began to accelerate dramatically. Since that time the number of mediums has grown rapidly, and so, as a consequence, has the importance of mediums for society. As film, radio, and television in turn carved out prominent positions for themselves, the relative importance of text in the medium spectrum has diminished accordingly. However, the 'new media' have only partly taken the space of text: mostly from time spent on leisure, and gathering news (though that could be called a leisure time pursuit as well). The use of text has never fallen below the minimal threshold automatically set by its use in education. In terms of such crucial areas as knowledge transmission, especially in education, and administration text has so far held its own, even

if the future is not at all certain.

As I suggested at the end of Chapter 5, it is clear that we are in a transitional stage. In the competition with the book—and other existing mediums—the digital textual medium is in a process of finding its own niche. This happens by elbowing the book and other mediums into theirs, while it solicits general acceptance of itself in its own right. Two major questions insist themselves. The first one is, if text does manage to hold its own, how will the book and the new digital textual medium cohabit? Will the book continue to serve as the most efficient reading machine for the many purposes it now serves, at least for the foreseeable future, or will digital reading machines take over from the book? The second question is a more fundamental one: in the increasingly mediated future I have just sketched, what might be the continued role of text? As other communicational modalities, both existing ones and ones yet to be devised, will continue to make inroads into the field of text, might not text lose its important position in human communication?

I would first like to have a look at the question how the relationship between printed and digital text forms is likely to develop. Can any factors perhaps be identified that impede or stimulate the development of one at the expense of the other? Some functions are being shifted from print to digital, for the new entrant's growth is, inevitably, at the expense of existing mediums. This is as we would expect. However, I suggested earlier that the differences between the two mediums are huge, leaving ample room for complementarity. That would appear to point at the likelihood of each of the two textual mediums being able to find its own niche. Against that view of complementarity it might be argued that, as the use of the digital medium proliferates and speeds up, the specific features of the book that are incapable of being replaced digitally (such as its haptic, hierarchical, unchangeable, monumental nature, and the less distractive reading experience it offers) are likely to become gradually less in demand socially, making them less relevant. Moreover, as a Universal Machine the computer possesses the capacity to offer substitutes (either by imitation or by the creation of alternatives—which may be even better suited for a particular purpose) even for properties which we deem to be irreplaceable.[25] This would lead inexorably to a diminishing importance of the printed book.

Roughly speaking two scenarios may be envisaged. The first scenario is that the two medial systems will continue to co-exist. In this scenario, each medium has strengths of its own (resulting from its salient features) sufficient for it to attract particular uses. After an equilibrium was reached, a peaceful co-existence between the two textual mediums could ensue. In this scenario books will continue to be produced and read in large numbers, far into the future, even if they will not necessarily command the center of the cultural stage. Besides the evanescence, non-linearity, multimodality of the digital medium the book will continue to offer desirable fixity, linearity, and mono-modality. Even as it has come to the end of its evolution, the book cannot really be equalled as a pretty near-perfect 'reading machine'. The Order of the Book may lose its monopoly, but it will not give way to a digital

[25] Whether the 'vook' (video-enhanced book; http://www.vook.com) constitutes either a suitable substitute for existing functionality or a credible example of the sort of novel functionality destined to win the hearts and minds of modern readers remains to be seen. See http://www.nytimes.com/2009/04/05/business/05stream.html for an example of such a reimagination of the printed page. See also http://movels.wordpress.com/.

order. Over the centuries we have come to cherish fixity and linearity, and it is simply too important to be able to read books anywhere at any time, independent of electricity, being able to scribble notes in the margins and folding the page to mark our place.

The second, competing, scenario is one in which we see the new medium asserting its ascendancy over the old. This involves the digital medium subsuming most of the crucial functions of print. Any characteristics for which a digital substitute may be devised will be assimiliated. Other characteristics will gradually lose their importance. We may now think that some of these are worth holding on to, but that is merely because of our mindset as *homo typographicus*. Soon the sense that these features are important will lose its urgency, if only by a simple process of attrition. In this scenario the Order of the Book will gradually morph into a digital order of sorts.[26]

In favour of the second scenario is the consideration that there is no reason to assume that the relationship between print and the digital medium as it now exists is more than a temporary and utterly contingent state. The digital medium will continue to develop as it has done over the last few decades. As it develops, and as new generations of digital natives grow up, digital textuality will become ever more capable of taking over any remaining distinctive functions of print. In other words, it is only a matter of time before a digital order asserts itself. That a total eclipse of the book by the digital textual medium has not happened yet does not mean it will not happen soon. To set off the last small but vital development only a small trigger is needed. This might be, for example, the development of a device even more book-like than the current e-paper devices, or a killer application for digital books comparable to the iPod/iTunes combine for music, such as possibly the iPad. (Again, the transformational effects of mediums are increasingly fast to make themselves felt. Both the speed with which new mediums were invented and the speed with which their effects came to be felt have grown exponentially. If the digital medium continues that line of development, we can be sure that whatever transformative power it embodies will take effect almost immediately. Never mind that the effects are likely to be ever more drastic.)

The trigger that might set off the eclipse of the book need not be a technological one of course; it could equally be one of the social factors discussed earlier. So far in education, the book has remained the main vehicle for the transmission of knowledge. The education curriculum has always presented a natural vantage point from which the Order of the Book could be established and maintained. Here, the hierarchical, orderly, and linear nature of the book's interface has always been notably at home. That interface represents a particular way of reading and using texts that is well suited to the hierarchical process of knowledge transmission. But in this natural habitat of the printed book—its last major stronghold—change is imminent. It has been noted that not only children's medial experience outside of school is becoming more and more important to them, but the discrepancy between their experience of mediums outside of school—dominated by digital games, mobile telephones, and computers—and inside school—mainly books—is growing rapidly. Confronted with this concern, many educationists are now pleading for a medium

[26] Note that, as I have argued elsewhere ('New mediums: New perspectives on knowledge production'), the fact that such a digital order will be based on the Universal Machine precludes the arrival of a stable new order.

use in the curriculum that reflects better the everyday reality of children outside of school.[27] If this should lead to a major reduction in book use in education, which is not an unlikely scenario, this would be bound to undermine the very foundations of the Order of the Book. In fact, it would not inconceivably spell its end.

The codex form of the book has been with us a long time. Accustomed as we were to that form, not surprisingly, the computer was at first (as is usual with new mediums) made to emulate the book. Such continuity is a social instinct, but the book had also come to represent a pinnacle of achievement: the perfect reading machine. As *homo typographicus* we did not want to give up what we persist in regarding as the achievements of typography. Increasingly, however, we will be able to recognise that in essence both books and their digital counterparts are tools for structuring and disseminating information, each with their own nature. Exploring the digital medium's own potential for structuring information, without constant regard to how it is done in print, will free us from ultimately improductive attempts at recreating the book in a digital form and allow us to discover the 'inherent possibilities' of the digital medium, thus speeding up the advent of a digital order.

One argument may perhaps be raised against this second scenario. Of the three criteria for measuring evolutionary success listed by Dawkins—longevity, fecundity, and copying-fidelity—the digital medium has spectacularly improved on fecundity and copying-fidelity. However, it appears—at least so far—to be letting us down badly in terms of longevity. But perhaps this is a classic pitfall of Darwinism. We should not be asking for the type of longevity that benefits *us*, but the gene (or in this case the meme) itself. From the digital medium's own perspective its longevity would seem assured: the Universal Machine will be able to adapt to changing circumstances much better than any previous medial technology, including notably the printing press.

That this second scenario is the more likely scenario makes the future of our typographic heritage a pressing concern. For the younger generation books and manuscripts may soon hardly exist unless they are available digitally. This raises the urgent question—one among many—which books and manuscripts will need to be made available digitally. On the surface the numerous mass digitisation initiatives carried out by Google and others are answering that question for us: everything. The reality is of course a different one. Not only is there much room for improving Google's digitisation, but also current copyright restrictions are hampering the digitisation of a very large body of very important texts, covering in fact much of the twentieth and twenty-first century. A large and important part of the textual record is thus threatening to disappear below the horizon of the younger generation. A further important question, and one that remains definitely unanswered, is *how* digitisation should be done in each of the scenarios. Our cultural inheritance needs to be made accessible to the digital generation in a form that speaks to them. Bridging the functional divide between the two textual modes will require a great deal of thought. Which properties of manuscript and print can be transferred

[27] See for example Jaap van Loon en Geeske Steeneken, 'Wat moet de internetgeneratie met een schoolboek? Heeft het boek op school z'n langste tijd gehad?' (What is the Internet generation to do with books? Has the book in school had its time?), in *Jaarboek voor Nederlandse boekgeschiedenis*, ed. Adriaan van der Weel, Leiden, 2007, pp. 111-31, or Diana G. Oblinger and James L. Oblinger, eds, *Educating the Net Generation*, Educause, 2005 (also available in pdf at http://net.educause.edu/ir/library/pdf/pub7101.pdf).

straightforwardly to the digital environment? How do we deal with the ones that cannot be transferred easily? There are many challenges there, chief among them learning how to deal with turning the solid, unchangeable monuments of print into the continuous, ever-changing events of the digital realm. We are of course trying. One recent example has been the rendition of the Bible in mobile phone language.[28] It was a translation of the most monumental and lapidary of books into the most ephemeral and unstable form imaginable for it. But was it a successful way of ensuring the continuing access to an important part of the Western cultural heritage? Are 'digital monuments' viable at all, or is the very term a contradiction?

Let's assume for the sake of the argument that the second scenario will indeed take place. Digital text is ascendant, and eclipse of the printed word is imminent. How would we then know a digital order if we found ourselves in one? What would a digital order look like? One obvious characteristic would be for the digital interface to become as intuitive as that of the printed book. The digital reading experience would have to be no less satisfactory than that of a true reading machine. Perhaps more telling would be if we found the digital interface insinuating itself into our metaphorical language in the same way centuries of print did for the book. That would testify to the digital text acquiring a status in its own right (after the loss of status of the digital text compared to print that we encountered in Chapter 5). If sufficient new metaphors would develop we could surmise that the book was in the process of being replaced as an icon.

Beyond the question about the relative position of analogue text versus digital text, the second question, about the long-term significance of text, analogue *or* digital, in a largely if not wholly digital medial future, is even more speculative, and even harder to answer. The present situation, in which it is not clear what the relationship between printed book and digital text is going to be, I have called a transitional stage. Having identified the computer's nature as a Universal Machine as its most salient property, we have to accept, though, that this means that, properly speaking, we cannot really assign any properties to it at all beyond what I have termed in Chapter 5 its core properties. As a Universal Machine, the computer could not be more protean. A specific example was when I decided to assign 'networking' as a primary property. In reality, I had to admit, this was a later invention, which occurred some time into the process of the Universal Machine turning into the medium it has become. Networking might thus more properly and fundamentally be styled an 'inherent potential' of the Universal Machine. In the same way, the Universal Machine will undoubtedly prove to harbour numerous as yet unconceived and inconceivable 'inherent properties', as a function of its unlimited inherent *potential*. Does this mean that all those properties I assigned it in Chapter 5 are not really properties? Of course not, but it does mean that this what I have called 'transitional stage' is not likely ever to end. It also means that the properties I have identified to make predictions about the future development of the digital medium, or even to make definitive assessments about the medium's influence, cannot safely be relied on.

Predicting the future was hazardous enough without giving cognizance of the fact that we are dealing with a medium that is an offspring of the Universal Machine. Just as it

[28] http://www.smstransl8r.com/bible.php instantly translates random fragments from the Bible into SMS language.

is quite possible that some of the properties we *have* recognised will prove to have unexpected implications, it is virtually certain that digital text will prove to have all sorts of properties—secondary technological ones—that we have not yet recognised. In particular it is not too far-fetched to believe that the computer as a medium will enable more sophisticated forms of communication than text in written characters affords. Writing was after all a curious invention, considering the processing demands on the brain of the cognitive effort involved. Textuality may appear to have been contingent on a series of historical circumstances that are now coming to an end. It may be on the verge of being replaced by different, more efficient forms of machine-to-machine and machine-to-human communications.[29] Experiments with the use of spoken text, both for interfacing with the computer's operating system and for text entry, are already proving successful, for instance. Digital photos taken with a mobile phone can be sent instantly to make reasonably eloquent statements of various kinds, and are increasingly used as substitutes for text-based communications.

Text has long co-existed with other modalities. However, each of these lived in its own realm. Digitally, text shares its medial space with all other modalities, opening the door to more direct competition from other modalities, existing or new. In the short run the value of text has appeared to increase, as a function of the way we have been accustomed to interface with the computer over the last few decades. But in the longer term, other modalities may well prove to have advantages over text. What shape our machine-to-machine and machine-to-human communications might take is anyone's guess. For all we know, they may even involve brain implants and artificial telepathy. Whatever may transpire, it is certainly possible, and not even unlikely, that textual communication will come to be regarded as cumbersome, and be relegated to a less prominent position.

Whether or not this will indeed happen, medial changes are already occurring on a scale that would have been scarcely imaginable only a few years ago. The effects of these changes are vast. The world is not a given which just sits there passively and patiently waiting to be studied and eventually known. Rather, our mediums define our perception of the world: of ourselves, and our culture. At the same time, our mediums are an important part of our culture. How may we know that culture if it determines our way of seeing it? How can we 'see our glasses' to determine how they give shape to what we are seeing? In this book I have tried, in spite of the challenges I listed at the end of Chapter 1, to see the glasses in my spectacles at the same time as the world that they afford me to focus on. I fear it has proved a tall order, like the Baron van Münchhausen dragging himself out of the morass by his own hair. But being human, I needed at least to have made the attempt.

[29] Susan Greenfield for one is confident that 'our future will probably not include such word-based communications [as word processing and email]'. *Tomorrow's People,* p. 87.