5

HOMO SOMNIANS

Humanity in the Age of the Internet

– Next then, I said . . . Picture people as dwelling in a cavernous underground chamber, with the entrance opening upward to the light, and a long passage-way running down the whole length of the cave. They have been there since childhood, legs and necks fettered so they cannot move: they see only what is in front of them, unable to turn their heads because of the bonds.

– A strange image, he said, and strange prisoners.

– Like ourselves, I replied.[1]

– Plato, *The Republic*, 514A

In Plato's cave, nobody sees what's really happening. They think they do, but they don't. Plato says we are like the cave dwellers. We think we see the Truth, but we don't. The difference is that we can see the Truth if we know how. Plato knew how and wanted to show us. But Plato also knew that we – or at least most of us – are either incapable of or uninterested in coming to grips with the Truth. Philosophers have the way and the will, but the rest of humanity doesn't. We are quite happy living in our pleasant illusions, far removed from the Truth. This is why we build the imaginary worlds – dramas – that Plato found so disturbing. For what are storytelling, literature, and theater but attempts to escape from reality into some fantasy? The storytellers, writers, and thespians all say we can learn something about ourselves from their productions. But what do we learn, really, if all that is depicted is fiction? Fiction cannot be the Truth, for it is the opposite of the Truth. And even those productions that claim to be something other than fiction – histories and the like – aren't they simply poor reflections of a reality that is gone and cannot be revisited, and therefore really fictions themselves?

Perhaps they are, and perhaps they aren't. In any case, Plato was on firm ground in asserting that we naturally seek the comfort of illusions. He would not, therefore, be at all surprised by what we have done with the Internet. For there we have created a cave of absolutely immense proportions. In it we see only the reflections of real people and things, the shadows they leave for us to observe on the screens before us. Unlike his prisoners, we are aware that they are there behind the electronic wall. Yet we don't know who or what they "really" are, and we don't much care. It's usually better if we don't know, for that makes the illusion more powerful. All that is important to us is that they provide gratification, that they present a virtual reality that is satisfying to us. Some part of it may not be agreeable, but the cave is so large and its variety so great that we can be certain we will find something diverting, amusing, or even useful in it. Just what that something is will happily remain our own business, because, although there are millions of us in the cave, we are functionally alone. The prisoners in Plato's cave cannot see each other. Neither can we see each other on the Internet, that is, if we don't want to be seen. We are free, therefore, to look where we will without regard for the judgments of others. An added benefit is that we, unlike Plato's shackled captives, can cast our own shadows. This is both enjoyable for us and pleasing to others. Whether our projections are truthful, reasonable, or dignified is largely beside the point. For the point of our virtual world is to entertain and be entertained, and that goal is sometimes best achieved by lies, foolishness, and impropriety. Most important, we believe that none of it matters precisely because we are in the cave and not in real life. We reject absolutely one of Plato's central premises, namely, that playing at acting badly and watching other people play at acting badly will somehow harm us.

Perhaps we are right, and perhaps we are not. Time will tell. It is certain, however, that we are currently in the middle of a significant change in the way we communicate with one another, a change brought by the Internet. As we will presently see, the change was sudden and is having a significant – though all in all, predictable – impact on the way we organize ourselves and think about what is right and what is wrong. Plato believed we should seek the Truth. The Internet suggests other ends.

WHY WE SURF

In order to show that the "pull" theory of media evolution explains the rise of the Internet, we need to demonstrate two theses. First, we must show that the technology behind the Internet was available some time before the Internet itself. If it were, then it makes sense to conclude that people could have developed the Internet but didn't because demand was insufficient. Second, we need to show that some new moment in world history made existing media – talking, manuscript-writing, printing, and audiovisual media – insufficient for the purposes of some organized group or groups, and that this or these groups elaborated a preexisting technical capacity – in this case, the ability to network computers – into a new medium.

What evidence, primary and secondary, can be brought to bear on these two propositions? On the one hand, we have all the data we need at our fingertips because the Internet and the social practices and values we claim it engenders are all around us. Any careful observer of the Web and modern life should be able to judge whether and to what extent the theory we have presented is valid. On the other hand, our task is made difficult by the very fact that we are immersed in a new and evolving phenomenon. No one offered a compelling explanation of the impact of talking, manuscript-writing, print, or audiovisual media in the early days of those modes of communication. Although the literature pertaining to the effects of the Internet is already large and growing quickly, what's on offer – much of which is somewhat hyperbolic[2] – is disappointingly vague.[3] It may just be too early in the game to gain the perspective needed to offer an accurate assessment of what the Internet is doing and will do. Maybe, but probably not. As we'll presently see, in the instance of the Internet, the past is a remarkably good guide to the future.

The Internet before the Internet

The story of the Web properly begins in sixteenth-century Europe during the Scientific Revolution, for it was then and there that the project that would end in the Internet was conceived in its modern form. That project was the systematic collection, classification, and dissemination of knowledge for the purpose of scientific progress.[4] The initial spurs

that urged European thinkers to pay close attention to data gathering, classification, and dissemination were two. The first spur was the revival of ancient Greek scientific interests and practices. Aristotle and his peers stimulated Europeans to think anew about the world of the senses, the more so now that their many works were widely available thanks to print. No better example of the new attention to data collection, classification, and dissemination can be given than that of Tycho Brahe, whose exact observations of celestial bodies helped his assistant, Johannes Kepler, formulate his eponymous laws of planetary motion and revolutionize our understanding of cosmology.[5] The second spur was imperialism. The people of the Renaissance had the good fortune of "discovering" (to put it very mildly) new worlds, and when they did, they imported new things from them by the ton. These novelties were often categorized and displayed in early museums of natural history – cabinets of curiosities (*Kunstkammern* or *Wunderkammern*). Scientifically minded elites created the first such institutions in the mid-sixteenth century.[6] By all reports they were big hits. The impulse to collect and catalogue was a characteristic of the age, as we can see in the path-breaking methodological writings of Francis Bacon, proto-information scientist *par excellence*. Bacon is most famous for the saying "knowledge is power."[7] He seems to have believed it. In a number of still-read books, Bacon outlined a program to banish ignorance and superstition by collecting, measuring, analyzing, and comparing everything. Like so many ambitious programs, it proved largely unworkable.

Happily, some of Bacon's fellows and followers were rather more practical than he. The founders of the early scientific societies not only theorized about collecting and exchanging data, they created organizations to do it. The result of their handiwork can be seen in the Italian *Accademia dei Lincei* (founded 1603), the English Royal Society (founded 1660), the French *Académie des sciences* (founded 1666), the Prussian *Akademie der Wissenschaften* (founded 1724), and the Russian *Akademiia nauk* (founded 1724).[8] Before these societies, natural philosophers had only very limited means to discuss their work with like-minded colleagues. The early scientific societies and state-sponsored institutions – especially research universities – improved this situation dramatically. Together they created the basic structure for handling scholarly information that persisted until the birth of the Internet. This system comprised three institutions. The first was the *library*,

which allowed scientific information to accumulate in one place for easy access. The second was the *index*, which permitted information in the library to be retrieved. And the third was the *article* (in a book or journal), which allowed scientists to share information at a distance. The entire system worked in a loop: scientists produced journals that fed the libraries that were indexed by bibliographers who then supplied them to scientists who produced more journals, and so on.

The new system of scholarly communications constituted a real step forward, but it was by no means perfect. Far from it. Libraries concentrated information, which was good. But they also isolated it, which was bad. You had to go to the library, it could not come to you. So if you weren't near the library you needed or if you were near and couldn't get in, you were out of luck. Indexes helped you find information, which was good. But they also hid it from you, which was bad. Alphabetical or subject indexes generally do not penetrate – or do not penetrate very far – the items they index. In an ordinary card catalogue, you get the author, title, a few subject headings, and the book's location in the stacks. Almost everything between the covers is obscured. This is to say that you really had to know exactly what you were looking for before you started to look, and this is inconvenient if you don't know quite what you want. Articles provided a convenient means to share scientific information on a specific topic, which was good. But they shared the deficiencies of the library and the index, which was bad. That is, if you didn't have access to the article for whatever reason – a subscription cost too much, the library lost it, your dog ate it – it might as well not exist. And even if you did have access to it, there was no really efficient method to find out exactly what was in it other than to read it carefully – not a very efficient way to track down specific facts. In short, the entire thing didn't work well for people who: (a) didn't have access to a big library; (b) didn't know exactly what they were looking for; and (c) didn't have the time or patience to read everything that might have what they wanted. That pretty much describes everyone who wasn't a student or professor at a university.

The problem was recognized. As early as the eighteenth century, enlightened souls were trying to figure out ways to improve scholarly communications and bring trustworthy knowledge to the people who needed it. The French *encyclopedistes* felt that the existing mechanism of separating truth from superstition, disseminating the former and

discarding the latter, was wanting. To rectify this sorry situation, Denis Diderot, Jean le Rond d'Alembert, and their *philosophe* allies revived an old (Greek, as it happens) idea – the encyclopedia.[9] They set themselves the task of compiling all that was true and useful in one place for all time. The result was the epoch-making thirty-five-volume *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers* (1751–). Yet the *Encyclopédie* and its imitators (especially the *Encyclopedia Britannica* [1768–] and the *Brockhaus Enzyklopädie* [1796–]) were limited by the medium in which they were produced, namely print. Books are fine for many purposes, but if your object is to provide a universal store of knowledge in which anything can be found instantly and anything can be amended as needed, they are not ideal. Anyone who has every used a print encyclopedia knows that they are big but not complete; well-indexed, though not well enough; and often updated, though never really current.

Print not only limited the degree to which scholarly communications could be perfected, it also limited the imaginations of the men and women who were trying to perfect it. Diderot, d'Alembert, and the Enlightenment gang just couldn't conceive of a way to store, find, and transmit information outside the ink-and-paper paradigm. A bit latter, however, some began to see past the printed book. One such visionary was the French bibliographer and information scientist Paul Otlet.[10] Otlet didn't much like books. He felt – correctly – that they concealed as much as they revealed. They were full of data that was basically hidden from researchers and, more importantly to the progressive, Internationalist Otlet, hidden from humankind in general. To Otlet, the existing means of storing, categorizing, and conveying information hindered human progress. But Otlet had a solution – the humble 3 × 5 index card. Otlet and his colleagues wanted to use the index card to crack the book, that is, to extract from the standard scientific print medium every bit of discrete information it held. According to Otlet's plan, these unique bits would be recorded on 3 × 5 cards and classified according to an exhaustive universal index so that information could be found and easily retrieved. He called his index the "Universal Decimal Classification." It was a kind of Dewey Decimal System on steroids. Otlet even dreamed of creating a Rube Goldberg-esque workstation in which scholars would use levers to find and extract cards from his massive universal card catalogue. It was all quite mad. The engineering

problems presented by print made Otlet's vision utterly impractical. For all that he was ahead of his time, Otlet was still thinking in terms of print.

New technologies such as microfilm inspired his followers to think past print, sort of. One of the most obvious problems with print as a mode of communications is its bulk and weight. A piece of paper is small, but thousands of pieces of paper are big. A piece of paper is light, but thousands of pieces of paper are heavy. Big, heavy things are expensive to transport. This makes them unattractive as media (cf. stone tablets). One way to surmount this problem, however, is to shrink the big heavy thing into a small light thing. Publishers have known this trick for centuries, and they have endeavored to test the limits of human vision by publishing ever smaller books with ever smaller type. Interestingly, if you are really devoted (not to say crazy), you can pack a lot of text into a very small place by hand. According to legend, followers of Mao inscribed the entire contents of his *Little Red Book* on a six-sided die. Such feats are impressive, but not very practical. The real breakthrough in tiny text came with the invention of practical photography by Louis Daguerre in 1839.[11] It took less than a year for one of Daguerre's admirers, the lens grinder John Benjamin Dancer of Manchester, to begin miniaturizing photographs for viewing under microscopes. In its early days, microphotography was nothing but a novelty. Rene Dagron of Paris was given the first microphotography patent in 1859. His chief product was a tiny image embedded in a tiny viewer embedded in a tiny trinket. Yet a few forward-thinking people at the time recognized that microphotography might be made to serve more practical purposes. In 1859, the same year Dagron patented his bauble, the *Photographic News* wrote that microphotography might allow "the whole archives of a nation [to be] packed away in a small snuff box."[12] Given the state of miniaturization at the time, it would have had to have been a very big snuff box. But no one needed to build such a box, because no one was really thinking of putting government archives on tiny bits of photographic paper – governments had more important things to think about.

Businesses didn't. In the early twentieth century, banks – theretofore used largely by rich folks and merchants – became truly retail businesses. Everyone began to use them, and thus they found themselves having to track millions of transactions, not only deposits and withdrawals (done

at the bank, so easily recorded), but also checking activity (done off site with third parties, so more difficult to record). In the mid-1920s, New York banker George McCarthy saw in microphotography a potential solution to the bank's paperwork problem.[13] With this in mind, the plucky money man invented the "Checkograph," a device that produced microfilm copies of checks flowing through financial institutions. For obvious reasons, Eastman Kodak loved the Checkograph, bought it from McCarthy in 1928, and began to sell microfilming services under its Recordak brand. By the 1940s, governments, university libraries, and corporations began to microfilm their holdings. They did so with some urgency. Even as Recordak filmed, entire cities were being wiped off the map in World War II, taking entire government archives, academic libraries, and corporate vaults with them. The ordinarily upbeat President Franklin Roosevelt stressed that the United States needed to microfilm everything "so that if any part of the country's original archives are destroyed a record of them will exist in some other place."[14] He uttered these words a bit over a month after the Pearl Harbor attack in which, as a matter of fact, "original archives" had been destroyed by Japanese bombers. It seems he expected more of this to come. If he did, he was right.

The notion that microfilm might be used to preserve and disseminate *some* knowledge – banking records, government archives, and such – rather naturally led the futurist H. G. Wells to the idea that it might be used to preserve and disseminate *all* knowledge. Wells proposed the creation of a "Permanent World Encyclopedia" that would capture and convey all of the world's wisdom by means of very tiny text.[15] "At the core of such an institution," he writes, "would be a world synthesis of bibliography and documentation with the indexed archives of the world. A great number of workers would be engaged perpetually in perfecting this index of human knowledge and keeping it up to date. Concurrently, the resources of micro-photography, as yet only in their infancy, will be creating a concentrated visual record." Such a record is, he says, already being created by "American microfilm experts" who are making "facsimiles of the rarest books, manuscripts, pictures and specimens, which can then be made easily accessible upon the library screen." By means of this remarkable technology, he gushes, "there is no practical obstacle whatever now to the creation of an efficient index to all human knowledge, ideas and achievements, to the creation, that

is, of a complete planetary memory for all mankind." One suspects that Wells did not have much hands-on experience of the "practical obstacles" presented by microfilm. Indeed, as anyone who has ever used it can attest, such enthusiasm for microfilm can only have been born of never having used it. Wells, it seems, never touched the stuff.

The next wave of information scientists had probably used microfilm, so they knew to look elsewhere for inspiration. The elsewhere in question was in the rapidly developing field of information-handling machines. The notion that one could use mechanical means – wedges, gears, levers, etc. – to store information and even solve mathematical problems was hardly new. The people who built Stonehenge over 4,000 years ago knew it; the Greeks who built devices to predict the position of celestial bodies in the second century BC knew it; the inventors of the slide rule in the seventeenth century knew it. So did one Vannevar Bush, engineer, science tsar, and technological visionary.[16] In the first of these capacities, Bush built the "Differential Analyzer" in 1927, a device that could solve complicated differential equations very quickly and accurately. In the second capacity, Bush ran the Office for Scientific Research and Development, the bureau that oversaw the Manhattan Project and all military research in the United States during World War II. In the final capacity, Bush wrote "As We May Think," an essay published in the *Atlantic Monthly* in 1945.[17]

Today Bush is remembered primarily for "As We May Think." It's little wonder, for it is a remarkably prescient essay. In it, he plainly says that gummed-up scientific communications are a huge problem. "Professionally," he writes, "our methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate for their purpose." Researchers produce more useful information than ever, but more than ever is simply lost due to an antiquated system of storage, search, and retrieval. "The summation of human experience," Bush complains, "is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships." In a word, the print paradigm – libraries, indexes, and articles – just wasn't doing the job anymore, if it ever did.

Bush proposed that the basic problem was the linear way that information was stored, indexed, and retrieved in print. Finding a "record" in a library catalogue was like walking a narrow, confined path: you

could go forward or backward, but you couldn't leave the trail. "The human mind," Bush pointed out, "does not work that way. It operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain." Bush dreamed of a workstation that could store and retrieve huge volumes of information, but which mimicked the way the brain related bits of data by subtle "associations." In the former aspect, Bush's "Memex" looks a lot like Otlet's data contraption, replete with levers, gears, buttons, and plenty of microfilm. It is the latter aspect – sorting by fuzzy, expandable, and user-directed association – that makes Bush's Memex noteworthy. Like Otlet, Bush dreamed of cracking the book, that is, finding a way to extract and isolate every bit of useful information in it. But his "associations" went beyond Otlet, for they allowed researchers to freely create new sources that could then be cracked by other researchers. "It is exactly," Bush wrote, "as though the physical items had been gathered together from widely separated sources and bound together to form a new book."

Bush was ahead of his time, not only in terms of his ideas but also in terms of the technology available to realize them. Yet help was on the way. It came from the U.S. Defense Department.[18] After World War II – which, as you will recall, had gone pretty badly for all sides involved, though worse for some than others – the American military became concerned about preventing "another Pearl Harbor." The U.S. generals had good reason to be worried, as the potential consequences of a sneak attack had grown much more terrible in the terrible nuclear age. So, they wisely set up a system of radar installations designed to detect airborne incursions from sea to shining sea. The radar bases worked fine, as radar itself had been thoroughly battle-tested during the aforementioned world war. In fact, the bases worked a little too well, that is, they provided too much information too fast for even the smartest generals to handle in a reasonable amount of time. And said generals did not, in fact, have a reasonable amount of time to sort through the reams of data and decide what to do, for the attacking planes – flying very fast – would arrive at their targets only minutes after the radars detected their presence. Something needed to be done to improve what the military calls "command and control" or, they said, we'd all be blown to hell. So the defense establishment decided to build a computer-aided

information network, the world's first. Made operational in 1959, SAGE (Semi-Automatic Ground Environment) brought everything the decision makers needed to know – including radar images, an innovation – to central locations so the deciding could be done. SAGE also assisted the decision makers – via automation, another innovation – in scrambling fighters and guiding them to their airborne targets.[19] Once again, science and technology had made America safe.

But then another problem arose, a hypothetical one posed by one of the many professionally paranoid people governments employ to dream up nightmarish hypothetical scenarios. What would happen, this thinker of the unthinkable asked, if one of the enemy's bombers got through the radar-based, electronically linked, computer-assisted early-warning system and managed to drop a bomb on the system itself?[20] The answer was plain: the system would crash and take America's ability to make good decisions about what to do next with it. This just wouldn't do. So, in the early 1960s, the government decided to invest some effort in creating a more robust network, one that wouldn't collapse like a house of cards if one of its cards were pulled away (or blown to bits, as the case may be). Happily, there were some very smart young scientists working on just this problem at various well-thought-of universities around the globe. They proposed an ingenious solution: break the system's messages up into chunks, send the chunks through multiple paths in the network, and reassemble them at the end. That way, if any path were destroyed, the several parts of the message would still get through by traveling along other paths and could be reassembled as if nothing had happened. Humpty Dumpty *could* be put back together again. This disassembly-reassembly system was called "packet switching" over a "distributed network."[21] It seemed to be a good solution to the problem of network fragility, and the American government was pleased to fund and implement it.

But scientists working on the new communications system pointed out yet another problem, as scientists will. It's fine to switch packets and distribute networks, but the computers doing the switching and distributing have to be able to talk to one another. Computers, you may recall, were sort of new at the time, and a lot of people were building them. Computer companies generally built computers that could talk to the ones they built, but not to the ones that other people built. So there were a lot of computers that couldn't talk to one another, many

of them in the American defense establishment itself, as it was the primary market for expensive computers. This was bad. But it wasn't the only difficulty, the scientists warned. Rather more selfishly, they noted that not only were mute computers bad for the nation's defense, they were also bad for science itself. You see, mathematicians, engineers, and physicists – all the folks who are so vital to America's security – love to talk to one another. They must do so, and often, in order to accomplish their work efficiently and effectively. If their computers couldn't talk to one another, neither could they, and science would suffer. So the scientists proposed a solution that would solve both the generals' problem and theirs: a set of computers and computer protocols (a sort of *lingua franca* for machines) that would link not only the defense establishment's computers in a distributed network, but theirs (or rather, those owned by their research institutes and universities) as well. The American government, being wealthy, worried, and respectful of scientists, decided to fund and implement this program too. So was the Advanced Research Projects Agency Network (ARPANET) born in 1969.[22]

Alas, neat though it was, ARPANET wasn't very useful if you weren't a general or a computer scientist. This was true for a variety of reasons, but the chief one was that you couldn't get to ARPANET from your network, wherever your network was. And there were several good ones in different places around the country and world. Just as a lot of computer companies were producing computers that couldn't talk to one another, there were serious establishments (especially scientific institutes and universities) creating networks that couldn't talk to one another. The military didn't care much, because it had its own network and, prizing secrecy as military folk will, didn't really want anyone else on it. But communications-hungry scientists did care, because they wanted to trade information in the service of scientific progress. What was needed, they said, was a network of networks, a massive grid that would enable every scientist to talk to every other scientist no matter what network he or she was on. As many parties and interests were involved, it took well over a decade, a lot of negotiation, and a boatload of money to create this "inter-network." But by the mid-1980s, the network of networks – the "Internet" – was alive and well, linking most big institutes and universities in the nation, and some overseas.[23]

Although the Internet was much bigger and more accessible than ARPANET, it was still pretty hard to use. You could exchange messages, files, and even run some programs remotely, but beyond that you couldn't really do much unless you were an expert. This bothered an English fellow named Tim Berners Lee. He worked at a big Swiss physics laboratory, and it was his job to make it simple for scientists to collaborate. Since it plainly wasn't simple, he set about designing a way to make the Internet useful as a collaborative tool. He figured that what people really wanted out of a network was access to things on computers, not computers themselves. After all, when you use the phone, you want to talk to someone, not simply connect to another phone. It's the same with the Internet. You want to use it to get information in documents, not to connect to computers. So in the early 1990s, he and a French colleague designed a system that used the Internet to store, receive, and send documents, and he called his invention the "World Wide Web."[24] On the World Wide Web, you seem to move from document to document, reading what you want and moving on. The computers are just where they should be, in the background. Technical people almost immediately recognized that the Web was extremely useful, and they made it a kind of a standard.

At this point, the Internet and the Web that ran on top of it were still obscure. People in the computer industry knew about it, because they make their living building gadgetry. Scientists knew about it, because they enjoy collaborating with colleagues in distant places. And, finally, geeks – especially young geeks – knew about it, because young geeky people make it their business to know about the latest technical advances. While the computer-builders were busy building networked computers for the collaborating scientists, a team of young geeks in Illinois had a monumental insight.[25] First, they noted that a lot of people were buying desktop PCs running the Windows or Macintosh operating systems, not UNIX, which was standard in "serious" computing. Second, they noted that these PCs could be hooked up to the Internet by phone lines. Third, they noted that our frustrated English fellow in Switzerland had already created a kind of software that made it easy to send, receive, and store multimedia documents on the Internet, although his program was kind of clunky and not very pretty. So these college students put one, two, and three together and set about creating a really intuitive, clean, multimedia "Web browser" for users of PCs.

The browser was something like a combination of a glossy magazine – full of pictures and text – and a TV beamed right into your home. It made the Internet easy to understand. In 1993, these college students *cum* entrepreneurs began to give their graphical Web browser away under the name "Mosaic." Suddenly it was not only easy to get on the Internet, but once you were there, it was easy to get around. By the mid-1990s, "surfing the net" was an activity like reading the newspaper, listening to radio, or watching TV, although there wasn't much in the way of newspapers, radio, or TV on it.

"Pulling" the Internet into Existence

And so the Internet was born. Its deepest roots, as we've pointed out, were scientific. In this sense, the Internet is the fulfillment of the 400-year-old dream that information might be collected, stored, and sifted easily, efficiently, and endlessly. Yet science itself did not "pull" the Internet into existence in the last quarter of the twentieth century. No, there were larger systemic forces at work, all of which are hinted at in the story we have just told. Generalizing, they were three: information capitalism, the surveillance state, and cultural privatism.

First, there was information capitalism.[26] Industrial capitalism, a product of the eighteenth century and one of the motive forces behind the spread of audiovisual media, is about producing goods. It still exists, as we still need things produced industrially, for there is no more efficient way to make them. But, beginning in the twentieth century, industrial capitalists noted two things. First, they saw that the data-handling requirements of modern business were becoming a drag on productivity and, more important, on profitability. Second, they understood that the return on investment in research and development could be significant, particularly in a legal framework that protected intellectual property and an economic framework – the public company – that allowed rapid financing and development. These two insights put a new and higher premium on information production, manipulation, and storage. Knowledge might be power, but information was money. Companies became interested in what were aptly called "business machines." Calculating engines had been around since the seventeenth century. Both Pascal and Leibniz built them.[27] By the 1880s, they were being produced commercially, and by the 1890s, they were becoming common

in offices throughout the developed world. The companies that made calculators and other early data-processing machines (punchers, tabulators, sorters) are still with us today: IBM, NCR, Burroughs (now Unisys).[28] They invested resources in researching and developing new products and supplied a steady stream of them to businesses seeking to make their operations more efficient. Somewhat surprisingly, computers were a relatively late addition to the game. First built in the 1940s, they – "mainframes" – long remained much too expensive for most businesses. With the advent of time-sharing by dial-up connection in the 1960s, more businesses began to use computers in their operations. But it was really only after the introduction of the PC in the late 1970s that computers become a staple of office work.

It was the spread of the PC that was to be businesses' primary contribution to the rise of the Internet, for, by giving computer manufacturers an incentive to produce low-cost, portable, easy-to-use machines, they put computers within reach of large numbers of consumers. This provided a kind of mass "base" for the rapid take-off of the Web in the 1990s. Some thought was given to how networked computers might aid collaborative work, in business and out. Examples include Ted Nelson's "Project Xanadu" (1960s), Murray Turoff's "Electronic Information Exchange System" (1976), Irene Greif and Paul Cashman's "Computer Supported Cooperative Work" (1984), and Charles Findley's "Collaborative Networked Learning" (1986).[29] But, by and large, businesses were caught off guard by the rapid expansion of the Internet. However, once they saw it for what it was – both a new place and a new way to conduct business – they very quickly exploited the opportunity it provided, thereby hastening its expansion.

The "pull" of information capitalism, however, paled before that of the surveillance state.[30] The welfare state was all about providing goods and services at a minimum level to its citizenry. In order to fulfill this mission, however, it needed to collect and crunch a huge amount of data. If you are going to send pension payments to everyone over 65 years of age, you need to know (a) where the money is going to come from; (b) who is going to process it and how; and (c) where the money is going to go. That might not seem like a lot of information until you consider that it requires you to know a host of other things: who works where, what they do, how much they earn, where they live, what they own, what they owe, what sorts of families they live in, to whom they

are related, how old they are, and sundry other difficult-to-anticipate items. Then multiply the task by many tens of millions. As the scope of the "safety net" expanded to include educational entitlements, health insurance, unemployment insurance, survivor's benefits, and all the other "rights" afforded to citizens, so too did the information-handling requirements of the state grow. It's not surprising that the enterprise that became IBM got its start building machines to tabulate the results of the U.S. censuses of 1890 and 1900.[31] Neither should it be unexpected that government bureaucracies remained the best customers of the makers of business machines throughout the twentieth century.

The pursuit of national welfare, however, was not the only reason modern states needed to ramp up their information-collecting and data-handling capacities. There were less savory grounds as well. One we have already touched on was the need to find more efficient ways to kill people and prevent them from being killed. The U.S. Defense Department funded virtually all of the research that led to the production of the first American computers, the first American computer networks, and the immediate forerunner of the Internet, ARPANET.[32] This investment was by far the most powerful factor "pulling" the Web into being in the second half of the twentieth century. Another factor was "state security," or rather insecurity. Governments have been spying on their subjects for eons, but the scope and intensity of clandestine state surveillance expanded radically during the twentieth century. This was especially true in the socialist world, where enemies were suspected under every rock, and party dictatorship ensured that every rock would be picked up without objection from the public. But it was also the case in democracies and semi-democracies, particularly during the periodic "Red Scares" that marked the century. Time and again, free governments set civil liberties aside in order to surreptitiously surveil the free citizens in whose interest they supposedly governed. Sometimes they had reason. Sometimes they didn't. But in either case the task of surveillance put an additional load on the state's information-handling capacity, and thereby helped "pull" the Internet into existence.

Finally, there was cultural hedonism.[33] In the first half of the twentieth century, cultural liberalism helped bring the modern audiovisual media into being by putting a fig leaf on impropriety. You could show most anything in public, so long as bodies remained clothed, speech clean, and messages "wholesome." The Hay's Code and its fellows

made most everyone a hypocrite, which was fine with most everyone. Appearances had to be maintained. Until the 1950s. For reasons that go far beyond the scope of this book, polite hypocrisy began to fall out of favor in that decade in much of the Western world. Like Holden Caulfield, a lot of people suddenly found themselves surrounded by "phonies."[34] Some of these people are cultural icons today: Hugh Heffner, who founded *Playboy* in 1953; Aldous Huxley, who issued *The Doors of Perception* in 1954; Jack Kerouac, who published *On the Road* in 1957.[35] In a sense, all three of these men were hinting at the same thing: appearances don't need to be maintained because they aren't being maintained as it is. We should, therefore, do away with appearances and openly embrace what is "real." And that, for the proto-pornographer, the advocate of drug use, and the poet of loafing about, was raw experience. The rising generation, it turned out, was very receptive to this notion.[36] It became central to the shift in mores that took place during the 1960s, the wake of which we still live in today. Heffner's, Huxley's, and Kerouac's philosophy (if it can be called such) rested on a utilitarian logic that was as compelling as it was simple: all you know and are is what you feel, and therefore the "good life" should be spent in the pursuit of feelings, especially the good ones. Combined with a convenient cynicism toward "the man" – that is, the real world – this doctrine exploded into full-blown hedonism under the thin guise of "mental expansion," "consciousness-raising," and "getting back to nature." Whether any minds were expanded, consciousnesses raised, or natures gotten back to in the 1960s and 1970s is not at all clear. It is certain, though, that a lot of sex was had, drugs were taken, and loafing about done. Not surprisingly, the people who, moving far past anything Heffner, Huxley, and Kerouac ever imagined, trumpeted the virtues of radical hedonism became heroes to the merry-makers and were made celebrities by the press. The names of Timothy Leary, Ken Kesey, and Hunter Thompson still ring today.[37] They were, after a fashion, serious people, or at least famous people, which increasingly amounted to the same thing. The intellectuals of hedonism added a veneer of high-mindedness to the pursuit of raw experience.

The problem, however, was that once right-thinking people had agreed to condone high-minded hedonism, they were defenseless against the low-minded variety. Any such differentiation would make them hypocrites, and recall that it was the fight against hypocrisy that started the slide into hedonism in the first place. If you approved of Hugh Heffner, Aldous Huxley, and Jack Kerouac, it was hard to consistently disapprove of Larry Flint, Snoop Dogg, and Charles Bukowski. These "free spirits" were all just "doing their own thing," which is what everyone was supposed to do. The courts more or less agreed. By the mid-1970s, only two classes of expressions could be constitutionally censored in the United States: (1) those that were likely to promote "imminent lawless action" (*Brandenburg v. Ohio*, 1969); and (2) those that a community deems obscene *and* a reasonable observer would find lacking in any serious "literary, artistic, political or scientific value" (the Miller Test, 1973).[38] In practice, this meant that nothing beyond credible death threats and kiddy porn was banned. The FCC could censor more, but really only on the public airwaves. The 1960s and the birth of cultural hedonism set the stage for the Internet. By the moment of its birth, people were ready for a channel in which they could hear, see, and say anything. Print and audiovisual media could not supply this. The Internet could and did.

Human Nature and the Internet

We saw earlier that whereas writing and printing spread slowly, audiovisual media took off in a few decades. The reason, we said, was in part because we have a natural disinclination to read and write and an inborn inclination to watch and listen. Interestingly, the Internet took off even more quickly than the audiovisual media. In the span of a few years, it covered the globe and penetrated every nation on earth. The preexistence of an audiovisual infrastructure explains much of this rapid spread and remarkable reach: the Internet "piggybacked" on other networks, and so did not have to wait for new networks to be built, as was the case with audiovisual media. But that doesn't explain the entire phenomenon. It seems sensible to say that there is something about the Internet that appeals to our natures, a drive that makes us want it. Is there?

The answer would seem to be "yes." While it would not be fair to say that the Internet pushes all our evolutionary buttons, it certainly pushes more of them than any other single device in history. As we've said, humans were designed to look for anomalies and solve puzzles. The Internet is full of anomalies and puzzles. The world is a very big place

and people are doing all kinds of things. You don't know about most of them. But now they are putting them on the Internet for you to find. Just about any search you perform, no matter how specific, is likely to return results that surprise you and present you with things to figure out. It's all there: the odd, the weird, the strange, the peculiar, the curious, the bizarre, the uncanny, the mysterious – everything. What is more, because you are on the Internet, you can quickly and easily do some research to clear things up. That's the idea, at least. So you surf from link to link to link, uncovering more and more and more information. Yet, as you do, you uncover new anomalies and puzzles that lead you in new directions. A book is a machine for focusing attention; the Internet is a machine for diffusing it. A book takes you on a trip from here to there; the Internet takes you on a trip from here to God-knows-where. Getting lost is half the fun of it. Most of us have had the experience of casually going to look something up on Wikipedia and ending up, an hour or more later, in a place we never imagined, learning about something we never knew existed. In truth, you don't so much look things up on the Internet as just look at things. This is something we clearly like to do, an end in itself. So compelling is our desire for anomalies and puzzles that some of the most popular sites on the Web are devoted to their collection. Some of them are low-brow, like Fark.com, and some are high-brow, like Metafilter.com, but they all exist precisely because we naturally find the unusual, curious, and just plain weird entertaining.

These link-presentation sites exist for another reason, also evolutionary in origin. Not only do we need to find what we called "relevance," but we are driven beyond reason to share what we find with others. We usually do this by talking, but the Internet has provided us with a much larger forum in which to present our trophies. Some commentators make the mistake of calling what happens on the Internet "exchange" and wax lyrical about how the Internet has unleashed a long-repressed human desire to "collaborate."[39] But the truth is that both exchange and collaboration on the Internet are *results* of the native drive to present relevance to others, not the cause. Ultimately speaking, we do not talk because we want to trade information or work together; rather, we talk because we naturally enjoy it, and we naturally enjoy it because talking – the presentation of relevance – increased our fitness eons ago. Similarly, we do not put things on the Internet because we desire to swap information or cooperate with each other; rather, we

do it because we naturally enjoy putting things on the Internet, and we naturally enjoy it because this sort of behavior – the presentation of relevance – increased our fitness eons ago. Posting is the continuation of talking by other means.

This is easy to demonstrate. People often wonder why anyone contributes to Wikipedia. Indeed, it's something of a puzzle if you look at it in terms of cost-benefit analysis, as least as cost and benefit are usually understood. What are the costs? Well, there is the time and effort you spend editing. But you spend a lot of time on the Internet anyway, so that's a minor expense. More significantly, there is the very real possibility that your edits will be erased *and*, to add insult to injury, that you will be abused by angry strangers whose hardheadedness is matched only by their ignorance. Wikipedia can be a rough place. What are the benefits? Well, you certainly don't get paid, which is the way most people who work expect to be rewarded. Neither do you attain glory, for most contributors edit Wikipedia anonymously or at least pseudonymously. Contributing just doesn't add up. Yet thousands of people do it. There are probably many reasons – the desire to participate in something "bigger than yourself," the fellowship of the "collaborative community," or the simple alleviation of boredom. But the basic reason people contribute is that they find it enjoyable, and they find it enjoyable for easy-to-understand evolutionary reasons. The Internet is like a great game of show-and-tell, and we like show-and-tell a lot.

Another button that the Internet pushes is our desire to experience what we called "intrusive stimuli." These, it will be recalled, are a class of sounds and sights that we are preprogrammed to pay close attention to, whether we like it or not. They include depictions of sex, food, drink, power, wealth, conflict, and violence. From an evolutionary point of view, these stimuli are always relevant and therefore instinctively draw our ears and eyes. It goes without saying that the Internet is brimming over with material of this sort. Obviously, there is more pornography in more flavors than one can easily comprehend. But not only that. Even "mainstream" sites often have a quasi-pornographic visual style. They show you things that you want to see but don't have the opportunity or stomach to see in "real life." In the former category – opportunity – one would put all the commodity porn that populates so many commercial sites: gadgets, cars, houses, clothes, and "bling" of every kind. In the

latter category – stomach – one would put the frequently disturbing pictures and videos of misfortune that litter the Web: pratfalls, car accidents, airplane crashes, and even people being beheaded. Looking at the one and the other you often get a kind of rush. The feeling may be superficially pleasurable or unpleasurable. But in either case it is a feeling, a kind of stimulation, that you desire on some very deep psychological level. If you didn't, you wouldn't look. And you always do.

Information capitalism, the surveillance state, and cultural hedonism "pulled" the modern Internet into existence. They succeeded in doing so rapidly and thoroughly in large measure because we are inclined by nature to like – even to the point of personal harm – what the Internet allows us to do. Once the door to the audiovisual media was opened, we ran through it. Once the door to the Internet was opened, we ran through it and, sometimes, stumbled.

WHAT THE INTERNET DID (AND IS DOING)

Not even two decades ago, then, the world of the "Old Media" – talking, manuscript-writing, printing, broadcasting – became the world of the "New Media" – those carried by the Internet. In truth, that's a bit of an exaggeration in two senses. First, despite what you might have heard, the "Old Media" have not and probably will not disappear, *ever*. All the historical evidence suggests that major media are remarkably persistent: new media don't displace the old, they join them. Second, and again despite what you may have heard, the Internet is not the dominant mode of human communications today. Far from it. About 80 percent of Americans currently use the Internet regularly. On average, they spend 17 hours a week online.[40] Almost all Americans chat, read, and watch TV. Every week they spend on average 13 hours chatting, 2.5 hours reading "for pleasure," and 23 hours playing couch potato:[41] Assuming they aren't doing these things simultaneously, Americans live in the world of the "Old Media" a lot more than they live in the world of the "New Media" (21.5 hours a week more, to be exact).

According to our "push" theory of media effects, the addition of the Internet to the mix should have altered social practices and values in Audiovisual Cultures; it should have produced a distinct Internet Culture in the distinct – and ongoing – Internet Era (1990 to the present).

As we saw earlier, our experience itself gives us abundant evidence to test this thesis, and our experience over the past quarter century is exactly what we will use to prove it.

Accessibility

There was a time, now dimly remembered, when computers were very expensive and Internet access was rare. The IBM PC, released in 1981, cost around $2,000;[42] the original Apple Macintosh, released in 1984, ran $2,500.[43] Neither had modems. These cost around $225 in 1980.[44] The Internet was in its infancy and there were no Internet service providers (ISPs), but you could access bulletin board systems (BBSs) for a few dollars a month. Today, you can buy any number of new, fully functional PCs – computer, screen, keyboard, mouse, modem – for less than $400.[45] The philanthropic organization "One Laptop per Child" is building a machine that will cost around $200.[46] If you don't mind used computers, you can get one for the price of shipment. Internet access will cost you about $10 a month at home, but you won't have any trouble finding someplace where it's free if you live in the developed world. Every school, public library, café, and many cities offer *gratis* wired or wireless access. And of course you get it at work for nothing, if you don't count the working part.

There was also a time, perhaps not so dimly remembered, in which learning to use a PC and navigate the Internet was hard. Many of us remember the wonders of config.sys, autoexec.bat, and the "blue screen of death." More of us, alas, know what TCP/IP and DHCP stand for. In the main, however, the tendency has been for both "usability" and "connectivity" to increase – that is, become easier – over time. Many computers are now truly "plug and play," though occasionally they have to be re-plugged and re-played. The era in which the tech guy was a god-king is not gone entirely, but it's fading fast. Proof that PCs and Internet access have become less costly in financial and training terms is borne out by the number of people who use them. It's estimated that there are more than one billion PCs in use worldwide today, and that number will double by 2015.[47] Something on the order of 1.4 billion people have Internet access.[48] Both numbers are rising. There are 6.7 billion people on the planet.[49] The digital divide, it would seem, is closing rapidly.[50] We should add that would-be monopolists

will have a hard time making Internet access any more expensive than it naturally is, for the Internet's logistical chain has no readily exploitable bottleneck. Computers are made in too many places for production to be controlled. They are small enough that they can be transported relatively easily and secretly. Once in operation, they can be hidden. Some Internet traffic moves over telephone and cable lines, which can be cut, but only at the loss of other important services. Internet signals that are transmitted over satellites and picked up wirelessly are difficult to interrupt. Some tyrannical states have attempted to limit Internet access.[51] Not surprisingly, only North Korea has been really successful, largely because it has no telecommunication infrastructure to speak of.[52] The country code for North Korea is +850, but don't try to call because almost no one has a phone.[53] Satellite dishes and even cell phones are periodically banned. The frightened leaders of China, Iran, Cuba, and other shackled countries censor the Internet, but their ability to do so in the long haul as satellite-delivered service expands seems doubtful.

The Internet is a marvel of accessibility. If you want to get on it and use it, you probably can. If you can't now, you'll be able to soon. Accessible media foster diffused networks, that is, ones in which the ability to send and receive messages is shared by a large proportion of the population. In the developed world – Canada, the United States, Western Europe, Japan, South Korea, Australia – 40 to 80 percent of the population have Internet access.[54] In the less developed though developing world – Mexico, South America, the Middle East, Russia, China – 20 to 40 percent of the population have it. In the undeveloped world – Africa, Central Asia, Southern Asia, Southeast Asia – between 0 percent and 20 percent do. Overall, about 20 percent of the earth's population can get on the Internet. According to our theory, diffused networks *equalize* social practices and values evolved in and around them. Diffused networks give everyone roughly equal power to send and receive messages. Thus, it is difficult for any particular sender or receiver to monopolize communications and use unequal control to create unequal power.

There are ways in which the Internet is not democratic at all. Governments regulate it, telecom companies own it, search engines dominate it, and big corporations manipulate it. But having said all that, it's probably the most democratic "place" in the world, at least in the sense of having equalized social practices. In the real world, you are a person with lots of traits – gender, race, class, and all of their subspecies – that differentiate you from others; on the Web, however, you are most often just a "user" like any other. Offline, Bill Gates is very rich and you aren't. But online, Bill Gates is a "user" and so are you. Citizenship is to offline democracy as "user-hood" is to online democracy. Since both you and Bill are "users," everything you do together online – play games, talk software, write encyclopedia articles – is going to be on a "peer-to-peer" basis. Actually, *all* virtual social practices are equalized in the sense of "more equal than in the real world." They are not, however, equal for at least two reasons. First, the real world bleeds into the online world. So Bill's offline cred – if the "user" is *really* offline Bill Gates – is going to win him points in the software discussion site that you can't score. Second, reputation matters in the online world. Bill might really know what he's talking about and develop a good reputation, while you might be a "troll" and develop a bad one. Bill's online "peers" are going to listen to him and they aren't going to listen to you (in fact, they may ask the "mods" – moderators – to ban you). If you behave, however, you and everyone else will get a voice, just like your "peer," Bill Gates.

That is the "is" of the situation: everyone is on the Internet (or soon will be) and everyone is more or less equal on the Internet. The "ought" that followed was a peculiarly radical form of egalitarianism that took the Print Era notion of the "marketplace of ideas" to an extreme. In Print Cultures, everyone *theoretically* had a voice. But in practice, only those who were willing and able to bear the cost of print expression actually "spoke." It was generally agreed that this restriction of voices was a good thing: the "marketplace of ideas" would work only if those trading ideas had some investment in them and knowledge of them. In Internet Culture, everyone – or nearly everyone – *actually* has a voice. The costs of expression are so low that anyone can "speak," and everyone does. The "marketplace of ideas" can work only with difficulty in this cacophonous environment, so some additional justification for everyone "talking" at once had to be found. It was in the form of the "wisdom of crowds," according to which large, uncoordinated groups of independent people "know" things that even experts don't.[55] An important conclusion follows: if more people always know more, then there can be no reason to restrict anyone from weighing in. By this

logic more is better even when it's not. Not surprisingly, some people just don't buy it, at least as it applies to the Internet.[56]

Privacy

It's the most famous cartoon ever produced about the Internet. It's been reprinted thousands of times. Everyone has seen it. "On the Internet, no one knows you're a dog."[57] In the real world, everyone knows who you are. Here's why. First, you don't get to decide who you are. Others do that for you. You can't elect to be blue if you're born green. You can try to pass as someone you aren't, and some have. But the difficulty and psychological toll are great. Witness Michael Jackson. Second, you only get one identity at a time. You can try to lead a double (or triple, or quadruple) life. This feat, however, is notoriously difficult to pull off, and usually ends in divorce, incarceration, or an extended stay in a mental hospital. Third, you don't get to change identities. You can attempt to remake yourself. But if you really want a new identity, you have to enter the FBI's witness protection program. That, alas, involves saying bad things about some very mean people, a risky endeavor in itself. Finally, you often have to present your identity to others in person. You can avoid the *tête-à-tête* with intermediaries, letters, and the telephone. But when the deal is finally done, you are often going to have to look the other fellow in the eye.

None of these rules applies on the Internet. You get to decide who you are. Just pick a user name, "Bob," and make up a false profile. You get to have multiple identities simultaneously. Just make up another user name, "Betty," and another false profile. You can switch from one identity to another easily. Toggle back and forth: Bob-Betty-Bob-Betty. You never have to meet anyone face to face, for everything you want to do can be done at a distance. Even having sex (of an electronic sort). This doesn't mean that you can't be tracked down. Unless you're an expert, you can be found. But it's going to take a lot of effort to get from Bob and Betty to you if you are at all careful. As for your correspondence, it's relatively easy to conceal. Imagine some unauthorized someone wanted to see a file you've placed on the Internet. They would have to know where the file is. Happily, there is software available that will make a file functionally invisible. If they knew where the file was, they would need to get to it. Firewalls can stop them. If they manage to get to it, they would have to be able to open it. Passwords can prevent them from doing that. If they managed to open it, they'd have to be able to read it. Encryption will prevent that. Someone really dedicated and smart will probably be able to hack the file, but, again, they are going to have to go to a lot of trouble.

The Internet, then, is very private indeed. With just a little effort, you can hide who you are and what you've communicated behind multiple layers of deception and security. People do it routinely. Private media engender segmented networks, that is, ones in which information can flow in confined, restricted spaces but not between them. According to our theory, segmented networks will *close* social practices evolved in and around them. For a whole variety of reasons – some noble and some base – people like to hide what they do, and the Internet enables them to do this like no medium before it.

The Internet has allowed people to accomplish something unprecedented: the creation of private though public social space. This may seem like a contradiction in terms, but that's only because most of us have never had the experience of being unidentifiable in public. If you've been to a masked ball, then you've come close. But even there, you can probably be identified because masks don't mask very well. On the Internet, however, you can achieve true anonymity: your offline self will remain private, while your online self – your "avatar" as it is sometimes called – remains open for all to see. When you are anonymous, *all* of the social practices in which you engage are closed in the sense that they cannot be identified with your offline self. If you want a partial "second life," all you need do is pick a pseudonym. If you want a complete "second life," you can find it in any number of online virtual worlds.[58] In either case, you needn't worry at all about what others think of you, because "you" are separated from your actions. You – that is, the real you – are not accountable.[59] It's well understood that when people are not accountable, they do things they ordinarily wouldn't and probably shouldn't. "When the cat's away, the mice will play," as the proverb has it. It's no surprise, then, that the Internet is full of such bad behavior, or at least behavior that is deemed bad by offline standards.[60] Yet, even if you decide to enter the online world using your true offline identity, you can still easily create a closed space and a closed social practice within it. You simply build what is commonly referred to as a "walled garden," that is, a network that cannot

118. Daniel J. Boorstin, *The Americans: The Democratic Experience* (New York: Random House, 1973), 371.
119. The literature on multiculturalism is enormous. For a recent overview, see Anthony Simon Laden and David Owen, *Multiculturalism and Political Theory* (Cambridge: Cambridge UP, 2007).
120. There is some dispute about this claim. See Batchen, *Burning with Desire*, 124ff.
121. Jody Rosen, "Researchers Play Tune Recorded Before Edison," *New York Times* (March 27, 2008).
122. Christopher Rawlence, *The Missing Reel: The Untold Story of the Lost Inventor of Moving Pictures* (New York: Atheneum, 1990).
123. James A. Hijiya, *Lee de Forest and the Fatherhood of Radio* (Bethlehem: Lehigh UP, 1992), 101ff.
124. Thom Holmes, *The Routledge Guide to Music Technology* (New York: Routledge, 2006), 41.
125. R. W. Burns, *John Logie Baird: Television Pioneer* (London: Institution of Electrical Engineers, 2000), 122ff.
126. Frank T. Thompson, *Lost Films: Important Movies That Disappeared* (Secaucus: Carol Publishing Group, 1996).
127. Rashod D. Ollison, "Anniversary 'Thriller' CD Can't Beat Original," *Baltimore Sun*, February 12, 2008.
128. Linguists are doing their best to record many languages before they disappear. See Nicholas Evans, *Dying Words: Endangered Languages and What They Have to Tell Us* (Malden: Wiley-Blackwell, 2009).
129. Website: "Documentation," *Oxford English Dictionary*. Retrieved August 6, 2009.
130. See Ronald E. Day, *The Modern Invention of Information Science: Discourse, History, and Power* (Carbondale: Southern Illinois UP, 2001), 7–37.
131. The Moviegoer [John Grierson], *New York Sun* (February 8, 1926). For more, see Jack C. Ellis and Betsy A. McLune, *A New History of Documentary Film* (New York: Continuum International Publishing Group, 2005), 3ff.
132. Commission on Education and Cultural Films, *The Film in National Life* (London: G. Allen and Unwin, 1932), viii, 115 §174.
133. *Journal of the National Institute of Social Sciences* 15 (1931), 140: "The Project includes: (1) Research at original sources for the collection and documentation of folk dances and music." On the WPA's folk song recording projects, Nolan Porterfield, *Last Cavalier: the Life and Times of John A. Lomax, 1867–1948* (Urbana-Champaign: University of Illinois Press, 1996), 381ff.; and Richard A. Reuss with JoAnne C. Reuss, *American Folk Music and Left-Wing Politics, 1927–1957* (Lanham: Scarecrow Press, 2000), 16ff.
134. The literature on the spread of audiovisual surveillance technology is large. For an example, see Clive Norris, Gary Armstrong, and Jade Morton, eds., *Surveillance, Closed Circuit Television, and Social Control* (Aldershot: Ashgate, 1999); Clive Norris and Gary Armstrong, *The Maximum Surveillance Society: The Rise of CCTV* (Oxford: Berg, 1999); and Mike McCahill, *The Surveillance Web: The Rise of Visual Surveillance in an English City* (Cullompton: Wilan Publishing, 2002).

135. See William G. Staples, *Everyday Surveillance: Vigilance and Visibility in Postmodern Life*, second edition (Lanham: Rowman & Littlefield, 2000), 67–75.
136. See Frederick Corney, *Telling October: Memory and the Making of the Bolshevik Revolution* (Ithaca: Cornell UP, 2004), 75–82.
137. See David King, *The Commissar Vanishes: The Falsification of Photographs and Art in Stalin's Russia* (New York: Metropolitan Books, 1997).
138. Louis Liebovich, *Richard Nixon, Watergate, and the Press: A Historical Retrospective* (Westport: Greenwood Publishing Group, 2003), 73ff.
139. Howard Koch and Julius J. Epstein, *Casablanca: Script and Legend* (Woodstock: Overlook Press, 1973), 95.
140. Much effort is currently being spent developing techniques to search digital audio and video. See Stan Z. Li and Anil K. Jain, *Handbook of Face Recognition* (New York: Springer, 2005); and David C. Gibbon and Zhu Liu, *Introduction to Video Search Engines* (New York: Springer, 2008).
141. Gary R. Edgerton, *The Columbia History of American Television* (New York: Columbia UP, 2009), 113ff.
142. See Paul McDonald, *The Star System: Hollywood's Production of Popular Identities* (London: Wallflower Press, 2000).
143. For an eye-opening look at this process, see Robert Hofler, *The Man Who Invented Rock Hudson: The Pretty Boys and Dirty Deals of Henry Willson* (New York: Carroll & Graf Publishers, 2005).
144. See Clayton R. Koppes and Gregory D. Black, *Hollywood Goes to War: How Politics, Profits, and Propaganda Shaped World War II Movies* (New York: Free Press, 1987); and Tony Shaw, *Hollywood's Cold War* (Amherst: University of Massachusetts Press, 2007).
145. See Peter Kenez, *Cinema and Soviet Society from the Revolution to the Death of Stalin* (London: I. B. Tauris, 2001). For a particularly interesting look at how stars were made to serve the interests of the Soviet state, see Simon Morrison, *The People's Artist: Prokofiev's Soviet Years* (New York: Oxford UP, 2008).
146. Neil Postman, *Amusing Ourselves to Death: Public Discourse in the Age of Show Business* (New York: Viking, 1985).

5. *HOMO SOMNIANS*

1. *The Republic*, translated by R. E. Allen (New Haven and London: Yale UP, 2006), 227.
2. See the introduction to this book. For useful correctives, see Andrew Keen, *The Cult of the Amateur: How Today's Internet Is Killing Our Culture* (New York: Broadway Business, 2007); Lee Siegel, *Against the Machine: Being Human in the Age of the Electronic Mob* (New York: Spiegel & Grau, 2008); and Mark Helprin, *Digital Barbarism: A Writer's Manifesto* (New York: Harper, 2009).
3. The Internet has generated and is generating a stupendously large literature. JSTOR includes reviews of 208 books with the word "Internet" in the title, the vast majority of which were published between 1992 and 2004 (JSTOR has a five-year moving wall). HOLLIS, the Harvard College

Library System catalogue, lists 678 books under the subject heading "Internet – Social Aspects."

4. For a recent survey, see John Henry, *The Scientific Revolution and the Origins of Modern Science*, third edition (New York: Palgrave Macmillan, 2008).
5. There are many accounts of Brahe and Kepler. A standard version is Alexandre Koyré, *The Astronomical Revolution: Copernicus, Kepler, Borelli*, translated by R.E.W. Maddison (Ithaca: Cornell UP, 1973), 159ff. For a more recent view, see James R. Voelkel, *The Composition of Kepler's Astronomia nova* (Princeton: Princeton UP, 2001), 93ff.
6. See Paula Findlin, *Possessing Nature: Museums, Collecting, and Scientific Culture in Early Modern Italy* (Berkeley: University of California Press, 1994). For a broader view, see Arthur MacGregor, *Curiosity and Enlightenment: Collectors and Collections from the Sixteenth to Nineteenth Century* (New Haven: Yale UP, 2008).
7. Francis Bacon, *Religious Meditations. Places of perswasion and disswasion, seene and allowed* (London: Printed [by John Windet] for Humfrey Hooper, and are to be sold at the blacke Beare in Chauncery Lane, 1597).
8. On early modern European scientific societies, see Martha Ornstein, *The Role of Scientific Societies in the Seventeenth Century* (New York: Columbia UP, 1913); James E. McClellan, *Science Reorganized: Scientific Societies in the Eighteenth Century* (New York: Columbia UP, 1985); and Mordechai Feingold, "Tradition versus Novelty. Universities and Scientific Societies in the Early Modern Period," in *Revolution and Continuity: Essays in the History and Philosophy of Early Modern Science*, edited by P. Barker and R. Ariew (Washington, DC: Catholic University of America Press, 1991), 45–59.
9. On the *Encyclopédie*, see Robert Darnton, *The Business of Enlightenment: A Publishing History of the Encyclopédie, 1775–1800* (Cambridge: Harvard UP, 1979). The idea may have been Greek in origin, but there were plenty of contemporary examples at hand. See Lawrence E. Sullivan, "Circumscribing Knowledge: Encyclopedias in Historical Perspective," *Journal of Religion* 70:3 (1990), 315–339; and Richard Yeo, *Encyclopedic Visions: Scientific Dictionaries and Enlightenment Culture* (New York: Cambridge UP, 2001).
10. On Otlet, see Trudi Bellardo Hahn and Michael Keeble Buckland, eds., *Historical Studies in Information Science* (Medford: Information Today, 1998), 22–50; Ronald E. Day, *The Modern Invention of Information Science: Discourse, History, and Power* (Carbondale: Southern Illinois UP, 2001), 7–37; and Françoise Levie, *L'homme qui voulait classer le monde: Paul Otlet et le Mundaneum* (Brussels: Impressions nouvelles, 2006).
11. On the history of microfilm, see Fredric Luther, *Microfilm: A History, 1839–1900* (Annapolis: National Microfilm Association, 1959); Susan A. Cady, "Machine Tool of Management: A History of Microfilm Technology" (Ph.D. dissertation, Lehigh University, 1994); and Alistair Black, Dave Muddiman, and Helen Plant, *The Early Information Society: Information Management in Britain Before the Computer* (Aldershot: Ashgate Publishers, 2007), 14–23.
12. "Micro-Photography," *Photographic News* 1:22 (February 4, 1859), 262.
13. Willard Detering Morgan, *The Encyclopedia of Photography*, 20 vols. (New York: Graystone Press, 1970), vol. 12: 2286.

14. "Letter from Franklin D. Roosevelt to R.D.W. Conner" (February 13, 1942), *American Archivist* 5 (April, 1942), 119–120.
15. H. G. Wells, "The Idea of a Permanent World Encyclopedia," in H. G. Wells, *World Brain* (Garden City: Doubleday-Doran, 1938).
16. On Bush, see G. Pascal Zachary, *Endless Frontier: Vannevar Bush, Engineering the American Century* (New York: Free Press, 1997); and James N. Nyce and Paul Kahn, eds., *From Memex to Hypertext: Vannevar Bush and the Mind's Machine* (Boston: Academic Press, 1991).
17. Vannevar Bush, "As We May Think," *Atlantic Monthly* (July, 1945), 101–108.
18. The following is based on Janet Abbate, *Inventing the Internet* (Cambridge: MIT Press, 1999); and Katie Hafner and Andrew Lyon, *Where the Wizards Stay Up Late: The Origins of the Internet* (New York: Simon & Schuster, 1998). For a good (if now a bit dated) review of the literature, see Roy Rosenzweig, "Wizards, Bureaucrats, Warriors, and Hackers: Writing the History of the Internet," *American Historical Review* 103:5 (1998), 1530–1552. For a more recent, broader treatment of the history of the Internet and related telecommunications technologies, see Gerald W. Brooks, *The Second Information Revolution* (Cambridge: Harvard UP, 2003).
19. On SAGE, see Kent C. Redmond and Thomas M. Smith, *From Whirlwind to MITRE: The R&D Story of the SAGE Air Defense Computer* (Cambridge: MIT Press, 2000). For a short, readable account, see Robert Buderi, *The Invention that Changed the World: How a Small Group of Radar Pioneers Won the Second World War and Launched a Technological Revolution* (New York: Simon & Schuster, 1996), 380–406.
20. Herman Kahn, *On Thermonuclear War* [1960] (New Brunswick: Transaction Publishers, 2007), 278.
21. On the origins of "packet switching," see Abbate, *Inventing the Internet*, 7–42.
22. On the origins of ARPANET, see Abbate, *Inventing the Internet*, 43–82. Abbate makes clear that ARPANET was first and foremost a research network, not a "military command and control system." See her "Government, Business and the Making of the Internet," *Business History Review* 75:1 (2001), 150. For an interesting collection of documents related to the founding of ARPANET, see Peter H. Salus, ed., *The ARPANET Sourcebook: The Unpublished Foundations of the Internet* (Charlottesville: Peer-to-Peer Communications, 2008).
23. On the formation of the "network of networks," see Abbate, *Inventing the Internet*, 113–146.
24. On the origins of the World Wide Web, see Abbate, *Inventing the Internet*, 214ff. The story has been told by the very people who invented the Web. See Tim Berners-Lee, *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by Its Inventor* (San Francisco: HarperSanFrancisco, 1999); and James Gillies and Robert Caliliau, *How the Web Was Born: The Story of the World Wide Web* (Oxford: Oxford UP, 2000).
25. On the origins of the browser, see Abbate, *Inventing the Internet*, 217ff. Also see Jim Clark and Owen Edwards, *Netscape Time: The Making of*

the Billion-Dollar Start-Up that Took on Microsoft (New York: St. Martins Press, 1999).

26. On information capitalism, see Muddiman and Plant, *The Early Information Society: Information Management in Britain Before the Computer*; James W. Cortada, *Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry They Created, 1865–1956* (Princeton: Princeton UP, 1993); Thomas Haigh, "Inventing Information Systems: The Systems Men and the Computer, 1950–1968," *Business History Review* 75:1 (2001), 15–61; James W. Cortada, *The Digital Hand: How Computers Changed the Work of American Manufacturing, Transportation, and Retail Industries* (New York: Oxford UP, 2003); and James W. Cortada, *The Digital Hand*: Volume II: *How Computers Changed the Work of American Financial, Telecommunications, Media, and Entertainment Industries* (New York: Oxford UP, 2005). For critical perspectives, see David Lyon and Elia Zuriek, eds., *Computers, Surveillance, and Privacy* (Minneapolis: University of Minnesota Press, 1996); and Jim Davis, Thomas Hirschl, and Michael Stack, *Cutting Edge: Technology, Information, Capitalism and Social Revolution* (London: Verso, 1997).
27. See Arno Borst, *The Ordering of Time: From Ancient Computus to the Modern Computer* (Chicago: University of Chicago Press, 1994), especially 106ff.
28. See especially Cortada, *Before the Computer*.
29. On "Project Xanadu," see Gary Wolf, "The Curse of Xanadu," *Wired*, 3.06 (June 1995). On the "Electronic Information Exchange System," see Howard Rheingold, *The Virtual Community: Homesteading on the Electronic Frontier*, revised edition (Cambridge: MIT Press, 2000), 113ff. On "Computer Supported Cooperative Work," see Paul Wilson, *Computer Supported Cooperative Work: An Introduction* (Oxford: Kluwer Academic Publishers, 1991). On "Collaborative Networked Learning," see Peter Goodyear et al., eds., *Advances in Research on Networked Learning* (Oxford: Kluwer Academic Publishers, 2004).
30. On the surveillance state, see Christopher Dandeker, *Surveillance, Power and Modernity: Bureaucracy and Discipline from 1700 to the Present Day* (Cambridge: Polity Press, 1990); Andrew Polsky, *The Rise of the Therapeutic State* (Princeton: Princeton UP, 1991); David Lyon, *The Electronic Eye: The Rise of Surveillance Society* (Minneapolis: University of Minnesota Press, 1994); Jon Agar, *The Government Machine: A Revolutionary History of the Computer* (Cambridge: MIT Press, 2003); Helen Margetts, *Information Technology in Government: Britain and America* (New York: Routledge, 1998); John Gilliom, *Overseers of the Poor: Surveillance, Resistance, and the Limits of Privacy* (Chicago: University of Chicago Press, 2001); and Sandra Brama, *Change of State: Information, Policy and Power* (Cambridge: MIT Press, 2006). Unfortunately, much of the literature on government-sponsored efforts to gather information on citizens is reliant on Foucault and his exaggerated image of modern society as "panopticon."
31. Cortada, *Before the Computer*, 53.
32. On Defense Department subsidies of the computer industry during the Cold War, see Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge: MIT Press, 1996); and Arthur L. Norberg and Judy E. O'Neill, *Transforming Computer Technology: Information Processing for the Pentagon, 1962–1986* (Baltimore: Johns Hopkins UP, 1996).

33. On the notion that "hedonism" or "self-fulfillment" has come to dominate postwar Western culture, see Daniel Bell, *The Cultural Contradictions of Capitalism* (New York: Basic Books, 1976); Christopher Lasch, *The Culture of Narcissism* (New York: Norton, 1979); and Robert Bellah et al., *Habits of the Heart: Privatism and Commitment in American Life* (Berkeley: University of California Press, 1984). For a revision, see Paul Lichterman, "Beyond the Seesaw Model: Public Commitment in a Culture of Self-Fulfillment," *Sociological Theory* 13:3 (1995), 275–300. On postwar permissiveness, see Arthur Marwick, *The Sixties: Cultural Transformation in Britain, France, Italy and the United States, c. 1958–c. 1974* (New York: Oxford UP, 2000). Also of interest is Ronald K. L. Collins and David M. Skover, "The Pornographic State," *Harvard Law Review* 107:6 (1994), 1374–1399.
34. J. D. Salinger, *The Catcher in the Rye* (Boston: Boston, Little, Brown, 1951).
35. Aldous Huxley, *The Doors of Perception* (New York: Harper, 1954); Jack Kerouac, *On the Road* (New York: Viking Press, 1957).
36. See Bill Osgerby, *Playboys in Paradise: Masculinity, Youth and Leisure-style in Modern America* (Oxford: Berg Publishers, 2001); Martin Torgoff, *Can't Find My Way Home: America in the Great Stoned Age, 1945–2000* (New York: Simon & Schuster, 2004); and Tom Lutz, *Doing Nothing: A History of Loafers, Loungers, Slackers and Bums in America* (New York: Macmillan, 2007), 215ff.
37. See Peter O. Whitmer with Bruce VanWyngarden, *Aquarius Revisited: Seven Who Created the Sixties Counterculture That Changed America* (New York: Macmillan, 1987). The "seven" in question are: William S. Burroughs, Allen Ginsberg, Ken Kesey, Timothy Leary, Norman Mailer, Tom Robbins, and Hunter S. Thompson.
38. On these cases, see Terry Eastland, ed., *Freedom of Expression in the Supreme Court: The Defining Cases* (Lanham: Rowman & Littlefield, 2000), 192–194 and 218–234.
39. See Howard Rheingold, *Smart Mobs: The Next Social Revolution* (New York: Basic Books, 2003); Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (New Haven: Yale UP, 2006); Cass Sunstien, *Infotopia: How Many Minds Produce Knowledge* (New York: Oxford UP, 2006); Dan Tapscott and Anthony D. Williams, *Wikinomics: How Mass Collaboration Changes Everything* (New York: Portfolio, 2008); Clay Shirky, *Here Comes Everyone: The Power of Organizing without Organization* (New York: Penguin Press, 2008). One should probably also include the many books of Lawrence Lessig.
40. "2009 Digital Future Report," Center for the Digital Future, USC Annenberg School of Communications (2009).
41. For chatting ("socializing and communicating") and TV watching, see *The American Time Use Survey, 2007* (Washington, DC: Bureau of Labor Statistics, 2008), table A-1. On reading "for pleasure," see *The American Time Use Survey, 2007*, table 11.

42. Website: "IBM Personal Computer. Model 5150," Obsolete Technology Website. Retrieved on August 10, 2009.
43. Website: "Apple Macintosh. Model M0001," Obsolete Technology Website. Retrieved on August 10, 2009.
44. For example, the 300 Baud Texas Instruments TI-99/4 modem, introduced in 1980. See Website: "Texas Instruments CC-40." Retrieved August 10, 2009.
45. Jen Aronoff, "Retailers Say Computers Hot-to-Go This Weekend," *Charlotte Observer* (August 8, 2009).
46. Stuart Kennedy, "Cheap PCs for Kids Starts a Chain Reaction," *The Australian* (July 28, 2009).
47. Simon Yates et al., "Worldwide PC Adoption Forecast, 2007 to 2015," Forrester Research (June 11, 2007).
48. Website: "Internet World Stats." Retrieved July 23, 2008.
49. Website: U.S. Census Bureau, "WorldPOPClock Projection." Retrieved July 23, 2008.
50. David Buckinham and Rebekah Willett, *Digital Generations: Children, Young People, and New Media* (London: Routledge, 2006), 255.
51. Christine Ogan, "Communications Technology and Global Change," in *Communication Technology and Social Change*, edited by Carolyn A. Lin and David J. Atkin (London: Routledge, 2007), 29. Also see Ronald Deibert et al., eds., *Access Denied. The Practice and Policy of Global Internet Filtering* (Cambridge: MIT Press, 2008).
52. See "North Korea," in *Access Denied*, 347ff. Also see Stacey Banks, "North Korean Telecommunications: On Hold," *North Korean Review* 1 (2005), 88–94; and Marcus Noland, "Telecommunications in North Korea: Has Orascom Made the Connection?" *North Korean Review* 5 (2009), 62–74.
53. According to Nolan, North Korea has about five telephone lines for each 100 inhabitants, and "most of these are installed in government offices, collective farms, and state-owned enterprises." See Noland, "Telecommunications in North Korea."
54. For the statistics that follow, see Website: "Internet World Stats." Retrieved July 23, 2008.
55. See especially James Surowiecki, *The Wisdom of Crowds: Why the Many Are Smarter than the Few and How Collective Wisdom Shapes Business, Economies, Societies, and Nations* (New York: Doubleday, 2004). A related though somewhat different idea is "crowdsourcing." See Jeff Howe, *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business* (New York: Random House, 2008).
56. Website: Jason Lanier, "Digital Maoism," Edge.org. Retrieved August 11, 2008. Also see Keen, *The Cult of the Amateur*, 92–96; and Siegel, *Against the Machine*, 83–124. The most trenchant criticism of the "wisdom of crowds" is that the conditions that must be in place in order for crowds to be "wise" are very unusual. See Eric Klinenberg's review, "Strength in Numbers," *Washington Post* (September 7, 2004), C03.
57. Cartoon by Peter Steiner, *New Yorker* 69:20 (July 5, 1993), 61.
58. See Edward Castronova, *Synthetic Worlds: The Business and Culture of Online Games* (Chicago: University of Chicago Press, 2005); Tim Guest, *Second Lives: A Journey Through Virtual Worlds* (New York: Random House, 2008); Tom Boellstorff, *Coming of Age in Second Life: An Anthropologist Explores the Virtually Human* (Princeton: Princeton UP, 2008); Wagner James Wu, *The Making of Second Life: Notes from the New World* (New York: HarperBusiness, 2008); and Edward Castronova, *Exodus to the Virtual World: How Online Fun Is Changing Reality* (New York: Palgrave, 2008).

59. On the implications of online anonymity, see Daniel J. Solove, *The Future of Reputation: Gossip, Rumor, and Privacy on the Internet* (New Haven: Yale UP, 2007), 125–160.
60. The relationship between online anonymity and "disinhibitive" behavior is well documented. See Michael Tresca, "The Impact of Anonymity on Disinhibitive Behavior Through Computer-Mediated Communication" (Master's Thesis, Department of Communications, Michigan State University, 1998); Adam N. Joinson, "Causes and Implications of Disinhibited Behavior on the Internet," in *Psychology and the Internet: Intrapersonal, Interpersonal, and Transpersonal Implications*, edited by Jayne Gackenbach (Amsterdam: Academic Press, 1998), 43–60; John Suler, "The Online Disinhibition Effect," *CyberPsychology & Behavior* 7:3 (2004), 321–326.
61. See *Ashcroft v. Free Speech Coalition*, 535 U.S. 234 (2002). For a discussion of the legal status of virtual representations and obscenity, see Amy Adler, "The Perverse Law of Child Pornography," *Columbia Law Review*, 101:2 (March, 2001), 209–273; Amy Adler, "Inverting the First Amendment," *University of Pennsylvania Law Review* 149:4 (2001), 921–1002; Andrew Koppelman, "Does Obscenity Cause Moral Harm?" *Columbia Law Review* 105:5 (2005), 1635–1679; and Yaman Akdeniz, *Internet Child Pornography and the Law: National and International Responses* (Aldershot: Ashgate Publishers, 2008).
62. The primary exponent of this comforting, consumer-friendly view is Lawrence Lessig. See *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity* (New York: Penguin Press, 2004). Also see Savi Vaidhyanathan, *Copyrights and Copywrongs: The Rise of Intellectual Property and How It Threatens Creativity* (New York: NYU Press, 2003).
63. Stephen Manes, "The Trouble with Larry," *Forbes* (March 29, 2004), 84ff.; Stephen Manes, "Let's Have Less of Lessig," *Forbes* (April 2, 2004); and Keen, *The Cult of the Amateur*; 24, 141ff.
64. Website: DomainTools, "Domain Counts & Internet Statistics." Retrieved July 23, 2008.
65. Website: Netcraft, "June 2008 Web Server Survey." Retrieved July 23, 2008.
66. Website: WorldWideWebSize, "The Size of the World Wide Web." Retrieved July 23, 2008.
67. Bin He et al., "Accessing the Deep Web," *Communications of the ACM* 50:5 (2007), 94–1001; and Alex Wright, "Exploring a 'Deep Web' That Google Can't Grasp," *New York Times* (February 22, 2009).
68. Kathryn Leger, "Stealing Time at Work on the Net; Companies Cracking Down on Cyberslacking," *The Gazette* (Montreal) (April 4, 2008); "Personal Web Use at Work Is 'Costing UK GB10.6bn a Year'," *Financial Advisor* (June 26, 2008). More generally see Patricia M. Wallace, *The Internet in*