Residual Media

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University of Minnesota Press
Minneapolis
London

Published by the University of Minnesota Press
111 Third Avenue South, Suite 290
Minneapolis, MN 55401-2520
http://www.upress.umn.edu

Library of Congress Cataloging-in-Publication Data

Residual media / Charles R. Acland, editor.
p. cm.
Includes bibliographical references and index.
ISBN-13: 978-0-8166-4471-1 (hc : alk. paper)
ISBN-10: 0-8166-4471-3 (hc : alk. paper)
ISBN-13: 978-0-8166-4472-8 (pb : alk. paper)
ISBN-10: 0-8166-4472-1 (pb : alk. paper)
1. Mass media and technology. 2. Technology—Social aspects. 3. Mass media and culture. I. Acland, Charles R., 1963–
P96.T42R47 2007
302.23—dc22 2006026092

Printed in the United States of America on acid-free paper

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14 13 12 11 10 09 08 07 10 9 8 7 6 5 4 3 2 1

2 Out with the Trash: On the Future of New Media

Jonathan Sterne

Upon arrival at my new office in 1999, I found it waiting for me: a state-of-the-art ca. 1982 300-baud modem. The unit was filthy and connected to wires for interfaces that had long ago fallen into disuse. The power cable worked, and the red LEDs lit up to signal the unit's readiness when I plugged it in. So naturally, I unplugged it again and put it in a storage cabinet. There was no practical use for the device in 1999 and its only use today is as an example. The modem was a relic or an artifact but it was useless for its original purpose. It was obsolete. So too were the old Pentium I computer and monitor I wedged between a metal cabinet and the ceiling later that year, in anticipation that someone would come and take them away. They waited for the entire five years I occupied that office.

For academics like me, the acquisition of a new computer at work is, to use Pierre Bourdieu's phrase, one of those "rites of institution."[1] The new computer, or the budget for one, is a standard part of the hiring package for new faculty members in many North American colleges and universities. It is a sign of institutional health when the university replaces computers just to be up to date. But these are banal facts, apparent to anyone in academia. That's why it is surprising how little this knowledge impacts academic writing about new communication technologies. Perhaps this is because the shadows of Augustine and Descartes still loom darkly over new media studies. Emphasis on virtuality, the ethereal, ideational, immaterial, and experiential dimensions of new media leads many writers to accept the myriad strategies that states, institutions, and individuals use to move computer trash into the backspaces of modern life. If we are willing to look seriously at those backspaces, our garbage can tell us a lot about the relationship between our past and future.

Many thanks to Carrie Rentschler, Ken Hillis, Bill Fusfield, Charles Acland, Ariana Moscote Freire, Jeremy Morris, and audiences in Toronto, Montreal, and New Orleans for their comments on earlier versions of this chapter.

"New" media technologies as we know them, and all of their components, are defined by their own future decomposition. Obsolescence is a nice word for disposability and waste. Billions of pieces of computers, Internet hardware, cellphones, portable music devices, and countless other consumer electronics have already been trashed or await their turn. The entire edifice of new communication technology is a giant trash heap waiting to happen, a monument to the hubris of computing and the peculiar shape of digital capitalism.

In modern large-scale societies, every form of communication involves the physical disposition of bodies and, for lack of a more elegant way to put it, the physical disposition of stuff. If you can call something a medium, then it has a physical infrastructure. Take the Internet, for instance. A great deal of the literature on new media that discusses users' experience does so in terms of "disembodiment," as if the medium somehow removes the body from the mind. For Descartes, this was an exercise in abstraction—one body, one soul, was his equation, although he believed that he could indeed forget his body and his senses.[2] Modern Cartesians are less certain on that score—a body may lead to multiple souls (or subjects). Sandy Stone's widely cited *War of Desire and Technology at the Close of the Mechanical Age* contrasts two stories: a tale of the trial of a man accused of raping a woman with multiple personality disorder, and the case of a psychologist, Sanford Lewin, who passed as a woman in his online encounters via Compuserv chat groups. Stone's pairing suggests that one effect of computers and the Internet is to assist in the splitting of subject and body, and to open up a range of possible subject positions for a single body.[3] This perspective takes Cartesianism for granted and expands on the theme of a split between the body and the subject. Analytically, the reader is supposed to identify with the "subject" part of that dyad and leave aside the body.

Step back from that identification for a moment. Imagine yourself standing next to a person who is using a computer to connect to the Internet to become "disembodied." By imagining ourselves looking at him or her instead of being the disembodied surfer, we are forced to confront the body left behind in standard tales of online subjectivity. To put it another way: a little distance from the event forces our attention to move from subjects to objects. This is how it might look: our surfer friend more often than not sits in a less-than-optimally-ergonomic position in front of a keyboard, mouse, and monitor hooked to a computer, and in the neighborhood of a phone line, DSL, Ethernet, or other kind of connection. If we follow this connection, it will take us on a spiral of continuously increasing scale: we quickly find ourselves arriving at bits of infrastructure proper. First the body, then the interface, then the computer. Then routers, servers, T1 lines, backbones, switches, mirrors, telephone lines, local area networks, and networks of the networks—until the networks are so networked that we call them the Internet. In its very name, the Internet signals hardware and infrastructure. In this perspective, our new media subjects are not only embodied, but they are surrounded by piles and piles of humanmade stuff. Much of this stuff is going to be taken out of service long before it no longer works. It will sit in offices and warehouses. And then it will be trashed.

If computers and data lines are today's machines in the garden, then trash hardware is the giant modernist statue in the front yard that offends the neighbors. The disposability of computers may be one of the truly distinctive features of new media in our age. Or rather, it is the perception of their disposability that is so novel and interesting. Although advertisements and press releases suggest that every new machine is supposed to manifest a revolution, even our most casual understandings of digital technologies imply their own decomposition. Computers have become disposable consumer goods, and all the while the fact of their disposal is largely hidden from the front spaces of social life.

As a result, our understandings of what constitutes a "new" medium have shifted in a subtle but significant way. For the better part of the nineteenth and twentieth centuries, "new" media were primarily understood as "new" with respect to other media: "new" media forms replaced older media forms. When most people write the phrase "new media," they probably think that they are talking about the newness of computers and digital hardware in contrast to other, older analog media forms. Yet computers and other digital media actually embody a different model of newness: computers have reached a point where their "newness" references other computers and not other media. This is not a wholly novel turn of events—after all, the harmonic telegraph was meant to supplant the single-channel Morse "sounder" and color television sets supplanted black-and-white ones. But the dynamics of computers as "new" media differ significantly from the usual stories about innovation in media history. In short, there are really two models of "newness" to which scholars of media change need to attend: (1) the "newness" of a medium with respect to other media, and (2) the so-called state of the art in design and function *within* a given medium. Scholars, journalists, and many others who write about computers have tended to collapse the second sense of newness into the first. That is why a magazine like *Wired* can call a new operating system a "revolution" with a straight face, and that is why scholars are willing to call computers "new" media even though they have been around for decades. A short detour through U.S. media history will illustrate how central trash is to this shift from comparison across media to comparison within a single medium.

When U.S. reporters took notice of telegraphy in the 1840s, they understood it as a "new" medium in comparison with other communication media of the day: mainly, the post. In the 1880s, both engineers and public commentators elaborated an understanding of the "newness" of the telephone by comparing it with telegraphy. Indeed, telegraph wires eventually came down as phone companies established hegemony in the United States and elsewhere.[4] This pattern extends well into the twentieth century: when television exploded on the American scene, it was understood as a "new" medium with respect to radio, telephony, and film. Leo Bogart's classic *The Age of Television* is clear and unequivocal on this fact. As Bogart noted, the emergence of television required radio to recreate itself.[5] A more recent version of this story would have compact discs replacing long-playing records.[6]

One might imagine the same to be true of digital media today. Many of the most widely cited cultural commentaries on digital media express their newness

in terms of their difference from "old" media such as television, print, or photography.[7] But if this were a sufficient explanation of the imagined "newness" of digital media, we could expect the moniker "new" to have declined in general usage by now. Strictly speaking, microcomputers—now simply called "computers"—are approximately forty years old. For the sake of argument, I am dating the history of microcomputers from the introduction of Digital Equipment's PDP-1 in 1960. It was the first commercial computer with a keyboard and a monitor. Compare that with the histories of other media at age forty. Telephony is usually dated from 1876. By 1916, commentators were no longer calling the telephone a "new" medium. Although telephony would not reach the majority of American homes until after World War II, it was a well-established feature of the cultural landscape. Radio is conventionally dated from 1899. By 1939, radio was not only no longer a "new" medium, it was essentially a consensus medium, reaching the vast majority of American households. Proportionally speaking, computer and Internet diffusion in America is greater than telephone diffusion was in 1916.[8] It is a well-established aspect of middle-class life: it receives extensive coverage in the news and appears regularly in fictional texts. Granted, the Digital Equipment PDP-1 was very different from the modern "personal computer," but Guglielmo Marconi's first radio (which he called a "wireless telegraph") was also quite different from the home radio set of 1939. On the scale of media history, computers have been around for quite some time, yet we persist in calling them "new media." The question is why.

In a weird, recursive way, new media are "new" primarily with reference to themselves. Computer culture has reached a truly bizarre equilibrium. Today, computers and other digital hardware displace their own counterparts more than anything else. "Newness" in computers is defined with primary reference to old computers. Along with cell phones, they are designed to become obsolete after a short period of use. They are designed to be trash, to make room for future profits, additional hardware sales, and performance upgrades. Certainly, computers have become a vehicle through which users can encounter "the new" in media technology. But even more, computers' apparently interminable status as a "new" medium speaks to the degree that we, who write about computer technology, have mistaken the "state of the art" in a single communications industry for the ongoing total transformation of the media environment. Journalists, scholars, and savants alike have collapsed the two meanings of "new" in our descriptions of media. Where other media industries certainly found ways to sell new hardware, the digital hardware industry has rationalized, accelerated, and made regular the process of equipment turnover.

One common available explanation of this tendency is that computers have not yet stabilized as a medium, since the technology is still evolving. One would expect, based on the history of other media, that innovation in computing would eventually settle down and a stable format and product would result. But within the occupational ideology of computer engineering, there is actually an opposite impulse: Moore's law. Intel founder Gordon Moore observed in 1965 a "doubling of transistor density on a manufactured die every year," which has been extrapolated to mean that computer power doubles every year. Moore's

observation has been canonized as a "law" by computer engineers and others. In fact, it is less of a law of computer evolution than it is a fantasy the industry wishes to uphold. There is no better evidence of this than the varying reports of the length of time for the doubled density. Moore's original proposition was a single year. Other observers have suggested that a more accurate duration is eighteen months. The Intel Web site has itself resorted to fudging the time period as "every couple years." In other words, Moore's law is more of an imperative than a law. Consider Moore's own reflections many years after his initial observation:

> To be honest, I did not expect this law to still be true some 30 years later, but I am now confident that it will be true for another 20 years. By the year 2012, Intel should have the ability to integrate 1 billion transistors onto a production die that will be operating at 10 GHz. This could result in a performance of 100,000 MIPS, the same increase over the currently cutting edge Pentium II processor as the Pentium II processor was to the 386! We see no fundamental barriers in our path to Micro 2012, and it's not until the year 2017 that we see the physical limitations of wafer fabrication technology being reached.[9]

The important thing to note here is that the computing industry, at least according to Moore, not only does not expect to stabilize anytime soon, it *does not want to*. Innovation, so the logic goes, keeps a market fresh and guarantees computer sales. Although this seems like a reasonable enough proposition from the perspective of marketing, keep in mind that the *pace* of innovation is considerably faster than other, "old" media industries like television or sound recording. Apple Computer, for instance, which does not have a significant share of the business computing market, segments its market into three divisions: "creative professionals" who replace their computers every twenty-four to thirty-six months; consumers who replace their computers every five years; and educational institutions that replace their computers every five to six years.[10] Although these figures might seem overvalued, they actually reflect a *decreasing* rate of purchase because of the market slowdown in North America.

Susan Strasser writes that, by the 1920s, "Economic growth was fueled by what had once been understood as waste."[11] A high rate of machine turnover marks a condition of tremendous profitability for the computer hardware and software industry, and it plays on a long-established principle in American consumer economics. Anyone familiar with the history of marketing and consumer culture will recognize the patterns and attitudes I describe as a variation in a long history of obsolescence. Sociologists and marketers have often divided obsolescence into two types: stylistic and technological. Stylistic obsolescence was decried by social critics and celebrated by marketers: the idea that objects go out of fashion and need to be replaced was clearly wasteful from an environmental or social-critical point of view. But it was also clearly a good thing from a marketing perspective because it kept markets open. In fact, stylistic obsolescence was the basis of the first modern forays into *planned* obsolescence. In 1923, General

Motors, in an effort to increase its market share against Ford, introduced the "yearly model change" to its line of cars. Although even their CEO, Alfred Sloan, acknowledged the additional cost of research and design that accompanied the move to deliberately render their stock obsolete on an annual basis, the benefits were immense. In addition to generating annual publicity for GM cars, the scheduled redesign allowed GM to rationalize its own innovation process with stylistic changes every year and technological changes every three years (based on the life expectancy of the dies used to stamp the metal). The phrase "planned obsolescence" did not itself find general usage until a 1955 *Business Week* article noted that GM's model of industrial design, which had caught on in the automobile industry, was moving to other consumer industries as well.[12]

The idea of technological obsolescence extends even further back than stylistic obsolescence. In *Democracy in America*, Alexis de Toqueville writes of Americans' belief in the "indefinite perfectibility of man." Such a belief, he argued, flows throughout U.S. society: "continual changes then pass at each instant before the eyes of each man." Obsolescence was the technological manifestation of this never-ending change: "I meet an American sailor and I ask him why his country's vessels are built to last a short time, and he replies to me without hesitation that the art of navigation makes such rapid progress daily that the most beautiful ship would soon become almost useless if its existence were prolonged beyond a few years."[13] In this example, obsolescence is coupled with that equally loaded term "progress." Technological obsolescence was supposed to represent genuine innovation, utility, and, to some degree, necessity. Certainly, that is de Tocqueville's reading of the sailor's reasoning. Although it is specific to the United States, it would not be much of a stretch to suggest this reasoning has been carried forward by an international computing industry.

The similarity between the sailor's analysis of innovations in shipbuilding and Moore's analysis of innovations in microprocessor manufacturing should not be lost on us: they are two species of the same genus. Almost a century later, the same texts that decry stylistic obsolescence would still celebrate the obsolescence derived from "progress." Indeed, with the rise of consumer culture in the intermediate decades, the ideology and practice of technological progress were disseminated more fully into everyday life. Classics of consumer culture, like Christine Frederick's *Selling Mrs. Consumer*, argued that "obsolete" objects should be replaced with "modern," up-to-date ones.[14] In essence, those "when to upgrade your computer" columns in newspapers and magazines descend from Frederick's consumer advice of the 1920s. The most basic aesthetic dimensions of commercial and fictional representations of computers (assuming for a moment there is a difference) follow this line as well. Mainstream depictions of computers in films and television class them along with cars and other consumer electronics: they are clean, new, and generally work well unless sabotaged. "New technology" conjures up well-lit images of sleekly designed computers and monitors; bright colors, spotless, smooth surfaces, clear screens, and quick applications. This obtains even though the average condition of computers is closer to dust-covered CPUs and monitors, screens dotted with fingerprints, and keyboards darkened by use. In the extreme, these so-called new technologies run

on operating systems so loaded down with applications and extensions that they crash on startup, with hard drives so full that they crawl along lazily seeking data. Of course it would be silly to expect the art of commercials to present audiences with computers as they are—advertisements are all about fantasies of novelty and change. But the ethos of commercial art extends into almost all public depictions of computing. In the vast range of available representations, computers are by and large clean, attractive, functional, and new. The exception would be the many online user group bulletin boards and listservs for particular brands of software and hardware. For most programs and platforms it is easy to find a litany of complaints and queries as to stability. Yet, even in these spaces, there is still often an unflappable belief—or at least a hope—that the latest new version will resolve all the existing problems. Today, the new computer is an object of industry and consumer fantasies alike.

So what makes computer obsolescence important, different, or new? The answer is that the computer industry has applied the logic of planned obsolescence to media hardware more thoroughly than any other media industry before it. Computers and digital media are no longer "new" with respect to other media. They are new primarily with respect to themselves. Designers know this. By the time a new IBM, Pentium, or Athlon processor rolls off the line, engineers are already working on a new model to render it obsolete. Marketers know this as well. Advertisements for "digital lifestyle" products from Dell, Apple, and Gateway (among other brands) all try to convince their viewers that new computers with faster processors, more RAM, and bigger hard drives will be necessary as a lifestyle accessory. Users know this too. People expect to replace their computers over time, and power users eagerly await the opportunity to replace their machines. Corporations and public institutions anticipate computer replacement in their budgets. Not only can U.S. citizens write off the purchase of a new computer under some circumstances, they can also write off the depreciation of the computer over time.

Obsolescence is not only planned but also forced or engineered. The boundary between a durable and obsolete has as much to do with social relations as it does with the decline or decay of the object. Groups of people choose to make an object obsolescent, or they choose to sustain an object long after it would have begun to fall apart on their own. As I have already suggested, this phenomenon is not limited to the computer industry. By way of comparison, consider Michael Thompson's analysis of how housing becomes "rubbish":

> The fact that buildings last for generations is dependent upon their receiving "reasonable maintenance." The amount of maintenance that is deemed reasonable is not a quantity deriving naturally from the intrinsic physical properties of the house and its environment. The level of maintenance that is deemed reasonable for a building is a function of its expected life-span and its expected life-span is a function of the cultural category to which that building is at any moment assigned, and, if its category membership changes, so will its expected life-span and its reasonable level of maintenance.[15]

Thompson's point is that buildings fall into disrepair and become obsolete because people decide not to maintain them anymore. "Obviously," writes Thompson, "it is much easier to impose durability on a solid granite-faced Edwardian bank than on a thatched wattle-and-daub cottage, yet we frequently choose the more difficult alternative."[16] His point is well taken: obsolescence and durability are first and foremost socially imposed categories, and they are only about the physical properties of things in a last instance that rarely, if ever, arrives.

As it is for buildings, so it is for computers. By limiting "backward compatibility" between older and newer computer systems—and this can be accomplished via changes to hardware or software—manufacturers make it increasingly difficult to interface between older and newer machines. Yet even this condition is not wholly made up and is not wholly a matter of an industry seeking the last drop of profit from a world of narrow margins and cutthroat competition. Most digital media are what Arnold Pacey calls "halfway" technologies. When we think of technology, we normally think of it as fully accomplished and reasonably functional—as in the sexy computers we see in magazine ads and on television. But computer technology is more like advanced medical procedures, missile defense, and other not-fully-accomplished technologies. It sort of works, but not in a flawless or entirely predictable fashion. Part of the problem, argues Pacey, is that technologies are often built to solve problems that are only half understood.[17] This approach actually fuels replacement: one reason people are so willing to replace infrastructure is that it doesn't work so well.

Combined with the "halfwayness" of most new media, planned obsolescence guarantees the continued recursive experience of digital media as "new." The "newness" of new media is sustained by people continually disposing of the equipment they have in anticipation of something better. The hope is always that the next generation will work better, be more stable, be more functional. Many computer users are aware that new versions of software and hardware are released well before all the bugs are ironed out. But by force of circumstance, they do not act on that knowledge. The halfwayness of computerized communication defines it. Users are ready for servers to be down and messages to bounce. They are ready to be infected with viruses, Trojan horses, and spyware. And they are ready to replace their machines. A certain faith in the promise of computing persists even if the reality of computing isn't all it's cracked up to be. One might be inclined to see this faith as tied to a cultural interpretation of computers' economic value. They are expensive to purchase and maintain, they must be imagined as better, more efficient or more flawless than they actually are.

Indeed, scholars interested in waste from a cultural perspective have framed the problem in terms of value.[18] But value alone is too blunt an analytical instrument here. Value is one particular kind of classification among many. A computer's social life might best be described as a kind of symbolic journey. It undergoes a series of symbolic transformations: it travels through categories from new, to useful, to obsolete, to unused, to trash. "Taxonomy is . . . not only an epistemological instrument (a means for organizing information) but it is also (as it comes to organize the organizers), an instrument for the construction of

society."[19] The production of computer trash is thus a fundamentally taxonomic process. A computer passes through several classifications in its lifetime and only some of them have to do with "value." But every time a computer passes through the threshold from one classification to another, its meaning and function do change.

Assuming that a brand-new computer confronts its first users in the "new" category, the first threshold through which a computer passes is the passage from "new" to "useful." This passage is accompanied by a significant drop in cash value. Usually, depreciation first occurs within six months of the computer's purchase, and it is mainly the result of manufacturers routinely updating their lines to compete with one another. A side effect of this routine update is to devalue all machines the company sold within the past few months. Once in the "useful" category, a computer's cash value on the used market will steadily decrease every few months for the life of the machine. It will likely remain compatible with existing software and peripherals for several years, but within a single year, its value may have dropped 50 percent or more. Computers thus spend most of their working lives outside the much vaunted category of "the new" even as they remain perfectly functional for their users.[20] As should be clear from my narrative here, "newness" is a function of marketing practices. A six-month-old computer's passage over the threshold from "new" to "useful" is the result of practices by the machine's manufacturer. In changing their line of machines in production, manufacturers actually begin to produce the obsolescence of old machines as well.

For a device to become obsolete, it must be devalued again. Although the first devaluation of a computer has to do with its resale price, obsolescence requires an attack on or erosion of the machine's use-value. This can be accomplished through companies' refusal to update software; their decision to change software, hardware, peripherals, or networks to protocols or formats that are no longer compatible with a generation of older machines; or their development of software that won't run on older machines. Ivan Illich calls this kind of technological regulation a "radical monopoly": a monopoly of technological form, as opposed to the domination of a market by a single company.[21] The result of a radical monopoly is coercive participation. People who wish to use a technological system must do so on terms dictated to them by the people who control the radical monopoly. This is not meant as a conspiracy theory: Microsoft has to adjust its software to PC developers' operating equipment and vice versa, but together their interactions define the parameters of a radical monopoly in computing at any given time—at least for those who use Microsoft products on PCs.

Even when companies deliberately or accidentally "obsolete" old computers, they do not automatically become trash. Some users will persist for years with an old machine until they are forced to update or upgrade. The moment of coercion might come when their computer has a mechanical failure, or it might come when users want to integrate with some kind of network that has baseline requirements beyond their computers' capabilities. This is one of the important subtleties that other kinds of studies of waste often leave aside. The usual

argument is that when an object loses its value, it becomes trash. But in the world of computing equipment, there is an important continuum between that kind of progression and a more insidious gap between obsolescence and trash. There is often a significant gap in time between the reclassification of a computer as obsolete and its fall into disuse. There is another gap between the time when a user ceases to use the machine and when it is finally thrown out or recycled.[22]

Computers' long decline from newness shapes their travels through the front and back spaces of social life. Computer obsolescence is a spatial problem. When computers exist in a marginal category—between "useful" and "garbage"—they often wind up in marginal spaces like warehouses, attics, and basements.[23] After they stop using a computer, users, whether individuals or companies, most often store them for a time after the cessation of use. The two most likely reasons for this are ignorance and denial. People may not know how to get rid of their computers. Or, more likely, the memory of dropping well over $1,000 (and probably considerably more) still lingers. As a result, there remains a belief that the machine might have some value—either economically or metaphorically. Chances are, at least among middle-class people in North America, that most people know someone with at least one or maybe more obsolete computers in their offices or homes. In fact, you all know of one such person thanks to the first-generation Pentium that lived on top of my supply cabinet and the modem that now sits on display in my new office.

This tendency toward storage creates a host of problems. Although a machine's condition is generally known before it is put in storage, computers that have been stored for some time have to be tested by someone. Organizations have to pay a technician to do it. This expense adds to the financial liability of computer recycling for organizations, and it becomes a structural incentive to throw them out. So, let's follow the logic: because computers are so expensive, people are less likely to get rid of their old machines—even after replacing them. Because they don't get rid of their computers right away, they are more likely eventually to throw them out. Yet computers are *so* valuable to many lines of work and leisure that they must be replaced. That is a twisted but true logic: computers are too valuable, so we eventually throw them out and buy new ones.[24]

As long as computers, software, and the Internet are conceivable as new technologies rather than as plain old vanilla technologies, we will be confronted by torrential rains of new machinery and applications. Those rains will mix together their own brand of toxic sludge as trash hardware piles up in basements, warehouses, and landfills. The U.S. Environmental Protection Agency projects that sometime this year (2005), for every new computer manufactured, another one will become obsolete. In the United States alone, more than 24 million computers became obsolete in 1999. Of those, only 4 million were properly recycled or donated. The remaining 20 million computers were dumped into landfills, incinerated, shipped as waste exports (and probably dumped or incinerated upon arriving at their destination), or stored. That was a single year in the United States alone. We are clearly talking about the disposal of hundreds of millions of computers in a very short span of time, all of which occupy the vague and fraught category of "obsolete" but may function perfectly well.[25]

Computer junkyards have sprung up across the United States. While a graduate student at the University of Illinois at Urbana-Champaign, I had the opportunity to observe the evolution of one such junkyard. It began as a repository of all the university's obsolete computers. It was a whole warehouse filled with piles of computers, monitors, disk drives, server racks, testing equipment. You name it, they had it. But most of this junk could not even be sold as junk. Now, the owner won't accept anything less than a Pentium II because he can't sell it. The rest of the materials, including the pile of dual-floppy systems and outmoded servers he inherited from the first owner, go into a landfill.

Some old technologies do make a comeback from the trash heap, but not computers. Old records, for instance, have surfaced from their status as once-dead commodities. Some can cross the threshold from "rubbish" back to "useful" through successive waves of nostalgic revivals. As Will Straw writes, global, "centrifugal" tendencies, "nourished by the scavenger-like record collecting tendencies of dance club disc jockeys, lounge music revivalists, curator-compilers like David Byrne, and by the activities of marginal reissue labels [are] dragging back, into the realms of hip credibility, musical currents long dismissed as false imitations or examples of debased exploitation."[26] In contrast, there is a tiny, barely existent vintage market in computer hardware. Old dual-floppy systems do not become fashionable again; they do not regain their value through discovery by hip members of the creative classes.[27] Until they are "obsoleted," many computers show no significant signs of wearing out. It is only when people stop caring for them that many of them begin to fall apart. So in an important way, computers' economic decay *hastens* the process of physical decay.[28]

Computers' physical decay raises other issues as well. The threshold of trash is an incredibly important one for computers because that is the moment when computers move from indoors to outdoors. Once it is reclassified as trash, the unit will be exposed to the elements and begin the long process of decomposition or decay. Of course, some computers will be recycled. But many more will be tossed out in the trash. When thrown into landfills or incinerated, computers and computer monitors can release hazardous materials and heavy metals into the environment such as lead, mercury, and hexavalent chromium. Each of these substances poses unique dangers to human beings and their environment. In landfills, these substances will eventually leak into the drinking water supply and the human food chain. Incinerating computers and parts releases toxic chemicals into the air, where people and animals breathe them in. It also creates ash and slag-containing toxic substances, which require specialized disposal. Some of the pollutants released through computer disposal, like lead, do not disappear over time.

As a result, many local, regional, and national governments are currently in the process of declaring computers to be hazardous waste. This means that they require special means of disposal and cannot be dumped into landfills or processed with other garbage. The disposal of computers has also become an issue worldwide. Some governments are exploring the idea of extended product responsibility (EPR). The idea behind EPR is to make companies responsible for the products they manufacture throughout the product's life cycle. Germany, the

Netherlands, Norway, Switzerland, and Denmark have all enacted EPR-related laws, and other European countries are following suit. Under EPR, theoretically, if you manufactured a computer monitor and five years later it surfaced in a landfill, it would be your problem rather than the state's problem. With EPR, companies are held responsible for the physical management of their products, the costs of the waste created by their products, the liability for environmental damage caused by their products, and for informing consumers about the possible environmental effects of a product at different times in its life cycle. In response to this kind of pressure, Hewlett-Packard and IBM will both, for a fee, dispose of your old computer for you.[29]

It is easy to see government involvement in computer disposal as a kind of natural advance of the liberal state (or what's left of it in some places). Prima facie, it seems reasonable that the state would step in to regulate computer waste, once the corpses of unloved computers reach a critical mass in storage lockers, warehouses, and landfills. But this very tendency to see state intervention as a natural outcome brings us back to the role of governments in all this. Dominique Laporte's provocation that "the state is the sewer" is apropos here.[30] The orderly management of computer waste is not simply an environmental problem but also a problem of legitimacy. It is the other side of innovation—as corporations manage or mismanage the introduction of new software and hardware into everyday life, so too must someone regulate the exit of computers from the social stage. EPR is government policy that acknowledges the future of all digital hardware is in the trash heap. It is a political response to an economic and cultural fact.

The state's managerial interest in waste is directly political. By managing waste products, by keeping them out of view and off its citizens' minds, the state maintains faith in infrastructure and the affirmative character of social life as mythically pure. Gay Hawkins calls knowledge of waste disposal a "public secret" because one of the state's most important symbolic roles is to help its citizens forget about their own excrement and other waste products.[31] The managed departure of computers from the social stage and into dumps follows a similar logic. To twist around Marx's famous handmaiden metaphor, the state is an administrative assistant to the computer industry when it comes to the disposal of computer trash. As with other kinds of refuse, computer trash works best as a public secret. If users can ignore their own computer trash once it leaves the home or office, it becomes that much easier to maintain an image of computers as new media. So even environmental regulations designed to restrict some of the damage done by computer disposal also help perpetuate the cycle of computer purchase, use, warehousing, and eventual disposal.

If that is not enough, in practice the regulations themselves do not so much reduce environmental harm as hide it from the middle classes of wealthy nations. A 2002 report coauthored by the Basel Action Network, the Silicon Valley Toxics Coalition, Toxic Link India, SCOPE (Pakistan), and Greenpeace China documents that "technotrash" is more often than not exported under the guise of recycling, only to be dumped in the villages and countrysides of Asian nations, especially China, India, and Pakistan. Computers thus become part of a

global trade in toxic materials, in which "recycling" means hazardous materials are moved from richer to poorer nations, with traffickers turning a tidy profit.[32]

Of course it would be silly to oppose some environmental regulations applied to computer disposal on the grounds that they are not strong enough. The interest of states in computer trash is a good thing, but it is clearly not enough. A "successful" environmental program can be based on classification of computers as hazardous waste or it can be based on some version of EPR. But both approaches essentially manage and legitimate the continued onslaught of computer trash and the ongoing manufacture of obsolescence by the hardware industry; they also inadvertently support the global trade in toxic materials. Ultimately, both hazardous waste and EPR approaches are preferable to real reform from the industry's perspective. From an industry perspective, the real fear must lie in the manufacture of a computer that is finally "good enough." Then the computer industry will find itself in the same position as manufacturers of radio sets in the late 1920s. Having sold as many sets as practical, companies started to go out of business. The television industry learned from radio. When they reached market saturation, they moved to campaigns for families to purchase a second set, and they introduced color televisions—at first as a luxury good and then as a necessity.[33] All the computer industry has done is to rationalize and speed up this process of obsolescence in consumer electronics. They have done so through a faster pace of innovation, a willingness to release computers and components as halfway technologies, and a constant onslaught of advertising and punditry.

Pacey argues that although some halfway technologies are the result of attempts to solve half-understood problems, the other part of the problem is that there are some things "which professionals are almost trained to ignore."[34] Knowledge of sustainability or "green computing" is one area that is simply written out of computer design at the moment. In fact, some computer components are considerably less durable now than in earlier models. As a cutting-edge technology, computers are built not to last. Like the ships of the 1830s, computers are built with an eye toward their own replacement.

This need not be the case. Illich uses the term "conviviality" to connote the following characteristics of technologies: ease of use, flexibility in implementation, harmony with the environment, and ease of integration into truly democratic forms of social life.[35] Obviously, Illich's vision is a utopian one, but his measure of a technology's conviviality seems relevant to the question of computer trash. We need a "convivial" computer, or rather a whole convivial system of digital components, a convivial digital infrastructure. Imagine a company that took its time developing a computer that could last, could be easily updated, repaired, and upgraded, was easy to learn and use, worked well with other platforms, and that was less environmentally hazardous when it did finally decompose. The dream is not unrealistic: we expect our cars and consumer appliances to work for a decade or more. Major appliances are supposed to last even longer, and more specialized technologies like musical instruments can last decades or even centuries. The models are out there. But for a computer company to engage in such an undertaking would be viewed as commercial suicide.

Imagine if a company successfully designed a computer that would last more than a few years, could easily be repaired and upgraded, was "forward compatible" with as-yet-uninvented devices as well as backward compatible with older ones, and was made of less hazardous materials. Imagine if such a product took the consumer market by storm, wiped out the competition, and became the dominant unit and platform in homes and private and public institutions all over the world. Eventually, the successful company's profits would level out or even decline as the market saturated. In the current economic climate, such stability would be read as a sign of economic weakness on the company's part.

It is tempting to label this scenario a paradox, but it is not a paradox at all. It suggests that contemporary corporate culture, with its drive for growth, increase in market share, and larger profit margins is a fundamentally inhospitable environment for any form of convivial computer. The truly sad thing about it is that a convivial computer is not a revolutionary idea. It does not require a fundamentally different economic system. It simply requires a manufacturer that would be more interested in long-term stability than near-term growth. No such manufacturer exists in the current economic environment. For now, it is up to academics, designers, policymakers, and artists to come up with convivial models of computing, and we will have to do it on our own time, with our own resources. But it can be done. We need digital hardware that is more democratic, slower to change, easier to use, and less damaging to the environment.[36]

In the meantime, the anticipation of their own decomposition defines our new technologies. I could write with Georges Bataille that hardware trash is the accursed share of the digital economy—that bit of excess that must be disposed of "gloriously or catastrophically."[37] Or I could write with a more modulated John Frow, who argues that waste is not excess but "a generative dynamic in the destruction and formation of value."[38] Either way, it is computer trash that turns digital technologies into "new" media. Whether metaphorical or real, our trash heaps are public secrets. Computer trash is a catastrophic dimension of that middle space between fantasy and accomplishment occupied by so much digital halfway technology. A seemingly endless cycle of creation and disposal is driven by the dreams of users who seek that killer application and by manufacturers who stay above the bottom line only so long as they anticipate the underground burial of next year's new product.

Notes

1. Pierre Bourdieu, *Language and Symbolic Power*, trans. Gino Raymond and Matthew Adamson (Cambridge: Harvard University Press, 1991), 125.

2. René Descartes, *Discourse on Methods and Meditations on First Philosophy*, 4th ed., trans. Donald A. Cress (Indianapolis: Hackett Publishing, 1999).

3. Allucquère Rosanne Stone, *The War of Desire and Technology at the Close of the Mechanical Age* (Cambridge: MIT Press, 1995). See also Sherry Turkle, *Life on the Screen: Identity in the Age of the Internet* (New York: Simon & Schuster, 1995).

4. See Daniel Czitrom, *Media and the American Mind: From Morse to McLuhan* (Chapel Hill: University of North Carolina Press, 1982); Steven Lubar, *Infoculture* (Boston: Houghton Mifflin, 1993); Carolyn Marvin, *When Old Technologies Were New: Thinking about Electrical Communication in the Nineteenth Century* (New York: Oxford University Press, 1988).

5. Leo Bogart, *The Age of Television: A Study of Viewing Habits and the Impact of Television on American Life* (New York: Frederick Ungar Publishing, 1956), 106–23.

6. The shift from LP to CD was as much a matter of engineering a market as it was a feat of technological innovation: retailers switched over to CD as quickly as they did because record companies stopped accepting returns on vinyl records. See Negativland, *Shiny, Aluminum, Plastic and Digital* (August 2003), http://www.negativland.com/minidis.html.

7. Jay Bolter and Richard Grusin, *Remediation: Understanding New Media* (Cambridge: MIT Press, 2000), Lev Manovich, *The Language of New Media* (Cambridge: MIT Press, 2001), Nicholas Negroponte, *Being Digital* (New York: Knopf, 1995).

8. David Crowley, "Where Are We Now?: Contours of the Internet in Canada," *Canadian Journal of Communication* 27, no. 4 (2002); Susan Douglas, *Listening In: Radio and the American Imagination from Amos 'N Andy and Edward R. Murrow to Wolfman Jack and Howard Stern* (New York: Times Books/Random House, 1999); Claude S. Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992); Tom Spooner, "Internet Use by Region in the United States," (Washington, D.C.: Pew Foundation Internet in American Life Project, 2003).

9. Gordon Moore, *The Continuing Silicon Technology Evolution inside the PC Platform* (October 2002), http://www.intel.com/update/archive/issue2/feature.htm.

10. Joan Hoover, Author Interview, 3 October, 2002.

11. Susan Strasser, *Waste and Want: A Social History of Trash* (New York: Henry Holt and Company, 1999), 204.

12. Jeffrey L. Meikle, *Twentieth Century Limited: Industrial Design in America, 1925–1939* (Philadelphia: Temple University Press, 1979), 12–13.; Strasser, *Waste and Want: A Social History of Trash*, 195, 274–75; Richard Tedlow, *New and Improved: The Story of Mass Marketing in America* (New York: Basic Books, 1990), 167–68.

13. Alexis de Tocqueville, *Democracy in America*, trans. Harvey C. Mansfield and Delba Winthrop (Chicago: University of Chicago Press, 2000), 428.

14. Christine Frederick, *Selling Mrs. Consumer* (New York: The Business Bourse, 1929).

15. Michael Thompson, *Rubbish Theory: The Creation and Destruction of Value* (New York: Oxford University Press, 1979), 37.

16. Ibid.

17. Arnold Pacey, *The Culture of Technology* (Cambridge: MIT Press, 1983), 35–37. See also Lewis Thomas, "Notes of a Biology-Watcher: The Technology of Medicine," *New England Journal of Medicine* 285 (1971). For a fascinating account of how these factors play out in missile technology, see Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge: MIT Press, 1990).

18. In fact, two of the key cultural analyses of waste signal this connection in their very titles: Stephen Muecke and Gay Hawkins, eds., *Culture and Waste: The Creation and Destruction of Value* (New York: Rowman & Littlefield, 2003); Thompson, *Rubbish Theory*.

19. Bruce Lincoln, *Discourse and the Construction of Society: Comparative Studies of Myth, Ritual, and Classification* (New York: Oxford University Press, 1989), 5–6.

20. This is slightly different from the scheme of devaluation elaborated by Michael Thompson. His studies of Victorian ephemera and old houses suggest that value and utility decrease together, and that so long as a thing is needed or desired, it would retain a certain amount of value. Although this makes sense in a study of houses, the case of computers is obviously a little different. Thompson, *Rubbish Theory*.

21. Ivan Illich, *Tools for Conviviality* (New York: Harper & Row, 1973), 51–57.

22. Jonathan Sterne, "Disposal of Computers," in *The Encyclopedia of New Media*, ed. Steve Jones (Thousand Oaks, Calif.: Sage, 2003).

23. On spatial sorting, see Strasser, *Waste and Want*, 6. See also Mary Douglas, *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo* (London: Routledge and Kegan Paul, 1966).

24. Sterne, "Disposal of Computers."

25. Ibid.

26. Will Straw, "Exhausted Commodities: The Material Culture of Music," *Canadian Journal of Communication* 25, no. 1 (2000): 183. See also Thompson, *Rubbish Theory*, 10–11; McKenzie Wark, "Fashioning the Future: Fashion, Clothing, and the Manufacturing of Post-Fordist Culture," *Cultural Studies* 5, no. 1 (1991).

27. One striking exception to this generalization was the band Man or Astroman? which has composed music for old dot matrix printers and made use of old equipment as part of an elaborate stage show. Computer trash artists have also made use of old machines, but their work belongs to the larger and more general genre of trash art.

28. Although there is a rising market for retro video games (and even video game systems, like the Atari 2600), these remain fairly inexpensive for the time being, and many of the ROMs are available for free on the Web.

29. Sterne, "Disposal of Computers."

30. Dominique Laporte, *History of Shit*, trans. Nadia Benabid and Rodolphe el-Khoury (Cambridge: MIT Press, 2000), 56.

31. Gay Hawkins, "Down the Drain: Shit and the Politics of Disturbance," in *Culture and Waste: The Creation and Destruction of Value*, ed. Stephen Muecke and Gay Hawkins (New York: Rowman & Littlefield, 2003), 47–52.

32. Jim Puckett et al., *Exporting Harm: The High Tech Trashing of Asia*. Silicon Valley Toxics Coalition (February 2002), http://www.svtc.org/cleancc/pubs/technotrash.htm.

33. Erik Barnouw, *Tube of Plenty: The Evolution of American Television* (New York: Oxford University Press, 1990); Lynn Spigel, *Make Room for TV: Television and the Family Ideal in Postwar America* (Chicago: University of Chicago Press, 1992).

34. Pacey, *The Culture of Technology*, 36.

35. Illich, *Tools for Conviviality*, 11, 13.

36. Linux has been lauded as an alterative, more democratic operating system—a step in the right direction—but it raises issues about labor and management because its maintenance requires programmers who have a lot of free time and are willing to work for free.

37. Georges Bataille, *The Accursed Share: An Essay on General Economy*, vol. 1, *Consumption*, trans. Robert Hurley (New York: Zone Books, 1988).

38. John Frow, "Invidious Distinction: Waste, Difference, and Classy Stuff," in *Culture and Waste: The Creation and Destruction of Value*, eds. Stephen Muecke and Gay Hawkins (New York: Rowman & Littlefield, 2003), 36.