Chapter Eight

Mercury Rising

For some months now, I had been diverting dozens of pounds of bottles, cans, paper, and kitchen scraps from the landfill in Bethlehem, Pennsylvania, though the folks at IESI probably had not noticed. Now I turned my attention to household hazardous waste, a category that, were IESI following the letter of the law, they'd surely appreciate my efforts to divert from their tipping floors, trucks, and landfills. "Hazardous waste" conjured leaking casks of picric acid and loose bundles of TNT, neither of which I had on hand, but once I started looking around my house, I came upon all kinds of noxious materials. There was rubber cement and superglue in my junk drawer (they contain a handful of chemicals listed by the EPA as hazardous), an ionizing smoke detector on my hallway ceiling (it was made with a small amount of americium-241, which has a radioactive half-life of 458 years), a broken thermometer in the bathroom cabinet (mercury is a potent neurotoxin), paint thinner in the basement (turpentine and mineral spirits are both flammable and toxic), a bottle of windshield wiper solution in my closet (it contains methanol, which damages the nervous system, liver, and kidneys), and rechargeable batteries all

over the place (they contain heavy metals, like cadmium and nickel, plus flame retardants that outgas poisons). None of this stuff was supposed to go into the regular garbage, but I had a sense that very few people knew or cared about this detail. San men aren't bloodhounds (except when it came to fine jewelry or bodies wrapped in rugs), and most of those items are small and easy to hide.

In the fictional world of a trash-conscious New York, residents would, with a spring in their step, collect this hazardous waste and deliver it to designated drop-off sites within their boroughs. When I telephoned the sanitation garage near my drop-off site (which didn't have its own phone number, and only the vaguest of addresses) and asked what they did with old paint, a san man suggested I just stick something absorbent in my cans and send them out with the regular trash. I had a sneaking suspicion he was offering me, over the phone, the official san man's salute.

"And what about the other hazardous stuff?" I asked. "What do you do with that?"

"We recycle it."

"How?"

"You'd better call public information," he said. "Whatever information is public you can find out." Oh, how I wished. Either the city didn't know what happened to the solvents and thermometers and lead batteries (banned by landfills in twenty-nine states, including mine) dropped off in the boroughs or it didn't want to say. For weeks my messages went unanswered, and I started to wonder if my efforts to keep waste from the municipal stream were worth it. Was I diverting stuff from place A only to have it return, after a circuitous journey, to place A?

I started calling stores that sold rechargeable batteries, the little black packs that make our cordless shavers, drills, camcorders, cell phones, and remote-control toys go. Retailers that partnered with the Rechargeable Battery Recycling Corporation (stores like RadioShack, Staples, Wal-Mart, and Target) were supposed to collect this stuff and ship it to a metals reclamation company. But I suspected, because no one gave me a straight answer, that harried

clerks often slipped these small nuisances into the trash. Still, despite my suspicions, a fair percentage of batteries did make it back into the system. Over the past decade, the RBCR claims to have kept more than twenty million pounds of nickel cadmium, nickel metal hydride, lithium ion, and small sealed lead batteries from landfills and incinerators. Where did they go instead? To a factory thirty-five miles northwest of Pittsburgh.

Inmetco was a quiet and unassuming place, at least according to its manager of environment, health, and safety, John Onuska. "We don't have any dead geese hanging on the fence or toxic lakes," he offered. Inside the plant, battery packs were smashed apart, to remove the plastic from the battery cells, which were then dried out and heated in a crucible. Cadmium was vaporized, condensed to a liquid, and chilled to form flattened pellets, called shot. Inmetco sold the shot to battery manufacturers and to fine-glass makers, who used it to make bright red and yellow pigments. The nickel and steel that remained in the crucible were cooked up with steel dust and other mill scraps in a smelter to produce a "remelt alloy," which was sold to manufacturers of stainless steel.

Recycling metals, like much of the recycling industry, is a dirty business, the absence of dead geese notwithstanding. But it spares the earth the far larger insult of mining virgin metals, with all its attendant energy use and pollution. Extracting one ton of copper, for example, requires miners to move an additional nineteen tons of rock. According to a Commission on the European Communities report on battery recycling (the EU, having embraced the precautionary principle, is way ahead of the United States in formulating policies to avoid and recycle high-tech waste), working with recycled cadmium and nickel requires, respectively, 46 percent and 75 percent less primary energy compared with the extraction and refining of virgin metal. Using zinc recovered from alkaline batteries consumes 22.5 percent less energy than extracting it from primary resources.

Would I be breaking the law if a rechargeable battery slipped into my kitchen trash can? The EPA's Resource Conservation and Recovery Act regulates the hazardous constituents of batteries, but

the law offers some latitude. Commercial enterprises that handle these metals are required to dispose of them in landfills designed for hazardous waste, but small businesses and households are exempt. The EPA cares less about alkaline batteries, since manufacturers agreed, in the late nineties, to phase out their use of mercury. (Still, the double-A's in your Walkman and the C's in your flashlight represent 80 percent of all batteries manufactured today, and they each contain trace amounts of mercury. Worldwide, manufacturers produce more than ten billion of these cells a year, creating hundreds of millions of pounds of solid waste.) "Are we supposed to take those batteries? No," Jim White, at the American Ref-Fuel plant in Newark, New Jersey, told me. "Might one possibly make its way past our inspectors? Yes."

In sixth grade, I attended a four-room schoolhouse with a wide-open basement. Mischievous children used to sneak downstairs at recess and comb through school supplies. Supervision was lax, and so after discovering a box of thermometers one rainy afternoon, we had nearly an hour in which to roll tiny balls of liberated quicksilver from hand to hand, bowl them across the floor, and lob them at one another's shirts. Eventually we got busted, but no one seemed concerned that the element with which we'd been playing so merrily was poisonous. Even the ancient Romans knew that mercury was bad news: they got convicted criminals to extract it from cinnabar ore, then they mixed it with gold to gild objects. These miners lasted an average of three years before they lost their hair, their teeth, and eventually their sanity.

Wildfires and volcanoes produce about a third of the mercury in today's atmosphere. Coal-fired power plants and incinerators that burn mercury-containing wastes (like household batteries and thermostats and computer circuit boards) generate the rest. (According to a study by Barr Engineering for the EPA, coal-burning electric utilities emitted an estimated forty-eight metric tons of mercury into the atmosphere in 2000.) Again, the problem with mercury is that once it becomes airborne, it mixes with rain and snow, then settles on lakes and waterways, where bacteria convert

it to methylmercury, which works its way up the food chain. Over time, exposure to elemental mercury causes permanent, and sometimes fatal, kidney and neurological damage (plus, of course, hair and teeth loss).

Still, mercury abounds in consumer products—in fluorescent lamps, gauges, car light switches, and dental amalgams. In the United States alone, citizens innocently discard some seven million thermostats a year, each containing three to four grams of mercury. Thermometers contain a half-gram of mercury. That doesn't sound like much, but the element is extremely potent. One Sweet Tart–sized mercury battery is enough to put a six-ton load of garbage over the fed's allowable limit for solid waste. In landfills, mercury leaches into groundwater, where bacteria transform it to the evil methylmercury. According to a study widely quoted by the EPA, it takes the settling of just one gram of vaporized mercury upon a lake of twenty acres to unleash a yearlong fish consumption advisory on that body of water. As regular as fishing season's opening day, state agencies issue mercury warnings for thousands of lakes across the nation.

The industrial world bristles with entrepreneurs jostling to get their hands on mercury from household products and industry. Chlorine producers who have given up mercury in favor of new technologies, for example, have vast quantities on hand. But the hopeful quicksilver merchants aren't neutralizing neurotoxins: they are spinning a liability into a commodity bound for developing nations that haven't banned its use. China, for example, relies on mercury for gold mining. India also imports large quantities for use in medical instruments and other manufacturing processes. Some environmentalists claim that this overseas trade keeps mercury prices artificially low, which increases its use in places that lack environmental regulations. One solution is to halt the sale of mercury and stockpile the old stuff in repositories. The United States currently stores 4,890 tons of mercury (in steel flasks inside thirty-gallon steel drums) at four Department of Energy warehouses in New Jersey, Ohio, Indiana, and Tennessee. The Pentagon is agitating to consolidate it all in one location. Until then, shifting

our mercury overseas keeps developing nations from mining virgin mercury. But while the commodity flows in one direction—from nations that enforce environmental protections to nations that do not—its hazards are multidirectional. The element vaporizes with ease, and so its poison drifts with the breeze. The local hazards of mercury are global.

One Saturday morning, I cleaned out thirty cans of paint and painting paraphernalia from my basement and set out to find, with my neighbor Tony and his fifteen pounds of spent batteries, Brooklyn's hazardous-waste drop-off site. It was supposed to be near Brooklyn's Sanitation Garage 11, in the Gravesend neighborhood, but when we finally found that garage, the san men enjoying an outdoor smoke told us the drop-off site hadn't been open for a year.

"What are we supposed to do with all this poisonous stuff?" Tony asked.

"Throw it in the trash," a burly guy suggested. While Tony fumed, I asked another worker where the drop-off site had been—I just wanted to see it—and he pointed toward a small trailer parked in an adjacent lot. "Good luck saving the earth!" trilled the first san man as we drove away.

After winding around parked snowplows and mounds of winter salt, we came to a chain-link fence. On one side was a crowd of angry Brooklynites; on the other, the trailer and a wispy-looking san man who claimed he couldn't open the gate. "I could squeeze through with my paint cans," I proposed.

"We're closed," he answered, then radioed his boss for help.

"The sign says you're open," said a young man in a Yankees cap. He had a liter of hydrofluoric acid in his trunk and he didn't feel like carting it back home.

The name of the acid should have rung alarm bells with the san man, but he kept a poker face. In 1996, a drum of this acid, which is used to etch glass and clean aluminum, exploded from under the packing blade of a garbage truck and showered san man Michael

Hanly, a twenty-two-year veteran of the force. He died, from inhaling the fumes, that day in the hospital.

When the supervisor appeared at the chain-link fence, the rain of abuse from a growing crowd of residents who'd been told this site was open was redirected toward him. "I'll take the latex paint and the batteries," the super said to me. He wouldn't take the Yankee fan's acid or a jug of windshield wiper fluid. "Call the DEP about them liquids," he said, easily sliding the "broken" gate open. (A Department of Environmental Protection employee later directed the Yankee fan, apologetically, to a private disposal company in Queens, which offered to pick up the acid for about three hundred dollars, or charge him fifty dollars if he'd drive it over himself. He chose the latter.)

Wade Salvage, based in Camden County, New Jersey, would eventually collect the latex paint I left at the drop-off site, along with a number of other household hazards. When I asked Andrew Wade, the company's president, what he did with these materials, he revealed as little as possible. "I've got twelve locations," he said. "I've got recycling and reprocessing customers." Could he be more specific? Only after Wade realized I wasn't "one of the weirdos" that continually hounded him did he disclose that batteries ended up at Inmetco (the recycling plant without dead geese, near Pittsburgh); that liquid mercury went to retorters who processed the element and sold it for reuse in various switches; and that fluorescent light bulbs went to a recycler who crushed the tubes and sent the glass to cement factories, the aluminum ends to metal scrappers, and the phosphorus powder to a retorter who extracted the mercury for resale and sold the phosphorous for filler. Paints, transmission fluid, and solvents were blended into an "alternative" fuel for paper and cement factories (it burns far hotter than coal or oil). Oil filters were banged into scrap metal. So-called poisonous waste, like insecticides, was tipped at incinerators permitted to accept household hazards.

Like any businessperson, Wade saved up his little piles of waste until he had piles big enough to sell on the open market or pay to have shipped and tipped. New Jersey didn't make it easy to store

e-waste

this stuff—the state's Department of Environmental Protection was partly funded with fines and fees—so my paint cans and batteries traversed the Garden State to land at Wade's "consolidation site" in Philadelphia. From the City of Brotherly Love, Wade told me with an air of great mystery, "it goes out to my various customers."

When Tony and I got back to Park Slope, I stacked eighteen cans of enamel paint, turpentine, and sealant in the bottom of my trash can. The san men, on pickup day, took everything piled on top but left the painting supplies. The clerk at the Brooklyn 6 garage, when I phoned to complain, advised me to open the cans, let the paint dry out, then put them on the curb for the next pickup. I set up my paint farm, but after a week nothing had solidified. Beginning to get annoyed, I started randomly asking san men for advice. Finally, I had a consensus. After checking to make sure that no one was looking, I banged the cans shut, hid them inside a tightly tied black plastic sack, and closed the lid on my pail.

Every day of the week except Sunday, New York's san men heave computers, cathode ray monitors, printers, cell phones, fax machines, and other electronic paraphernalia into the back of their packer trucks. The bigger components lie on the sidewalks before pickup, sometimes for days, and are incorporated into the street life of the neighborhood. Construction workers take cigarette breaks perched atop seventeen-inch monitors; a CPU becomes a plinth for an azalea. This stuff, when the garbage truck comes around, isn't mongo: it is junk, likely less than two years old (according to the alarums of environmental advocates) and already obsolete.

Across the nation, electronic waste is accumulating faster than anyone knows what to do with it—almost three times faster, in fact, than our overall municipal waste stream. According to the National Safety Council, nearly 250 million computers will become obsolete between 2004 and 2009. Carnegie Mellon University researchers have predicted that at least 150 million PCs will be buried in landfills by 2005, and by the following year, predicts the

Silicon Valley Toxics Coalition (SVTC), some 163,420 computers and televisions will become obsolete every *day*. Where will all these gizmos go, and what impact will they have when they get there?

Before I started to poke around my garbage, I had no clue that the computer sitting so innocently upon my desk, a virtual extension of my body, essential to my work and increasingly useful for buying more stuff, was such a riot of precious but pernicious materials. The average desktop monitor contains nearly four pounds of lead. (Electronic waste is the largest single source—about 40 percent—of lead in municipal dumps.) Printed circuit boards are dotted with antimony, silver, chromium, zinc, lead, tin, and copper. Cell phones have their own periodic arsenal: arsenic, antimony, beryllium, cadmium, copper, lead, nickel, and zinc. Exposure to these metals has been shown to cause abnormal brain development in children and nerve damage, endocrine disruption, and organ damage in adults.

Tapping away at my keyboard was probably doing me little harm, I figured, but it wouldn't take much for my sleek little ThinkPad to morph into a corrosive contaminant. Crushed in a landfill, it would leach metals into soil and water (remember, all landfills eventually leak); in an incinerator, it would exhale noxious fumes, including dioxins and furans, that would taint both fly and bottom ash. Everything must go somewhere—the environmental scientist Barry Commoner said it long ago, and I understood it implicitly now. But when I learned that fourteen of the fifteen largest Superfund sites were metal mines, it made me wonder: if we continued to take metals from the ground, solder them into consumer electronics, and then dump those components into fresh holes in the ground, wasn't it only a matter of time until those holes became Superfund sites, too?

I felt guilty about the afterlife of my computer, but the processes that gave birth to this miracle machine were equally troubling. According to a United Nations University study on the environmental impact of personal computers, it takes about 1.8 tons of raw materials to manufacture your average desktop PC and monitor. According to the EPA's Toxics Release Inventory, mining

operations in 2003 released nearly 3 billion pounds, or 45 percent, of all toxics released by US industries: mining is the nation's largest industrial polluter. And we are a nation that *has* environmental laws. In the rush to supply our demand for new copper, coltan, gold, silver, and palladium—the stuff that fuels our 'lectronic lifestyles—African and Asian nations are tearing up their hillsides and hollows. Some gorilla populations in the Democratic Republic of Congo have been cut nearly in half as the forest has been cleared to mine coltan, a metallic ore comprising niobium and tantalum. Coltan is a vital component in cell phones, of which Americans discard about a hundred million a year.

Could a computer be recycled? I'd heard some murmurings on the subject, but computer recycling seemed to mean different things to different people. At one end of the spectrum were individuals giving or selling their working computers to others in need. At the other end were dealers who accumulated broken computers, cannibalized them for parts, and junked the rest. How did they get their source material? I had a chance to find out when my network router quit connecting me to the Ethernet. I relegated this mysterious black box, a chunk of plastic the size of a hardcover book, to my basement until a local recycling group organized an e-waste drop-off. Around the nation, charities, environmental groups, and municipalities were organizing similar drives, some of which collected nearly twenty tons in a single day.

I arrived at my collection site, at the north end of Prospect Park, to find several folding tables shaded by white tents and patrolled by clipboard-toting volunteers. The tables were laden with unwanted monitors, scanners, TVs, cell phones, keyboards, printers, mice, cables, and speakers, many of which had absolutely nothing wrong with them beyond a bit of dust and, in the case of the computers, a processing speed that only yesterday seemed dazzling. The spirit of bonhomie under the tents reminded me of the city Parks Department's Christmas-tree mulching parties, except that instead of returning nitrogen to the earth, we were, presumably, returning precious nuggets of metal to technology. (The parallel was made manifest at another city e-waste event, where

volunteers offered fresh compost to anyone dropping off a stale computer.) Passersby pawed through the electronic casbah, taking what they wanted for free. The representative from Per Scholas, a Bronx computer recycler founded in 1995 to supply schools and other nonprofits with hand-me-down computers, could only look on stoically as the good stuff—which he could refurbish and sell—disappeared. The bad stuff—which included my router—was headed his way.

And so was I, on a drizzly winter afternoon. Debarking from the subway in the South Bronx, I made my way under one elevated expressway, across eight lanes of traffic, over the empty loading dock of a rehabbed brick factory building, up a freight elevator, and through a low defile of shrink-wrapped computer monitors stacked on wooden pallets. Ed Campbell, Per Scholas's director of recycling, led me into a large open room where teams of technicians wiped computer hard drives clean, then loaded the machines with Pentium II microprocessors, memory, and mice. The reconditioned computers, collected from corporations and institutions that paid Per Scholas ten dollars a machine, would be resold, at low cost, to "technology-deprived families." According to Campbell, Per Scholas's efforts kept some 200,000 tons of electronic waste from landfills and incinerators each year.

I watched a technician in training squirt a monitor with Formula 409, and then Campbell took me to see the darker side of the computer recycling revolution, where a cavalcade of monitors, some of the most powerful symbols of capitalism's success, were being smashed, one by one, to smithereens. The broken-down Dells, Apples, and Gateways—most of them collected at community drop-off events—trundled up a conveyor belt and into a shredding machine. "We call this a rough liberation," Campbell said. "Basically, we're crushing the computers into glass, plastic, and metals." Hidden inside the machine's bland carapace, a series of magnets, eddy currents, and trommel screens separated the shards and spat them into yard-high cardboard boxes called gaylords: ferrous metals here, nonferrous there, plastic on one side,

glass on the other. A Per Scholas spokesperson said the metals went to Pascap, a Bronx company that resold them to smelters; the plastic went to a company that melted and pelletized it for resale. Disposing of the glass, which contained lead, presented Per Scholas with its biggest headache to date.

"Glass is a liability, not a commodity," Angel Feliciano, the company's vice president for recycling services, told me. "We save it up until we've got a truckload, then we pay $650 a ton to a smelter who'll haul it away." Lately, the glass had been landing on the loading docks of the Doe Run Company, in south central Missouri. The company separated lead from glass through a process of heating and reducing. It used the resulting silica as a fluxing agent in smelters that produced brand-new sixty-pound ingots of lead from raw ore. The lead liberated from the matrices of CRT glass, said Lou Magdits, Doe Run's raw-materials manager, was combined with lead recovered from car batteries, ammunition, and wheel weights. And where did all this recycled lead go? "Into car batteries, ammunition, wheel weights, and new CRTs," said Magdits. (In Peru, where Doe Run operates a lead, copper, and zinc plant, significant amounts of sulfuric acid rise into the air and fall down as acid rain. Farmers in La Oroya, home of the smelter, have charged Doe Run with contaminating their fields. In 1999, Peru's Ministry of Health determined that 99 percent of children in the area suffered from lead poisoning. The company, which bought the smelter from the Peruvian government in 1997, has entered into an agreement with the Health Ministry to reduce blood-lead levels in two thousand of the most affected children and claims that safety measures have decreased blood-lead levels in workers by 31 percent.)

One hundred percent of the material dropped off at my e-waste event was, to Per Scholas, "junk." But at least Per Scholas was handling its junk responsibly. According to the Silicon Valley Toxics Coalition, up to 80 percent of the material collected from well-meaning residents and businesses at e-waste events nationwide is bundled up and shipped overseas, mostly to China, India, and Pakistan. Perhaps half of those computers, the ones that function, are

cleaned up and sold. But the remainder are smashed up by laborers who scratch for precious metals in pools of toxic muck.

Investigators from SVTC and the Basel Action Network (whose name refers to the 1992 Basel Convention, an international treaty that seeks to halt trade in toxic waste; the United States refuses to sign it) found men, women, and children in the Chinese village of Guiyu extracting copper yokes from monitors with chisels and hammers. Squatting on the ground, they liberated chips and tossed them into plastic buckets while acrid black smoke rose from burning piles of wire. After harvesting the easy stuff, the workers, who wore no protective gear, swirled a mixture of hydrochloric and nitric acid in open vats, trying to extract gold from components. Afterward, they dumped the computer carcasses and the black sludge in nearby fields and streams. Tests on the soil and water showed levels of lead, chromium, and barium hundreds of times higher than US and European environmental standards for risk. The accumulating carcinogens, here and in other Chinese coastal towns that accept e-waste, have contributed to high rates of birth defects, infant mortality, tuberculosis, blood diseases, and severe respiratory problems.

I was confounded by the way streams of postconsumer electronics divided and branched, with only a minute percentage of working computers returning to the headwaters of reuse. The computer recycling world, I said to Angel Feliciano, seemed suffused with weirdness. "Yes," he said to me slowly. "There *is* weirdness. There's inconsistency. Recycling, as it is today, is a great way for individuals to make money because they can pretend to be doing something." Feliciano was speaking, naturally, about the other guys, not his company. (In the months to come, though, I'd hear that Per Scholas had established a relationship with a New Jersey recycler that regularly bundles old equipment for sale overseas. At this point, Feliciano was no longer returning my calls.) "There's no regulation, and it's more profitable to do the wrong thing," Feliciano continued. "You ship it overseas. Or you have a sweatshop of people in this country working twelve hours a day for five dollars an hour, taking computers apart by hand and breathing this

stuff in. You get into it for the short term. In five years, when you get out, the EPA will be taking a closer look."

It doesn't hurt the prospects of the unscrupulous that the general public is at once wildly enthusiastic to "recycle" its electronic waste and wildly ignorant about how this is done. I hate to say it, but it is a bit like the bad old days of curbside recycling in New York: folks had high hopes for the materials they set out, but so much of it—contaminated by food or bereft of an end market—ended up buried. Still, a peanut butter jar in the landfill is one thing: a circuit board in your drinking water is another.

Why is it so difficult to recycle computers righteously? For starters, it is dangerous, labor intensive, expensive, and unrewarding, in the sense that markets for the materials aren't always large or reliable. Then, there is a playing field tilted in favor of new production and the export of old. Some original computer manufacturers charge forty dollars for repair manuals on their products (instead of putting them on the Web) and lobby to make "gray market" refurbishing illegal in the developing nations where they sell their new models. At the state level, governments spend bond money to build incinerators and operate landfills, but most recycling centers have to balance the books on their own. The federal government encourages recycling and reuse, but it doesn't require it. "If we were paying what we should for virgin resources, e-waste recycling would be much more economical, and local governments perhaps could break even on e-waste recycling," said Inform's Eve Martinez, who has set up numerous e-waste collections. But mining companies, like logging companies and the oil and gas industry, continue to benefit from perverse subsidies. Under the 1872 Mining Act, corporations lease land at five dollars per acre, pay no royalties to the government on minerals they extract, and pass any environmental cleanup bills to taxpayers.

As the hazards of e-waste have worked their way into the news, some computer manufacturers have initiated take-back programs in which consumers wipe their hard drives clean, then swaddle, seal, label, and ship their large packages back to original manufacturers. The cost and the inconvenience discourage wide-

spread participation by individuals, which is perhaps what those manufacturers had in mind. They don't want anyone buying a refurbished computer: they want consumers to buy a new one, preferably from them. IBM's take-back program was designed for the institutional user looking to either "recover value," in the company's words, or "dispose of obsolete assets" (in the first scenario, IBM buys back used equipment; in the second scenario, it hauls those ancient assets away, for a small fee). Hewlett-Packard's take-back program is friendly to individuals (the company even accepts computers and peripherals it didn't manufacture), but it is pricey. To mail my laptop, dead router, and one printer would cost me sixty-four dollars, minus the box and packing materials. (The company puts postage-paid labels and envelopes in some printer cartridge boxes.) When I asked staffers at one of the largest computer merchants in New York City about taking back my gently used IBM ThinkPad, they said they didn't do it, didn't know anything about it, and had never before been asked about it.

For its part, Massachusetts bans televisions and computers from landfills. Instead, it contracts with a company called ElectroniCycle, based in Gardner, Massachusetts, to process its e-waste. Harvesting material from drop-off events and retailers, ElectroniCycle recovers ten million pounds of electronics a year: technicians refurbish between 5 and 10 percent of their computers for resale; send another 5 to 10 percent to specialty repair houses; and smash the rest into fifty different categories of scrap, including plastic, copper, aluminum, barium glass, and leaded and mixed glass (which is recycled back into cathode-ray tubes). Reusable integrated circuits and memory cards are gleaned, then circuit boards are sent off site for recovery of gold, palladium, silver, and copper. Nothing goes overseas. In California, which also bans e-waste from landfills and restricts its shipment overseas, retailers that sell hazardous electronic equipment would soon be paying the state an "advance disposal fee" (collected from consumers) of between six and ten dollars per device to cover the cost of recycling. Still, manufacturers aren't required to participate in the collection or processing of waste.

Every time ElectroniCycle shunts a laptop to the reject pile, I imagine Michael Dell rubbing his hands in glee, like *The Simpsons'* Montgomery Burns when he finally fulfilled his lifelong ambition to blot out the sun. But computer manufacturers' freedom to pump out product without a thought for its afterlife is probably doomed. The Computer TakeBack Campaign, founded by more than a dozen social-justice and environmental groups, calls for manufacturers of anything with a circuit board to make "extended producer responsibility" (EPR) part of their credo. EPR would shift collection and recycling costs from taxpayers and government to the folks who make and promote these goods. Theoretically, the system would give companies an incentive to make computers and other gadgets that last longer, are made of reusable or fully recyclable materials, contain fewer toxics, and are swaddled in far less packaging.

In Europe, EPR is well under way. In 2003, the European Union adopted a directive that requires producers of electronics to take responsibility—financial and otherwise—for the recovery and recycling of e-waste. In Switzerland, which has far surpassed the goals of the EU directive, the cost of recycling is built in to the purchase price of new equipment. Consumers return e-waste to retailers, who pass it on to licensed recyclers. In the United States, almost half the states have active or pending e-waste take-back legislation: the proposals, naturally, cause electronics manufacturing trade groups to howl. Still, Maine—which has no tech industry to speak of—recently passed a law that requires manufacturers of computer monitors, video display devices, and televisions to finance a system for their environmentally responsible reuse and recycling. (Previously, the state had let residents stuff computers into their household trash if they could prove, through laboratory testing, that they were nonhazardous. Those who opted out of the expensive testing—and it's hard to imagine that anyone opted in—brought their e-waste to transfer stations, which paid recyclers to haul away and dismantle them.) Now Maine's computers will be delivered to consolidation points and sorted into mountains destined for their makers: Toshibas over here, HPs over there.

What those companies will do with them is, at this point, unclear. As Angel Feliciano said to me about the computer recycling world, there is weirdness.

What about other high-tech waste? Every month, according to the Worldwatch Institute, more than forty-five tons of CDs become outdated, useless, or unwanted. Responding to the glut, dozens of companies have sprung up to wipe clean compact discs, laser discs, and digital videodiscs. If the plastic discs can't be reused, they are shredded and blended into automobile parts, office equipment, and other products. (Meanwhile, the Disney Company is working in the opposite direction, selling DVDs that erase themselves after two days' exposure to air. Instead of renting a rewatchable disc, consumers buy something they use on Saturday night and slip into the trash on Monday.) Entrepreneurs degauss VHS tapes (and sell them for surveillance work) and collect and remanufacture ink and laser toner cartridges. (Other companies promote a green agenda but set the bar fairly low: Epson America collects ink cartridges from schools and other nonprofits, but instead of refilling them, a collection agency "converts [them] to energy through an environmentally sound incineration process at a licensed waste-to-energy recycling facility.")

Another set of entrepreneurs is scrambling to collect the tens of millions of cell phones that are stuffed into drawers when their owners switch services, or jilted when thinner models come along. Phones are refurbished, sold overseas, or programmed to dial 911 and donated to the elderly and to women's shelters. It is economies of scale that make these recycling efforts go, but the junked electronics in household waste streams are often too few and far between to make municipal collections worthwhile. For example, it takes between 40,000 and 44,000 pounds of compact discs, about 1.2 million CDs, to make one standard container of shredded, sellable plastic. So while it *feels* as though I have enough promotional AOL discs—they arrive every few weeks in the mail—to make it worth New York City's while to come and collect them, I don't. And neither does anyone else.

When I heard that a Sony Electronics vice president had, at an industry trade show called Waste Expo, proposed dumping electronic waste into open-pit hard-rock mines, I thought he'd been at the minibar too long or was only being poetic: from minerals came these monstrous hybrids and to minerals they would return. But the Sony exec was serious. One mine, he said, would hold seventy-two billion PCs, enough to make the crushing of waste and the extraction of copper, gold, iron, glass, and plastics profitable. Electronic equipment is often richer in rare metals than virgin materials, containing ten to fifty times more copper, as a percentage of weight, than copper ore. A cell phone contains five to ten times more gold than gold ore itself.

While waste traders salivated at this idea, the antimining crowd quivered. Wouldn't deep pits of computers add insult to a system that is already, environmentally speaking, injured? Was this an invitation to dump stuff in a hole and forget about it? Would high-tech miners, wearing biohazard suits instead of Levi's, extract the valuable stuff using cyanide and arsenic, then walk away from what remained? The notion got a little bit of play in the waste world, then cranky recyclers grabbed the microphone and the idea of dumping unholy alliances of metals and plastics into the ground, to be mined another day, slowly sank.