Chapter Nine

Satan's Resin

In the sixties, you could always insult a guy by calling him "plastic." It meant he was phony or superficial. The opposite of plastic was "real." In Mike Nichols's 1967 film *The Graduate*, the hopelessly straight Mr. McGuire, a friend of the Braddock family, offers career advice to the recently graduated Benjamin Braddock. "I just want to say one word to you. Just one word. Are you listening? . . . Plastics." The word became a kind of shorthand for a suburban life of conspicuous consumption and upward striving. It stood for a rejection of old ways and an embrace of modernity, which included the throwaway culture made possible by the expanded use of plastic. Where the *bricoleur* of a century past (that is, an odd-job man who worked with his hands, using the *bricoles,* or odds and ends, that lay at hand), or even Benjamin Braddock's grandparents, had understood metalworking and woodworking, plastic—this wondrous new material—was a mystery. As Susan Strasser writes in *Waste and Want,* "Nobody made plastic at home, hardly anybody understood how it was made, and it usually could not be repaired." Which explained, in part, why there was a

pink plastic flashlight pen with a retractable monster tongue sitting in my kitchen waste can.

Across the nation, recovery rates for almost all recyclable materials have declined over the last couple years. But the recovery rate for PET plastic (polyethylene terephthalate, that is, marked by a number 1 surrounded by chasing arrows), the most widely collected type, has fallen especially hard, from a high of 39.7 percent in 1995 to a low of 19.9 percent in 2002, when 3.2 billion pounds of PET bottles were buried or burned. Number one water bottles have an even worse recycling rate than number one soda bottles. In 2002, only 11 percent of plastic water bottles were recycled in the US. And as the market segment grows—and it is growing, faster than any other segment in the US beverage market—the problem is bound to get worse. In 2003, Americans consumed 13 billion liters of bottled water, much of it in half-liter servings, and global bottled-water sales reached 155 billion liters.

Recycling experts link the drop to the rising number of beverages consumed away from home—in offices, parks, cars, and other places that lack a handy recycling bin. The lower recycling rate is a loss for the environment, but it also represents a lost opportunity for PET processors and end users that can't expand their operations or have gone out of business. Had all those bottles been recycled, the Container Recycling Institute reported, "an estimated 6.2 million barrels of crude oil equivalent could have been saved, and over a million tons of greenhouse gas emissions could have been avoided." After e-waste, plastics are the fastest-growing portion of the municipal waste stream: according to the GrassRoots Recycling Network, Americans trash more than forty million plastic soda bottles a day.

Early one morning, I drove out to Farmingdale, Long Island, to see how my yogurt cups, which I had delivered to my local food co-op, were transformed into seawalls and lumber. American Ecoboard sat at the dead end of a bland industrial park, the sort of place where, in heist movies, ne'er-do-wells plan robberies in empty warehouses. I walked through a sad-looking collection of

plastic-wood picnic tables and knocked on a metal door. No one answered, so I walked into a vestibule the size of a large port-o-san, calling out a hello. I got no answer, so I let myself in to the inner office.

Calling out "Hello? Hello?" I eventually raised a harried-looking man named Ron Kwiatkowski from a back office. The president and CEO of American Ecoboard, Kwiatkowski was stocky, with a rounded face. He wore blue jeans and a plaid shirt, and he had a mustache and the sort of beard that's mostly shaved, with just a thin line of dark hair around the perimeter of his jaw. We talked for a while about the plastic recycling business—he'd spent ten years working for Coke—and then we walked down a narrow hallway toward the manufacturing floor.

For no good reason I had expected a plastic recycling plant to be filled with bubbling cauldrons of toxic goo. I had imagined white-coated chemists with thermometers in their pockets, test kits at the ready, and beakers lined up on shelves. Instead, Ecoboard's manufacturing floor was dimly lit and populated with large, low-tech machines. It smelled like melting, but not burning, plastic, and the workers, many of whom spoke Spanish, were dressed in jeans and black hoodies. Dust caught in my throat as I watched forklifts scoot gaylords of ground-up plastic across the plant floor. The confetti-sized bits went into a hopper, where they were blended with pigments, anti-inflammatory agents, UV protectors, and fiberglass, for added stability. "It's like making a cake," Kwiatkowski said. "We have a basic model, then we make cakes with different characteristics—reinforced for structural materials, different colors for decking."

After it was mixed for several hours, the batter ran through a series of pipes into extruders, or twenty-five-foot-long tubes, electrically heated to 400 degrees. After the molds were water cooled, an extruder screw pushed the finished product out the end. Beams were cut, just like lumber, and stacked.

"It's very simple," Kwiatkowski said, shrugging. He and his partner had built all this stuff themselves. At first they thought it

would take two men to run each of the four lines, but with some tweaking they realized only one worker per line would suffice.

Ecoboard got some of its plastic from groups like food co-ops or local Boy Scouts, but most of it they bought from brokers or MRFs. The company didn't have to buy the odds and ends that showed up on its doorstep, but it paid between fifteen and twenty cents a pound—or four hundred dollars a ton—for the loads they picked up by truck. "This is a pennies business," Kwiatkowski said. "And you can make or lose millions with pennies." The previous year, the pennies had added up to a $3 million profit.

I asked how much plastic Ecoboard used in a year. "In 2003, we'll exceed eight million pounds," Kwiatkowski said. I had pulled a couple yogurt cups, which weighed three-eighths of an ounce each, from my recycling bin for Kwiatkowski, just to leave my mark on this place, but now I felt a little silly adding them to the pile of containers waiting to be ground up.

Before the city cut back on recycling, my plastic (minus the yogurt and cottage cheese cups, which, for complicated reasons having to do with polymer chemistry, were problematic for many recyclers) was picked up once a week by san men from the Brooklyn South 6 and dropped off at a MRF run by Allied Waste in Greenpoint, at the northern reaches of the borough. With only minimal hassle, I got the site manager on the phone. Daren Dutchin immediately set himself apart from all my other sources by inviting me out to tour his facility at my earliest convenience.

I didn't wait more than a day before picking my way through the unfamiliar industrial neighborhood. There were a lot of trucks on the roads here, a lot of honking traffic and diesel exhaust. Scott Avenue was lined with corrugated-metal fences and men in jumpsuits hosing sidewalks. At the avenue's dead end, where the MRF was located, someone had planted a row of linden trees and painted their trunks bright yellow, for safety. One tree lay at a right angle to the sidewalk, severed at truck bumper's height.

Inside Allied's office, the Formica desks were bare and boxes cluttered the floor. Before the recycling suspension, Dutchin had

190 employees handling 550 tons of mixed metal, glass, and plastic a day. Now he had just ten employees, who worked at transferring commercial solid waste from packer trucks to eighteen-wheelers. Once you were established as a waste hauler, it seemed, it was a simple matter to switch your target material. While waiting for Dutchin, a Guyanan with a lilting accent, to get off the phone, I counted no fewer than five wall clocks. Each ticked, but none told the correct time, in any time zone. I read the posters. "Allied Waste Wants You to Improve Our Margin, Protect Our Assets." My favorite safety message said, "Keep in mind: a truck on fire causes low productivity."

Finished with his call, Dutchin led me into the warehouses adjacent to his office. They were dim, oily-floored places with indistinct ceilings. The high windows were broken, and the air was damp. Scores of small blue Dumpsters were clustered together, like a herd of empty ice cube trays. Milk jug caps and flattened juice cartons littered the ground. I shivered and pulled my jacket tighter.

"It was warmer in here when the MRF was running, wasn't it?" I asked Dutchin.

"Not really," he said.

As we strolled through the deserted plant, Dutchin explained the former operation. The packer trucks backed in and tipped their loads of plastic, metal, and glass onto the floor. A grapple pulled out any bulky material and fed the rest onto a conveyor belt that trundled it up, at a forty-five-degree angle, to a trommel. The trommel was a thirty-foot-long rotating horizontal barrel divided into six sections with different-sized holes. Broken glass came out first, dropping onto a conveyor that delivered it to a bunker, or holding bin, then to a hammer mill, where it was pounded into a material that gave recycling proponents agita.

"The glass was nonprofit for us," said Dutchin. "We crushed it and used it at our landfills as alternative daily cover." The cover, which was mandatory, kept down dust and odors and discouraged rats and birds. But because crushed glass was ultimately buried, it allowed the antirecycling crowd to claim that recycling is a waste of time, that all those containers "just end up in the landfill."

Dutchin went on. "The next section of the trommel has bigger holes. Aluminum cans, steel cans, water bottles, that kind of thing, drop to another conveyor." The conveyors here were distant cousins to the rubber-belted things in supermarkets. Five feet wide, they rose ponderously from below the floor, girded with steel bars. The belts rolled through a gallery of eight "pickers," who were paid nine dollars an hour to pluck plastics by type and drop them through crude chutes to bunkers down below. The plastic was crushed and baled, then sold to brokers who resold it, or to mills that shredded the plastic for resale or extruded it, as Kwiatkowski did, into other products. The metal rode for another few feet along the conveyor until magnets pulled out the steel; an eddy current handled the aluminum. Both of these commodities were delivered to Hugo Neu's Greenpoint scrap yard, where they had an appointment with the Prolerizer. The shredded metal was then loaded onto barges, tugged to Jersey City's Claremont Channel, and transferred to ships bound for the highest bidder.

I walked up a metal stairway to the picking line. The conveyor belts were covered with dust and pigeon droppings. In the gloom I made out shards of glass, a floor mat, a dinosaur toy from a fast-food restaurant, and a take-out container stamped with chasing arrows around the number 7. Plastic number 1 (PET, used in soda bottles) and plastic number 2 (high-density polyethylene, or HDPE, used in milk jugs) are the two most commonly collected and recycled types of plastic. Number 3 plastic, polyvinyl chloride (PVC), is used to make pipes, shampoo bottles, carpet backing, and automotive parts. Number 4, low-density polyethylene (LDPE) is used in plastic bags, six-pack rings, and flexible lids. Number 5, polypropylene (PP), appears in bottle caps, snack food wrap, and some containers and film packaging. Number 6, polystyrene (PS), is most commonly found in plastic cutlery and food containers; and number 7, "other," is just what it sounds like, and usually unrecyclable.

The triangular symbol was nothing but a headache for Daren Dutchin. The recycling industry developed it to signify recyclability, but the chasing arrows were appropriated by the Society of the

Plastics Industry in 1988. The arrows make the virgin-plastic manufacturers look good, but they encourage the public to dump anything with a symbol into the recycling bin regardless of whether local MRFs can handle it, along with some plastics, like coolers and sports watches, that have no arrows at all. The result is contaminated loads of material that ultimately have to be dumped. Recyclers have requested that plastic-container manufacturers modify their use of the misleading graphic, but the industry has so far refused.

The vast emptiness of the Scott Avenue MRF gave me the creeps. Not twelve months ago, the warehouse had been a miserable hive of low-wage activity, operating six days a week, twenty-four hours a day. The conditions, I'd heard, were medieval: hot, cold, damp, noisy, dirty, relentless. Now I had the sense that rats were moving stealthily over the rafters, that cats slunk through the derelict equipment, just out of sight. Sumac trees were growing up under the conveyor belts near a train siding. I heard creaking from the roof, the thrumming wing beats of pigeons.

Dutchin, of course, wasn't remotely creeped out by this place. He knew every nut and bolt here, and possibly every rat, too. He was proud of the operation. To him, the emptiness represented lost opportunity: jobs for recent immigrants, a way to reduce the burden on landfills. "It was so beautiful," he said to me now, interrupting my horror movie thoughts. "I wish you could have seen it." Never had two individuals, gazing upon the same scenery, been so out of sync.

I sat down one morning and cut a sheet of paper into small slips. On one I drew a stick figure representing me. On another I drew a horizontal rectangle representing D'Agostino's, my local grocery store. On the third I drew a slightly stylized beverage distribution truck. Then, I cut out two paper nickels and one paper soda bottle, made of PET plastic. And then sliding these scraps around on my desk, I enacted a small play to help me visualize how New York State's bottle bill works. The action began when the distributor brought a cola bottle to the D'Agostino's and the store paid the

distributor a nickel deposit. In the second act, I showed up to buy my cola and paid a nickel deposit. I drank the cola, offstage, then returned the empty to D'Agostino's and collected my nickel. In the third act, the distributor returned to the store for the empties and paid back the nickel that set this drama in motion. At this point, the distributor also paid the store a two-cent fee for handling.

But let's change the scenario a bit. What if I bought my cola (or a beer, which also has a five-cent deposit), walked offstage with it, and never came back? Who would keep my nickel? In New York, Connecticut, Oregon, Vermont, and Delaware, it is the distributors. In the six other states with bottle bills, unclaimed deposits go toward recycling education or administration, alcohol treatment programs, or the state's general fund. In 2000, estimates the Container Recycling Institute, beverage distributors in New York retained $140.9 million in unclaimed nickels. Proponents of a bigger, better bottle bill in New York State, which would include sports drinks, water, teas, juices, and other hugely popular "New Age" beverages, are trying to redirect that money—more than $172 million is expected—to recycling and other environmental programs. (Bottle bills in California, Hawaii, and Maine already cover New Age drinks.)

Who could argue with an expanded bottle bill? It would keep litter off the streets and beaches, keep solid waste from the landfill, conserve natural resources through recycling, and direct money to environmental programs. (According to the NRDC, such a bill would lighten New York City's waste stream by 220 tons a day, saving as much as $10 million in curbside collection and disposal costs.) Well, grocery store operators, to name just one group, aren't so keen on an expansion. They'd have to devote more storage space to the sticky, wasp-attracting beverage containers and hire employees to handle them. And then there are distributors, who pay the two cents-per-container fee, and bottlers, who have to clean those containers and find an outlet for them. Waste haulers and MRF owners don't like bottle bills, either: they take weight away from them, and in the garbage world weight equals money. Over the years, packaging, food, and petrochemical industries

have quietly spent tens of millions of dollars fighting existing and proposed bottle bills. And they've done it at exactly the same time that they are very publicly promoting recycling.

The garbage landscape is littered with greenwash tactics, in which polluters pose as friends of the environment but spend more money advertising their green projects than on the projects themselves. One masterful example of corporate greenwash is the Keep America Beautiful campaign, which was founded by beverage companies and packaging executives in 1953 after magazine ads began promoting beverage cans as "throwaways" (one depicted carefree boaters slinging empties into a lake). Litter alongside roads, rivers, and farm fields had begun to accumulate, prompting Vermont to pass the nation's first bottle bill, which banned the sale of beer in nonrefillable containers. Beer companies didn't like that one bit. They lobbied hard against the law, and in four years it expired. (The state enacted a new bottle bill in 1972.)

In a stroke of marketing genius, Keep America Beautiful (KAB) urged individuals to take responsibility for this waste, to "put litter in its place." In 1971, the organization sponsored one of the most successful public-service announcements in history, a TV commercial in which a Native American, complete with braid and eagle feather, paddles down a pristine waterway until he reaches a teeming city. When he spots empty beverage cans swirling in the shallows, a tear rolls down his leathery face. KAB proudly called the "Crying Indian" spot an "iconic symbol of environmental responsibility." (Iron Eyes Cody, who played the Indian and claimed to be a Cherokee-Cree, was later outed as a Sicilian American named Espera DeCorti.)

But whose responsibility is the foul mess along the shore? The organization's underlying message is that individuals, not corporations who produce single-use containers, are responsible for trash, and that individuals must change their behavior, not manufacturers. Keep American Beautiful focuses on antilitter campaigns—which enlist millions of volunteers a year to clean up beaches and roadsides—but it ignores the potential of recycling legislation and resists changes to packaging. Between November 1992 and July

1993, the American Plastics Council, a KAB sponsor, spent $18 million on a national campaign to "Take Another Look at Plastics." The ads crowed that more than a billion pounds of plastic had been recycled in 1993, but they failed to mention that fifteen billion pounds of virgin plastic were produced during that same eight-month period. According to a report by the Environmental Defense Fund, for every one-ton increase in plastic recycling between 1995 and 1996, there was a fourteen-ton increase in new plastic production.

For twenty years environmental groups, including the Sierra Club, the National Audubon Society, and the National Wildlife Federation, lent legitimacy to KAB by sitting on its advisory committee. Those relationships ended after a board meeting in July of 1976, when American Can Company chairman William F. May denounced bottle bill proponents as communists and called for a total KAB mobilization against proposed bottle bills in four states. Today, KAB is funded by about two hundred companies that manufacture and distribute aluminum cans, paper products, and plastic and glass containers, in addition to companies that landfill and incinerate all of the above.

Do bottle bills work? Do they "put litter in its place"? According to the Container Recycling Institute, the eleven states with bottle bills recycle beverage containers at a rate of 70 to 95 percent, while states without bottle bills average 37 percent. (Though, thanks to the declining value of the nickel, and, again, Americans' increasingly mobile lifestyle, the percentage of cans and bottles redeemed even in bottle bill states is dropping.) New York's bottle bill is estimated to divert more than 650,000 tons of aluminum cans, and glass and plastic bottles from the state's municipal waste stream each year. Of states that track how much waste their container deposit laws divert, Iowa clocks in with 50,000 tons, Maine 54,000 tons, and Vermont nearly 16,000 tons.

There is a lot of green pride in New York over the bottle bill, but it isn't widely known that the law doesn't require distributors and bottlers to actually recycle the containers they collect back into

new beverage containers. Only between 4 and 6 percent of glass bottles sold in New York are refillable; the rest of the redeemed bottles are melted down and reincarnated as new containers. It is technologically possible to blend recycled plastic with new resin in plastic bottles, but there isn't much incentive to do so. (In Scandinavia, Germany, and the Netherlands, consumers return PET bottles, which have a sturdier formulation in those countries, to companies that sterilize and refill them again and again.) In the United States, packagers and manufacturers prefer new plastic because it is cheaper than recycled plastic, it's free of incompatible polymers, and its color is easier to control. The quality of virgin plastic is guaranteed, and the infrastructure to make it is already in place. Pressured by shareholders in 1990, both Pepsi and Coca-Cola promised to use 25 percent recycled plastic in their bottles, but neither company did. In 2000, both companies committed to using 10 percent recycled content by 2005.

So where are all the postconsumer plastics going? If they are part of a mixed stream collected at curbside, they might end up at a place like American Ecoboard. If they are PET bottles redeemed in bottle bill states—and therefore cleaner and less contaminated with other grades of plastic than loads of curbside bottles—they are probably transformed into sleeping-bag fiberfill, carpets, and fleece jackets. Turning Sprite bottles into Synchilla hoodies is slightly more complicated than turning shredded pellets into picnic tables. The bottles are first shipped to a processing plant to be washed and granulated. The flakes are dried and sold to a mill, where they are melted and squeezed through tiny holes in flat plates called spinnerets (named for the tubular structures from which spiders secrete silk threads). After the plastic solidifies, it's spun into long threads and stretched to many times the fiber's original length. The strands are then crimped into wave patterns, using heat, and cut to length, ready for weaving into Synchilla, Capilene, Polartec, or another product with a fuzzy-sounding name.

Not all postconsumer plastic cycles back into gross domestic product. According to the Association of Postconsumer Plastic Recyclers, 35 percent of PET bottles collected in the United States in

2003 were exported, mostly to China. The bottles followed a national trend: more and more, recyclable materials for which industry has no use or that it can't afford to process are being sent overseas. In 2002, we shipped to China about 450,000 metric tons of scrapped plastic (more than seven times the amount in 1996), 3.3 million metric tons of paper (more than five times the 1996 figure), and 2.3 million metric tons of scrap iron and steel (nine times more than in 1996). This global trade sends recycling jobs overseas, but it gives us cheap goods. Is it a fair deal? Our nation consumes more than its share of natural resources, we create the most waste, and then we send it to be processed in countries that fail to protect their workers or their environment from industrial pollution. Sure, overseas workers get jobs, but they also get contaminated water, soil, and air. Seattle's recycling program owes much of its success—it had a 39.7 percent diversion rate in 2002—to strong overseas markets for plastic. But that could change. "People are starting to realize that recycling isn't so simple," said Pete Erickson, of Seattle's Cascadia Consulting. "We're thinking about our impact overseas. We want to be a good global citizen."

In the midnineties, Greenpeace researchers poring over US Customs Department data discovered that the Pepsi-Cola Company was shipping plastic scrap to Madras, India. When the company denied the practice, Ann Leonard, who now works at the Global Anti-Incinerator Alliance, packed her bags and went off in search of proof.

"When I first got to Madras, I went around to all the ragpickers, because they know everything," said Leonard, who speaks in rapid-fire bursts. "They're very organized and hierarchical. Each family does a different resin: one does only PET; another does only HDPE. The ragpickers were mad because they couldn't compete with all the plastics coming in from overseas. They were losing their livelihood." The ragpickers gleaned plastic from roadsides and trash cans, selling it to small factories that made low-quality plastics for sandals and kitchen goods. "You know," said Leonard, "all that stuff you see in Third World countries that breaks. Cups and bowls."

"And toys?" I asked.

"Yes!" Leonard yelped. We both had young children, and every time they went to birthday parties—her son on the West Coast and my daughter on the East—they came home flush with candy and cheap plastic toys made in Asia. "And they always end up in the trash," Leonard said, sighing.

I'd never talked to anyone so vehement about plastics. A native of the Pacific Northwest, Leonard had always thought she'd work as a forest activist. Then she went to school in New York and was bowled over by the amount of cardboard piled on sidewalks for collection. "That's where all our forests are going," she said to herself. Almost overnight, she dedicated herself to waste activism instead.

Riding around Madras in a rickshaw, Leonard ordered her driver to a halt every time she spotted a plastic bottle in a ditch. Over and over again, she saw bottles stamped "California Redemption Value"—bottle-bill bottles! "Finally, we came over a rise in the road and saw this enormous pile of compressed and baled bottles. The factory, owned by Futura Industries, washed, chipped, and melted the plastic, which it added to virgin plastic to spin polyester fabric. Out back there was a pile of waste—the hard bottoms of PET bottles, their lids and labels." According to the plant manager, Futura processed only between 60 and 70 percent of the bottles it received (not unlike Allied, back in Brooklyn). The rest were either too contaminated with residual material, with other garbage that arrived mixed in with the shipment, or with substances impossible to recycle. This last category was growing by leaps and bounds as bottlers introduced weird hybrids into the marketplace: plastic bottles with aluminum tops, tinted or painted plastic, and bottles made of multiple layers.

According to Greenpeace, 50 percent of the discards shipped overseas were contaminated. Importers were left with mounds of plastic that they either dumped on the ground—often in unlined, unmanaged sites where they leached toxins into the soil and water—or burned. Greenpeace reported that none of the recycling workers employed by Futura—30 percent were women earning

less than thirty cents a day, 60 percent were children, and the remaining 10 percent were old and disabled men—wore a mask or other clothing that would protect them from noxious fumes released by burning plastic, a combination of carbon dioxide, carbon monoxide, and sulfur dioxide, and, in the case of PVC, dioxin. Dioxin migrates on the wind, settling on grasslands and in the water, where grazing animals and fish consume it. Like DDT, dioxin doesn't readily break down in fatty tissues: it accumulates. According to medical researchers, traces of dioxin can be found in every person on earth.

In response to Greenpeace's report on the dumping situation, Pepsi claimed that workers were not endangered, that Coke was doing the same thing, and that this was what bottle recycling looked like. "But it's not recycling at all," said Leonard. "True closed-loop recycling has no new resource input and no waste output. And that's virtually impossible with plastic waste because its chemical structure changes when it's heated and the quality degrades. We're just delaying its eventual dumping."

I hung up the phone and stared out the window for a minute. If Leonard was right, then it didn't matter whether I redeemed my plastic bottles at the store, the first step on a journey to Asia, or gave them to American Ecoboard, via my food co-op. "Recycling" plastic, because it created new toxins and left old ones behind, might be more harmful than landfilling.

Leonard had suggested I call Berkeley's Ecology Center, which developed the East Bay's highly successful curbside recycling program, fueled its collection trucks with biodiesel, and ran a storefront that sold environmentally friendly carpet shampoo, compost bioactivator, whale magnets, and relaxation tapes. But for all its orthodoxy, the center for many years refused to collect plastic, which its founder, operating on the same wavelength as Ann Leonard, preferred to call "Satan's resin." Why such opposition? Because picking up plastic at the curb, said the Ecology Center, would legitimize the production and marketing of packaging made from virgin plastic, imply that it was ecologically friendly, and en-

courage residents to buy more of it. Alas, all this abandoned Berkeley plastic would only end up in the landfill. (In 2001, the city began to collect number one and number two containers, but only if they had necks narrower than their bases.)

As Leonard said, plastic isn't truly recyclable in the way that glass, metals, and fibers are. Streams of mixed plastic can be turned into only one other product (plastic wood, garden pavers, or toothbrush handles, for example). When their useful life is over, these products cannot be "recycled" again. They have to be burned or buried. Either way, they add toxins to the environment. Unmixed streams are another matter: they actually can be refashioned into bottles and containers. But there isn't much demand from their makers for recycled plastic. Virgin is so much cheaper.

And even if plastic manufacturers magically got it together and began using recycled content, the Ecology Center would still take issue. The raw material for the plastic used in packaging is ethylene, a gas derived from natural gas or from a fraction of crude oil that has a composition similar to natural gas. "Both natural gas and crude oil are products of fossils and are therefore not renewable," says the Berkeley Plastics Task Force report.

Producing and refining ethylene is a multistep process, one that employs small armies of those white-coated chemists I mistakenly conjured at American Ecoboard. First, the gas has to be heated, then refrigerated, then combined with solvents, comonomers, additives, and other chemicals. The mixture is then "polymerized" to create long-chain molecules. The new polymer is extruded, pelletized, or flaked: the finished product is called a resin. The resin is sold, reextruded, and made into containers, films, and other products.

If it sounds energy intensive, it is. But even worse, plastic is toxic both to make and to dispose of. On the front end, says the EPA, the production of plastic emits the toxins trichloroethane, acetone, methylene chloride, methyl ethyl ketone, styrene, toluene, and 1, 1, 1 trichloroethane, as well as sulfur oxides, nitrous oxides, methanol, ethylene oxide, and volatile organic compounds. Plastic manufacturers use copious quantities of benzene and vinyl chloride, which are known to cause cancer in humans. Ingesting other ingredients of plastic production can lead to birth defects and damage the nervous system, blood, kidneys, and immune system. Many of these chemicals are gases and liquid hydrocarbons that readily vaporize and pollute the air; many are flammable and explosive, and many can cause serious damage to ecosystems. In an EPA ranking of the twenty chemicals whose production generates the most total hazardous waste, five of the top six are chemicals commonly used by the plastics industry. Not surprisingly, plastic resin factories tend to be clustered in low-income communities of color (mostly in the Gulf States, which have easier access to gas lines). OSHA health studies have shown that people who work in and live near plants that manufacture plastics and the chemicals used to make them experience higher incidences of some kinds of cancer than other populations.

At the end of their useful lives, plastic products that lie by the roadside or get buried in landfills can leach phthalates—which give plastic its softness and flexibility but have been linked with endocrine disruption—into groundwater. Burned in an incinerator, shampoo bottles, take-out containers, and bathtub mats release other toxins that escape smokestacks or are concentrated in bottom ash, which is eventually buried in landfills (unless it is combined with other materials and used in construction).

Of all the materials we throw out, plastic is among the hardest to kill. It doesn't biodegrade in any conventional sense; sunlight causes it to photodegrade into ever-smaller pieces of polymers. These are easily consumed by some organisms, but they're still too large and too tough to be digested by microorganisms. In a landfill, where the sun never shines, plastic doesn't get even this far. ("Earth friendly" biodegradable plastics, made of potato- and cornstarch, need moisture to break down; this, too, is in short supply within most landfills.) But washed into the ocean from rivers and streams, dropped overboard from boats, or abandoned as fishing nets, plastic degrades into pieces that choke turtles, entangle jellyfish, and fill the stomachs of seabirds from the tropics to the antipodes, which then starve to death because they always feel full.

Besides the usual bits of balloons and bags, Laysan albatross chicks have ingested a cigarette lighter, a toothbrush, a tampon applicator, a toy robot, a golf ball, and lids from a car battery and a shampoo bottle. In 1999, marine researcher Charles Moore surveyed five hundred square miles of the North Pacific subtropical gyre and found six pounds of floating plastic for every pound of naturally occurring zooplankton. He repeated his study in 2002 and found ten pounds of plastic for each pound of zooplankton. A 2004 study conducted by marine ecologists around the British Isles showed accumulations of microscopic fibers and bits of synthetic polymers in beach and seabed sediments, as well as a big jump, in the last two decades, in the concentration of plastic particles amid plankton.

The more I learned about plastic, the worse I felt about the way I transported short-grain brown rice from the food co-op to my home (in a number 4 LDPE bag that I reused) and stored my leftovers in the fridge (in number 5 polypropylene containers). Not only was plastic bad news, both coming and going, but trying to recycle it possibly made the situation even worse. "It's just a diversion from more important issues, like sending putrescibles—very valuable stuff—to the landfill," Dan Knapp told me. Knapp was part of the Berkeley Plastics Task Force, and he ran that city's Urban Ore, a reuse and recycling center that kept five thousand tons of "waste," in hundreds of different categories, in circulation and out of the landfill. "We should just ban plastics. They're not worth it."

After talking to Knapp I reviewed my own garbage data. It's estimated that Americans go through about a hundred billion polyethylene bags—the ubiquitous eighteen-microns-thick grocery sacks that snag on branches, skip along on the breeze, clog sewers and storm drains, and burrow into ditches and dunes—a year. Although plastic bags don't take up a lot of landfill space, they persist in the environment for decades, if not centuries. Like other forms of plastic, they have high social and environmental costs—called "externalities"—that are borne by the public and by government, not by the producers of the plastics or their intended users. Recognizing these externalities, South Africa has prohibited the sale of plastic bags under 80 microns thick, and Taiwan and Bangladesh, where plastic trash clogged street drains that carried human waste, have banned free distribution of the bags in stores. Ireland reduced bag use by 90 percent by instituting a fifteen-cent charge for each sack.

Because they were so light, plastics left barely a mark in my trash logs, though I was going through an average of 5.2 Ziplocs and thin vegetable bags a week. When I began separating the bags from my kitchen trash, the total number of items in the can fell by nearly half. I ignored the slimiest bags, but the torn veggie bags, the worn-out Ziplocs, excess shopping sacks, pretzel and spinach and cheese bags, scraps of Saran Wrap, bread bags, and their ridiculous inner plastic liners now collected in yet another bin in my personal materials recovery facility (my kitchen). After one month, I had an entire pound of them.

Until producers took back the resins they sent out—I figured this would take a legislative act—I was going to have to change my habits. Instead of carrying my brown rice home in a plastic bag, I could buy it in a recyclable box. That sounded good until I considered its product-to-package ratio. According to California's Integrated Waste Management Board, a delivery of one thousand pounds of rice in plastic bags generated 3.9 pounds of waste, while the same amount of rice delivered in paperboard generated 78.1 pounds of waste. Which was preferable? The choices, like so many at the intersection of consumerism and environmental concern, were agonizing.

Switching from bottles of liquid dish soap to cakes of hard yellow soap, which worked great and came with zero packaging, was a no-brainer. I was already reusing my Ziplocs, but I resolved to always use containers, rather than Saran Wrap, to hold leftovers. I checked my data sheets again: the only other plastics that occurred in my trash were bottles of shampoo, conditioner, olive oil, ketchup, mouthwash, medicine, and, twice, children's bubbles. A year's data included three half-liter water bottles, but on that mat-

ter my conscience was clear: they were outliers, introduced by guests unaware of my single-use phobia. I was devoted to my wide-mouthed Nalgene bottle—refillable, hardy at all temperatures, a cinch to clean. Then I read about a study conducted at Case Western Reserve University and learned it was made of a polycarbonate called Lexan that's been linked in mice to an endocrine disruptor called bisphenol-A, which has in turn been linked to chromosome abnormalities and the runaway development of fat cells. The only healthy alternatives for toting around liquids, it seemed, were the leather bota bag, popularized by Chianti-drinking campers in the seventies, and the bladders of large ungulates, like buffalo or elk, popularized by hard-core survivalists.

But what about the plastic bottles I used at home? I decided to buy ketchup only in glass. I would buy olive oil in cans, then give them to Wendy Neu. I could buy shampoo and conditioner in the largest-size plastic bottle I could find. It was either that or go for those antiquey-looking products, usually "botanical," that came in blue glass. But they were expensive, and heavy, and slippery when wet, and impossible to squeeze the last and even second-to-last drops from.

Exactly, I could hear the plastics industry murmuring as I made the case for Satan's resin.

Part Three

Flushing It Away