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WITH respect to the mounting problem of garbage, we appear to be in a difficult and unclear transitional era. Old technologies are being or are perhaps about to be superseded and behavior seems on the way to changing. Analysis of the problems of garbage may therefore be of little relevance because it is too grounded in the past, or so focused on future possibilities as to be very tentative. It is perhaps emblematic of the transitional moment that the world's largest sanitary landfill, Fresh Kills on Staten Island, will soon close after half a century as the main repository for New York City's garbage (New York Times, December 21, 1997, sec. 1, p. 41). The timing could hardly be worse if the eventual solution of our problem is technological innovation, because closing Fresh Kills likely means using outmoded, expensive, and relatively polluting technology—for example, traditional incineration—for the transitional interim until new technologies or new behaviors resolve the problem or reduce its scale.

After briefly surveying the mechanics of the distribution and disposal of garbage, I will turn to examining several moral issues in the life of garbage in our time. The mechanics involve strategic interactions between individuals, firms, and governments because, in general, the problem of garbage is a collective, not an individual, problem, although its resolution is partly through the aggregation of individual efforts. In a sense, the system turns out garbage and we individuals wish to put it back in. Ideally, the system would convert the garbage back into something valuable, but at the very least we want the system to dispose of the garbage cheaply and without causing harms to us in various ways.

Throughout the following discussions, I will often draw comparisons to other problems of pollution, which is the more general class of problems to which garbage belongs. The moral issues include conflicts between nations and generations that result from external effects of garbage disposal, the morality of pricing these external effects (I will not discuss the direct pricing of garbage handling itself), the role of moral commitments in getting individuals to handle the problem directly by recycling, and the possibility that garbage can become a resource rather than primarily a burden.

In general, more or less for reasons laid out in the opening paragraph, I think the problem of garbage allows for, at best, very sketchy and incomplete understanding at this moment in its changing history. As may the reader also, I therefore find the following discussion quite unsatisfactory. I suspect that, ten years from now, it will seem jejune, as will most contemporary policy discussions of garbage. That is a sad and historically odd fate for discussions in moral and political philosophy, but an increasingly common one. Given our current difficulties with garbage, we should hope to be pleased with that fate for this discussion.

THE MECHANICS OF DISTRIBUTION AND DISPOSAL

The components of garbage are mass produced and then very efficiently distributed jointly with consumer goods. Just as Alfred Marshall defined hides and beef, or grain and straw, as "joint products," because the quantity produced of each depended in large part on the quantity produced of the other (Marshall, 1949, pp. 321-23), garbage is a joint product of consumer goods. Indeed, because garbage is the end-state of many, perhaps most, consumer goods, such as newspapers, broken appliances, and worn out clothing, it is not merely joint but nearly identical. This means that it is distributed almost free of charge jointly with the valued goods as part of the cost of

those goods. A central problem of garbage is, therefore, that the efficiency of its production and distribution is far greater than the efficiency of its collection and disposal, which cannot be the fortuitously joint product of other activities that are valued in their own right.

In some sense, at the level of the individual consumer or end-producer, we produce garbage piece by piece, but we have traditionally disposed of it en masse. If there were the incentive to handle each item of garbage separately to put it in its proper place on some shelf, as we handle the initial packages of goods (and other items that leave a residue) when we buy the goods, we might readily manage the flow of garbage in successful ways. This difficulty underlies much of the criticism of actual garbage policies for recycling and even of the whole idea of recycling. Recycling requires disposing of garbage selectively piece by piece and therefore requires behavior changes. Continuing to deal with garbage en masse would require technological innovations. The two can work against each other. New technologies for disposal can reduce the value of recycling materials, while recycling can undercut the value of new installations for disposal (Johnson, 1993, p. 26).

Much of the focus of garbage policy in the past couple of decades has been the individual, whereas almost the entire focus of policy on many other forms of pollution is the firm. For example, I may be the end-producer of atmospheric pollution when I drive my car or, if I were a supposedly environmentalist Californian, my gas-guzzling and massively polluting four-wheel drive behemoth. But the manufacturer has already done the major work of reducing my pollution. Dealing with firms merely requires incentive structures in the form of fines, fees, tax rebates, and so forth, assessed either directly as prices or indirectly as fines in response to regulations. Such incentives are easily factored in as part of the net cost of production. Dealing with individuals requires either incentives or moral exhortation to change behavior. Applying incentives at the individual level, however, is very costly and inefficient because monitoring is difficult. With current technologies, the chief problem in recycling is motivating consumers—the end-producers—to make recycling work well without substantial fines or monitoring, either of which would be extremely costly to administer.

Much of the effort to manage garbage focuses on technological fixes for the handling of the mass. Some of the legal devices that have been invented focus instead on individual end-producers of garbage, as with laws mandating bottle and can deposits and laws requiring separation of recyclables. These two devices work by addressing individual motivations for action, although they may not work exactly as anticipated. The image in early defenses of bottle and can deposits for soft drinks and beer was of children collecting bottles from beaches and elsewhere in order to collect the deposits. The image we see in our daily lives in American cities is of the homeless scavenging through trash to fetch out the bottles and cans. Because there are relatively destitute, often homeless people, we have less difficulty recycling than we would otherwise have. And the image of the individual home or apartment dweller separating garbage by types runs against the reality of large, especially older, apartment buildings in which the burden falls heavily on the janitorial staff (Specter, 1992). But these policies have a potentially valuable focus: they address individual psychology and motivation and do not restrict the problem exclusively to large-scale technological devices.

While the harms that garbage does may not equal those of other major forms of pollution, the difficulty of dealing with it might, with present technology, be harder. The chief problem with garbage is that its disposal is handled initially by an extremely decentralized system. It is necessary for each individual, or family unit, or, in some cases, apartment complex to handle its own waste in ways that make it possible to

collect much of it for recycling. The effort involved in doing this may be more costly than the benefit. We typically reduce costs of various productions by reducing them to mass processes, such as assembly lines or chemical processing systems. The radical increases in productivity from various industries over the past couple of centuries has resulted in large part from reductions in labor inputs. Of course, it might happen that the increased labor input required for recycling has other benefits than merely the direct benefit of less environmentally harmful disposal of garbage. For example, it should lead to reduced use of various resources and the concomitant reduction in environmental harms from using those resources. Still, recycling cuts against the standard trend to reduced labor inputs.

In this respect, garbage is therefore very nearly unique among pollution problems. For other problems of pollution, there are major firms that can be regulated in ways that reduce the levels of pollution through, essentially, mass production of the reductions. Increasingly, however, we are able to handle one part of the output of garbage with a mass production system. Food wastes can be put down the drain very efficiently—about as efficiently as they can be thrown out. Thereafter, they can be processed en masse, although, of course, often they are not but are merely poured into waterways and oceans. This device depends, however, on the prosperity of those disposing of the wastes, because it requires running water and garbage disposals. Hence, it is a device essentially available only to relatively prosperous societies and households. If all garbage could be handled in an analogous manner, end-producers would have little trouble with it.

The strongest claim one can make for requiring consumers to handle their waste in ways that make recycling plausible is that, once they develop relevant habits of separating items, they will find it not much more demanding than merely throwing everything into a single garbage bag. Unfortunately, the claim may be less compelling for some people than for others, because it is not trivially easy to separate wastes in the required ways. Hence, people require not merely the development of different habits but also increased understanding of what the issues are. The hassles of mastering the issues entail start-up costs that the short-sighted might weigh very heavily. Labeling clearly would help to resolve this problem. In addition, labeling that tells something about the costs and impacts of various packaging materials would enable consumers to choose less harmful products, as many would evidently do.

If the reason we have difficulty disposing of garbage well is that to do so costs individual consumers, there are two devices we may use. We might use legal penalties to coerce consumers to handle their garbage properly, or we might somehow reward them for doing so. Legal devices and rewards might work for large units, such as apartment complexes, but they would be inefficient and ineffective for single family units. They seem to work to a substantial extent with bottle deposits, which may generally impose a cost on consumers and pay a reward to scavengers and to institutions that provide collection bins. But they have as yet to be applied to most kinds of recycling. We might therefore depend on modest moral commitments to motivate individuals to recycle, as discussed below.

INTERNATIONAL AND INTERGENERATIONAL PROBLEMS

Environmental problems typically have two moral implications that are relatively new to human existence. There are external effects of one community's action that harm another community, so that the first community transfers part of its costs of living the way it does to other communities. And there are effects on future generations, so that our generation burdens future generations with part of the costs of our living as well as we do or the way that we do. It is only a relatively small part of the problem of

garbage that it has these effects. Most of the problem is essentially localized to the community that produces it. So long as we do not dispose of garbage either by dumping it into waterways that feed into oceans, putting it in landfills that do not handle the greenhouse gases of decay (the gases can be funneled off to supply energy), or by incinerating it poorly enough to produce greenhouse gases and other airborne pollutants, garbage need not entail international problems and may not entail intergenerational problems.

Garbage is internationalized chiefly in two ways. First, according to a 1966 EPA study, older landfills not equipped with gas collection systems produce 36 percent of the methane emissions in the United States (Denison and Ruston, 1997, p. 57). Methane, which is primarily produced by cattle and by decaying organic materials, is one of the most important greenhouse gases. Second, dumping into waterways was once widely practiced and dumping of sewage is still a problem. Until 1986, New York City dumped 200 million gallons of raw sewage daily into the Hudson River at its 125th Street sewage plant just south of the George Washington Bridge. By 1996, treatment at that plant removed ninety percent of the organic wastes (New York Times, June 9, 1996, sec. 1, p. 46). Direct dumping of garbage into the Hudson River, the harbor, and the ocean near the city was an issue for about a century. Indiscriminate dumping in the Hudson threatened to block shipping lanes and, in 1857, was restricted to the area between Liberty and Ellis Islands. While, as Emma Lazarus's tribute to them on the Statue of Liberty says, the "wretched refuse" of the world came to America, the refuse of New York was dumped beside the island through which they entered the country. Ocean dumping of garbage was suspended a century ago, reinstated in 1919, and finally stopped by the U.S. Supreme Court in 1934. Ocean dumping of sewage ended only in 1992 (Kannapell, 1994).

As of today, the garbage Americans produce need not make life for, say, the Chinese significantly worse. Some other major pollutants have inescapable and much greater international effects. Greenhouse gases produced in the United States can harm the entire globe—and the United States produces a very disproportionate share of the total of such gases, including more than a fifth of the world production of carbon dioxide, the most important of greenhouse gases (New York Times, May 31, 1992, sec. 4, p. 6). Similarly, the United States has contributed massively to the believed destruction of the ozone layer. It has contributed to fouling the oceans well beyond its national shores. Apart from some continued greenhouse gas production, its current garbage problems are far more localized.

For many of our contemporary environmental problems, there are potentially severe implications for future generations. For garbage, that seems less true in a fairly straightforward logical sense. If our generation burns very much of the extant fossil fuel without finding alternative energy sources while building infrastructures that depend heavily on cheap energy, future generations may bear heavy costs. If our generation fouls the upper reaches of the stratosphere, wrecking the ozone layer and creating a haze that causes greenhouse warming, the costs of overcoming these harms might be expected vastly to exceed the amortized costs of reducing the pollutants in the first instance. For garbage disposal, so long as there are no hazardous wastes involved, the chief problem for future generations is that available disposal sites, such as landfills, will be used up. But the development of alternative ways to deal with garbage at that point might not be more costly than developing them now to preserve more of the landfills for later. The only current policies that would have clear future benefits would be policies that actually reduced the amount of garbage produced by, for example, introducing better technologies for packaging.

Unfortunately, most moral theories are not equipped to handle intergenerational tradeoffs. This is a striking feature of these theories: they are conceived as though to

apply to a closed community without future generations. Libertarian rights theories leave future generations at the mercy of the collective results of following the rights in the present generation. Human or natural rights theorists are stuck with the problem of intuiting one right after another in a shambling attempt to keep the theory coherent. There is no good reason to think the intuitions of a natural rights theorist are inherently better than those of the rest of us. Rawlsian justice is too dependent on mutual advantage to be workable for intergenerational issues. Communitarianism is utterly irrelevant almost by definition since the problem of environmental destruction is universalistic and communitarianism's only principled position is antiuniversalism. Kantian rationalists might eventually have something to say about environmental issues, but they must first have something to say about politics and institutions at all. Virtue theorists must have a prior account of the goodness or rightness of an environmental regime before they can give an account of the virtues that would bring the regime about. Utilitarians may be the only moral theorists with genuine access to such major environmental issues as global warming from greenhouse gases but, when mutual advantage moves are blocked, they must have recourse to strong interpersonal comparisons of well-being. Efforts to master this problem to date have not been promising.

PRICING GARBAGE DISPOSAL

Economists commonly argue for tradable rights in emissions as the most efficient solution to various pollution problems. For example, my firm or my nation is allocated some number of credits (representing, say, tons) for some pollutant that it can emit, and your firm or nation is allocated some number. If it happens that you can reduce your pollution more cheaply than I can, you can sell me some of your credits and we both are better off while achieving the wanted level of pollution reduction overall. For example, the United States and China might trade emissions rights for certain greenhouse gases. China, which is generally at an earlier stage of technology in relevant industries, can achieve much greater reductions in emissions with relatively cheap technological fixes than can the United States. China could buy cheap technology by selling pollution credits and still make a profit. And the total production of greenhouse gases could be reduced.^(FN1) Ironically, it would be the United States that then paid for the reduction. Moreover, a large side benefit of the Chinese efforts, also paid for by the United States, would be reduction of more local harms, such as acid rain, that would primarily or exclusively benefit the Chinese.

Against the economists' position, many lawyers argue for strict regulations and legal enforcement of them, although increasingly lawyers seem to be coming to share the economists' view for contexts in which it seems easily workable, as for example when monitoring is easy. Some, including some philosophers and some public advocates, argue that selling pollution credits would be immoral. Perhaps these differences of view are merely instances of professional deformation. But one might hope that, if the point of whatever system we adopt is to reduce pollution, we could evaluate each of these positions on the ground of how well it would work toward that goal. At the moment, it appears that—if they were successfully administered—either tradable emissions rights or regulations would be beneficial moves. Then the question is how they would perform over the long term.

The usual defense of a system of tradable credits is that it would immediately give everyone involved the incentive to improve technologies in order then to be able to sell credits at a profit. An administered set of regulations would tend to give weaker stimulus to the development of less polluting technology. And it would be relatively expensive to administer. Monitoring might be more expensive for the tradable credits

regime, because it would require measurements of actual emissions. Monitoring under the regulatory regime would be cheaper if all that had to be monitored were the actual technologies in place. But if that were all the system required, it would become very inefficient very quickly at lowering pollution because it would tend not to encourage technological change. In general, I think the case against the regulatory regime and for the tradable credits regime is clear for emissions that are relatively easily monitored. The case for emissions that are hard to monitor is harder, although if technological change is fast, the value of more expensive monitoring is still likely to pay off overall.

A typical version of the moral argument against tradable credits has recently been given by Michael Sandel on the Op-Ed page of the New York Times. He gives three arguments, two of which are largely irrelevant. The moral argument is that turning pollution into a commodity to be bought and sold removes the moral stigma that is properly associated with it. If a company or a country is fined for spewing excessive pollutants into the air, the community conveys its judgment that the polluter has done something wrong. A fee, on the other hand, makes pollution just another cost of doing business, like wages, benefits, and rent (Sandel, 1997).

Sandel's argument is bad on two quite different grounds. First, it is most obviously bad as an argument for intelligible and successful policy on pollution reduction, as several letter writers say in their objection to his editorial.^(FN2) These letters are by people, most of them academics, who have been extensively involved in analyzing policy on these issues. The letters fairly uniformly seem to seethe with contempt, a stance that is not unusual in letters to the editor about editorials. But the stance seems in this case to be uniformly prompted by Sandel's failure even to mention the central concern of those who think it at least worthwhile to consider the merits of tradable credits. The issue for policy is presumably how much we can actually reduce pollution to benefit billions of people. This issue seems to be of no concern to Sandel—even though it is this issue that sparked the policies that sparked his comments.

Second, the argument is incoherent as a matter of morality. The position assumes that there are right and wrong actions in principle with respect to "excessive" pollution. But typically, whether my polluting is even harmful at all depends on how much other pollution there is. For example, if few people live along the Hudson River and dump their sewage into the river, the effect might be harmless, because the sewage would be degraded and processed by organisms in the river (those organisms regularly dump their own sewage into the river). But if hundreds of thousands dump their sewage into the river, the result might be that virtually all the oxygen in the water will be consumed by the decaying waste, so that fish and other aquatic life will be asphyxiated. The river has a carrying capacity, below which no harm is done and significantly above which the river is radically altered, even reduced to a nearly dead river or at least one without fish. Similarly, allowing every household to vent the smoke from a wood-burning fireplace in New York City two centuries ago was fine; doing it today would be disastrous. Many of the problems of pollution today are the results of trends in practices that at an earlier time were not harmful but that, with increasing density of population, have become very harmful.

The definition of "excessive" pollution is a matter of convention, not of moral principle, and for many of the most important pollutants, it is entirely contingent on what others are doing. Indeed, on the conventional nature of the definition of excessive pollution, note that people in an impoverished society and people in a wealthy society might have quite different judgments on what counts as excessive. People in the impoverished society would likely be willing to tolerate much worse pollution than would people in the wealthy society. That is because they would be willing to make a greater trade-off of the costs of pollution against the benefits of cheap production. Indeed,

many argue that putting resources into job creation would be far more valuable to most people in the third world than reducing pollution there. This would enhance life prospects for those people far more than expenditures on environmental benefits would. This is true not only for those now living but also for their future generations as well (Nasar, 1992). Older Americans will recall a visiting delegation of Chinese during the Nixon administration. They looked out over the thick yellow smoke and uncounted smokestacks of the Cuyahoga Valley and were impressed with the beauty and wonder of the vista.

On the contingent nature of the notion of excessive pollution, note that, as it stands, Sandel's living contributes to the world's pollution, whereas if he had lived several centuries ago in various places, it would not have done so, even though he might have been far more polluting then. He regularly exhales carbon dioxide, the worst of the greenhouse gases. He presumably produces garbage. What is excessive here? Is it excessive that a factory produces greenhouse gas emissions when it also produces goods that improve the lives of, say, relatively destitute people in Africa or Asia? No. It is virtually impossible to do the latter without doing the former. Work produces extra greenhouse gases because people breathe harder while working. What is excessive is not what that factory does or what Sandel does but the collective production of garbage, emissions, and so forth.

It therefore makes some sense to say we are collectively in the wrong for our joint emissions and our massive outpouring of garbage. But it need not make analogous sense to say that Sandel or the factory in Africa is in the wrong for their emissions and garbage. There is often no way to unpack the collective claim of responsibility into a set of individual claims that makes any sense without constant reference to the collective effects of individual actions. Collective and individual responsibilities are not merely functional, additive equivalents. In some contexts there might be collective but no individual responsibility (Hardin, 1988, pp. 155-60). This is arguably the case for the collective actions that may lead in the end to destructive global warming.

There is a large but often fruitless branch of academic ethics that holds that what counts as right or wrong is personal actions of particular kinds rather than results of any kind. That branch of ethics has little to say to us about how to manage the harms of pollution, garbage, and the fact that billions of us live on this limited planet. Practitioners of this branch of ethics can do no more than Sandel does and assert that polluters do wrongs. If the assertion is true in general, then we do wrong to live.

Beyond these general objections to the supposedly moral argument, there is a peculiar irony in the problem of garbage disposal. Of course, a major problem with garbage disposal is that it tends to produce emissions of various kinds, such as greenhouse gases, so that we might have to decide between a regulatory and an economic regime for controlling and even reducing these emissions. The irony is that large cities, such as New York, would likely be more able to justify investment in the latest technology for disposal. They might therefore generally produce less emissions per capita than smaller communities and they might tend to sell their pollution credits to smaller communities. In part, this follows from the greater returns to scale that make it genuinely more valuable for larger garbage producers to invest in high-tech solutions.

Smaller and poorer communities would typically move into new technologies more slowly or would pool their garbage with that of other cities or even, in the most optimistic technological scenario, sell their garbage at a profit to large and innovative disposal firms. Hence, against Sandel's criticism that a system of tradable emissions credits would be immoral because it would allow the wealthy nations to pollute by buying credits from the poorer nations, a system of tradable credits for pollution from garbage disposal would likely go the other way entirely. Smaller and poorer

communities would purchase New York's tradable emissions credits. Oddly, in parallel with the case of international emissions credits as assumed by Sandel, that means they would help to pay for New York's reduction in emissions from garbage. But, of course, that would make sense economically for the poorer communities because it would be cheaper for them to contribute in this way than through direct investment in their own disposal systems. If international trading in emissions credits worked this way, with China buying credits from the United States, Sandel and other moralists would no doubt think it then immoral because the United States would be "exploiting" China, although the exploitation has the opposite form of the one he has condemned.

Briefly consider some of the possible regulatory solutions to the garbage problem. Rules could be directed at various points in the process of generating and disposing of garbage. Some legal rules would be destructive in the longer run, and not even very much longer. For example, mandating that packaging be only of certain kinds would reduce the incentive to invent new kinds that might actually help to resolve our problem. But regulatory rules to use packaging, unspecified as to exact type, that can cheaply be recycled or disposed of without substantial harmful side effects might be generally beneficial. Certain state laws mandating bottle and can deposits have worked fairly well to encourage the return of bottles and cans to collection stations for recycling. They work, of course, through incentives to those who collect them and, to some extent, to those who are the end producers, although many of the latter might be even more motivated by moral commitments. If the main effect of deposits is their incentive effect, especially on the poor who collect bottles and cans for sale to recycling programs, they sound partially analogous to tradable credits. I pay a fee for the use of and disposal of a can while someone else is paid a reward for reducing pollution by returning the can. Presumably, Sandel and others therefore object to the use of bottle deposits and think it would be more nearly moral to force consumers to dispose of their own bottles and let destitute bottle scavengers find income in other ways.

MORAL COMMITMENTS

Recycling and some other responses (such as lower or more selective consumption) to problems of garbage likely depend for their success on at least some moral commitment on the part of individual citizens. For example, environmentally safe aerosols were very competitive in the market. Evidently for moral reasons, some customers preferred them enough to choose them over less safe products that used ozone-destroying gases as propellants. Presumably, almost no one was hostile to the less destructive products. Hence, manufacturers had incentive simply to switch to safer propellants, and the first to do so may even have gained competitive advantage from advertising its change. In this case, very slight moral commitment was enough to tip the scales over to the collectively preferred outcome. But this was due to the working of the market on its production side. One propellant was substituted for another and the basic behavior of consumers did not have to change significantly. There was little problem of microbehavior.

Garbage is, with present technology, different. If the scale of its problem is to be reduced, many producers will have to change from their current behavior, and consumers—end producers—will also have to change their behavior, perhaps in ways that conflict with their current interests. Garbage therefore poses a potentially severe problem of microbehavior.

We can commonly vote for a generally moral policy or a collective benefit that costs us individually if the policy or benefit can be arranged through regulation, as in banning lead from gasoline or chlorofluorocarbons (CFCs) from many uses, or through direct

provision, as with education, highways, air traffic control, and so forth. When we arrange the resolution of a collective action problem by voting whether to coerce ourselves universally to contribute to its provision, you or I can simply vote on whether the collective benefit to us outweighs our personal contribution to providing it. If the personal benefit to each outweighs the personal cost, we face a net collective (and personal) good; if not, not.

Since our vote determines whether we get the good and at the same time blocks the possibility of easy free-riding, we can confidently vote for it, as, via our representatives, we voted to stop the use of lead in gasoline despite the relatively high cost of doing so because the benefit to our children seemed to outweigh those costs. With garbage sorting and reduction, however, we need to change actual choice behavior daily, so that, although we might vote for a system of garbage collection and recycling, we would individually still often be able to be free-riders on the effort. High enforcement costs would make free-riding relatively easy for many people. We might easily be able to enforce compliance with sorting regulations on large apartment complexes but not on individual households.

We might be able to overcome the perverse incentives against collective action with a modest moral commitment. Garbage may be an unusual case of a problem that could, at least in substantial part, be handled by instilling modest collective values in individuals. But it might not be worth the cost to do so unless we suppose that highlighting the morality of recycling and reduction of consumption of instant garbage has positive impact on moral commitments more generally. It is plausible that those who are morally motivated on garbage issues are generally so motivated and that environmental concerns are not the prior stimulus to their morality. If so, the limits of moral commitment may be relatively severe. In particular, there may be a fairly low ceiling on how much improvement we can expect to get with moral commitment to reducing the problem of garbage.

Richard Titmuss argued that moral suasion was the best way to handle the collection of blood for medical uses (Titmuss, 1971). Against Titmuss's thesis, Kenneth Arrow argued that moral exhortation is not cheap and need not, perhaps even should not, be used when other devices are readily at hand (Arrow, 1972). Against the generalization of Titmuss's argument from the realm of blood to environmental commitments, it is telling that Titmuss's England required contributions of blood from only about six percent of the relevant adults. Six-percent recyclers would have slight impact on our garbage problem. If technological fixes such as the plasma torch system (discussed below) become cheaply or, better still, profitably possible, one might then suppose that the pressure on end-producers to do something about their own garbage production would slacken considerably. (There is one remaining loss if disposal displaces recycling. Resources will be expended more quickly, often with consequent pollution problems.)

Those who argue that sorting garbage for recycling is not a special burden for people might, instead of thinking of quasieconomic costs, think of the odd fact that we have begun to give a lot of thought to our garbage. Many people buy selectively to avoid excess garbage; many consciously struggle with the morality and burden of their handling of garbage; and many flout the emerging norms on how to deal with it. Pushing people around with moral claims and imprecations against them and their behavior might work to enhance the prospects of recycling, but we have too little experience with such a massive social program to be sure that it will not eventually undercut moral claims for more important issues or for issues on which we do not have other devices that might work in lieu of moral exhortation and commitment. Arrow's argument against too-ready reliance on moral exhortation and commitment in

the case of blood collection may apply even more forcefully for a matter that seems, in daily life, as trivial as where and how to dispose of a beer can or a newspaper.

GARBAGE AS RESOURCE

Some view garbage as a potential resource rather than a burden to be dealt with. In the oil fields of the Middle East, natural gases are flared rather than contained and then sold, while in the oil fields of Texas, these gases are part of the extravagant bounty and they yield huge profits. The amount of energy wasted in the Persian Gulf and vicinity is such as to make it the brightest area on the globe at nighttime, brighter than great cities. The wasted energy is a significant fraction of the energy from exhaustible carbon fuels "used" each year. The most optimistic visions of garbage handling might see it as similarly foolish to waste garbage. Of course, there are analogous problems of making use of these potential resources. Collecting and transporting the gases of the Middle East is itself an expensive proposition, just as collecting the garbage in usable form is expensive in some sense.

Current technological developments might soon make garbage, even garbage that has long been in landfills, commercially valuable. One perhaps grossly optimistic prospect is the use of plasma torches to convert landfills into vitreous slag plus more than enough fuel-grade gases to power the torches (Gibbs, 1993). Under the anaerobic conditions inside the compacted pile of garbage, such a torch, heating up to fourteen thousand degrees Fahrenheit, would not burn the materials. Rather, by pyrolysis, it would cause the materials in the landfill merely to break down chemically into their less harmful constituents. Experiments using such a torch on shredded garbage cut the mass (or weight) of the materials by 80 percent and reduced their volume by more than 99 percent. The lost mass was, of course, the gases that were emitted. These were fuel-grade and could generate 25 percent more electricity than the torch consumed. The vitrified slag that remained might have commercial value as filler in asphalt or concrete or in other uses. Indeed, it could be used as perfectly safe landfill, for example, to extend the island of Manhattan still further (about twenty percent of the island is landfill, about half of that garbage [Kannapell, 1994]). The first planned commercial plasma furnace in the United States was to treat hazardous wastes for Kaiser Permanente in California. In the best of all worlds, Fresh Kills might someday soon be commercially exploited by such a technology and that large part of Staten Island might become newly valuable land.

Even when market solutions could work—because changing technology to one that is less polluting actually pays off economically by reducing costs—they must evidently often fail. In the production of plastic wraps, PVC (polyvinylchloride) gases were a dangerous part of the atmosphere in the relevant factories. Enclosure of the production process to protect workers against exposure to this demonstrated carcinogen was legally mandated. Only then did Dow and other companies create the technology for encapsulating the production process, a technology that substantially reduced costs of production. In a sense, they had an incentive to enclose the process for their own economic reasons, but they knew too little about that incentive to act on it. Their initial reaction to the requirement of enclosure was to complain that it would destroy the viability of their product by raising its cost prohibitively. Anyone now living in North America might suspect that, on the contrary, the chemical companies have since produced enough of their product to swaddle the globe.

Only under the duress of a legal mandate did the chemical companies radically alter their production technology for the better in the PVC case. One can tell similar stories for other mandated environmental changes, such as the profitable business of selling the products scrubbed from the smoke stacks of electric utility companies. This is an

especially common pattern in chemical company regulation. Michael Porter and Claas van der Linde studied 181 waste-prevention activities for the twenty-seven activities for which such data could be calculated; each \$1 spent on these programs netted savings on average of \$3.49, although the industry fought hard against all the regulatory policies that forced these programs on them. In the end, it is hard not to suppose that industrial antipollution efforts pay directly and not only through the effects of reduced pollution (Porter and van der Linde, 1995, p. 125; also see Gladwell, 1997). Yet the market does not work especially well in getting firms to go ahead with programs that, once forced on them, turn out to be profitable to them. Or at least it does not work as quickly as it does when government raises the costs of older ways of doing things by penalizing them.

CONCLUDING REMARKS

Sadly, I will end on two negative points, one on the side of interests and the other on the side of morality. First, the story of chemical and other industry failings to adopt beneficial, because profitable, innovations before being virtually coerced to by government regulation suggests some reason to doubt the most optimistic expectations of economists and others who suppose pricing systems will have quick impact on changing technology in beneficial ways. Even though the firms of the chemical industry are highly competitive and invest heavily in research to beat each other to market and to the patent office, they seem repeatedly to have undersold themselves on the value of innovation or attempts at innovation involving old products. Once a product line is in place, it may be produced in the same old way, and that way might finally be superseded more often by the supersession of products rather than of processes. For old products, the sunk costs of an assembly or other production process might trump the expected gains from junking that process and adopting another. A new product, on the other hand, might simply entail, as an often unexpected consequence, the demise of an old product, so that there need be no decision deliberately to kill the old product and, perhaps with it, its polluting production process.

Second, it is sometimes supposed that morality begets morality, perhaps by example or even by a sort of embarrassment. (The latter might more commonly be a religious than a moral theoretic expectation, and it might depend on shaming by the not merely moral but the moralistic.) Hence, we might suppose that the use of moral appeals in dealing with garbage would actually enhance the more general morality of people's actions and commitments in other realms as well. In some contexts, morality does seem to beget morality. For example, if you are trustworthy, I may soon see that I should also be trustworthy because then you will be willing to take risks on cooperating with me to our joint interest, which means to my interest, in many ways. Your trustworthiness therefore induces mine. This is, of course, a directly reciprocal relationship in which interests and plausible morality go well together, so much so as to reinforce each other. Your contributing to the reduction of greenhouse gases in our world of billions of people might technically also be called reciprocal with those billions. But that does not bring their interests in acting the way you do in line with the morality of their acting that way. Their interests and their morality still conflict. Therefore, we may be glad if technological innovation finally has a large impact on reducing the harms of garbage disposal because that will likely work much better than moral exhortation.

Added material

FOOTNOTES

1 President Bush's administration proposed such a system as one of its few genuine moves in favor of environmental improvement. See *Science* 247 (February 2, 1990): 520-21.

2 See letters by Sanford E. Gaines, Michael Leifman, Eric S. Masken, Steven Shavell, and Robert N. Stavins, *New York Times*, December 17, 1997, p. A30. The last three of these writers are colleagues of Sandel at Harvard.

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