CHAPTER 14

Changing Behavior to Save the Environment

KEY TERMS

approach prompts
avoidance prompts
commons dilemma
consequent interventions
contingent interventions
dominant Western world view
environmental education
feedback
foot-in-the-door technique
free-rider
individual good–collective bad trap
missing hero situation
modeling
negative reinforcement
new ecological paradigm
nuts game
one-person trap
positive reinforcement
prompts
public goods problem
punishment
self-trap
social dilemmas
social traps
vandalism

INTRODUCTION

Imagine that you are a shepherd and that you share a pasture known as "the commons" with the other shepherds of your village. Further assume that the commons cannot be enlarged—it constitutes all the land you and the others have on which to graze your animals. Although you share the pasture land, the economic benefits you gain from your herd are yours, and from time to time you are confronted with the decision of whether to purchase another sheep for your flock. The commons is becoming depleted, but you feel that you would enjoy the economic advantage of owning another animal. After all, the commons could support one more sheep without too much further damage. You reason that the cost (to you) of one additional sheep grazing on the commons is quite low, and you conclude that you are acting rationally by deciding to make the purchase. However, force yourself to consider what would happen if all the shepherds added one extra animal. The eventual result would be complete depletion of the commons, and all would suffer. After you have ruminated on this for a while, you become uncertain about what to do.

This story is taken from Hardin's (1968) "The Tragedy of the Commons." As you have probably realized, it offers an excellent analogy with many aspects of contemporary life. Many resources are being consumed at too high a rate, which is endangering the future availability of the resource. At a personal level we often find ourselves faced with resource-related decisions that are modern-day equivalents of whether or not to add another sheep to our herd. Should we avoid buying paper plates in order to save trees? If we use paper plates can we avoid wasting water to wash dishes? In a sense, our needs are pitted against those of the larger community. We are faced with a choice between satisfying our immediate needs with the prospect of negative future consequences to society, and restricting our present consumption for the further good of the community. The way we resolve such dilemmas obviously has important implications. Hardin argues that if we want the commons to survive, each of us must give up some of our freedom. While the individual shepherd will benefit by adding to his or her flock, one must refrain for the greater good. But as logical as this seems, your experience may suggest to you that it will require more than reasoning to make people refrain from behaviors that are environmentally destructive, although personally satisfying. Unfortunately, people frequently fail to respond to reason alone.

John Platt (1973) considers situations such as the **commons dilemma**, in which short-term personal gains conflict with long-term societal needs, to be types of **social traps**. In general, Platt feels that social traps are hard to break out of, but claims it is essential for researchers to design strategies enabling us to do just that. Various methods have been suggested to help us break out of the commons dilemma (cf. Edney, 1980; Platt, 1973). For example, researchers have tried to increase short-term costs of environmentally destructive behaviors so that they become less attractive behavioral alternatives, and have attempted to decrease the costs of environmentally constructive acts. Environmental psychologists have also tried to educate people (e.g., by conducting environmental seminars) to make them realize their interdependence and to make the long-term societal costs of squandering resources more salient, and have advocated adding reinforcers to encourage behaviors incompatible with those that waste precious resources. Some have also supplied people with feedback about the extent to which they are depleting the commons and have assessed the effects on resource overconsumption of dividing up available resources (e.g., through rationing).

In this concluding chapter we will discuss a broad range of techniques that have been used by environmental psychologists in an attempt to study and change an array of human behaviors that are not in our best interests environmentally. Some environmentally destructive behaviors are easily amenable to conceptualization in terms of the "commons dilemma" and "social trap" analyses we have described, while others require a different type of conceptualization. Therefore, the approaches we will discuss for dealing with environmentally destructive behavior include the sorts of techniques mentioned as useful for attacking the "commons dilemma" type of problem, as well as other methods.

ENVIRONMENTAL PSYCHOLOGY AND SAVING THE ENVIRONMENT

Clearly, changing human behavior to save the environment is an extremely important topic. However, past research in environmental psychology has focused more on the effects of environmental variables (e.g., crowding, deteriorated environments) than on how to modify our behavior to save the environment. Environmental psychologists have documented that certain environments affect us adversely, but have done less research on how to change our behaviors so they do not have adverse effects on the environment. There is a big difference between knowing that people react negatively to filthy urban areas or to energy or other resource shortages, and getting them to do something about solving these problems. We need to devote more research attention to studying how we can have a positive effect on the environment, as opposed to focusing on how it affects us.

What unique contribution can environmental psychology make to help deal with the many environmental problems we face (e.g., insufficient and expensive fuels, air and water pollution, a generally deteriorating environment)? The approaches other disciplines have taken have emphasized physical technology. For example, a great deal of attention has been focused on developing

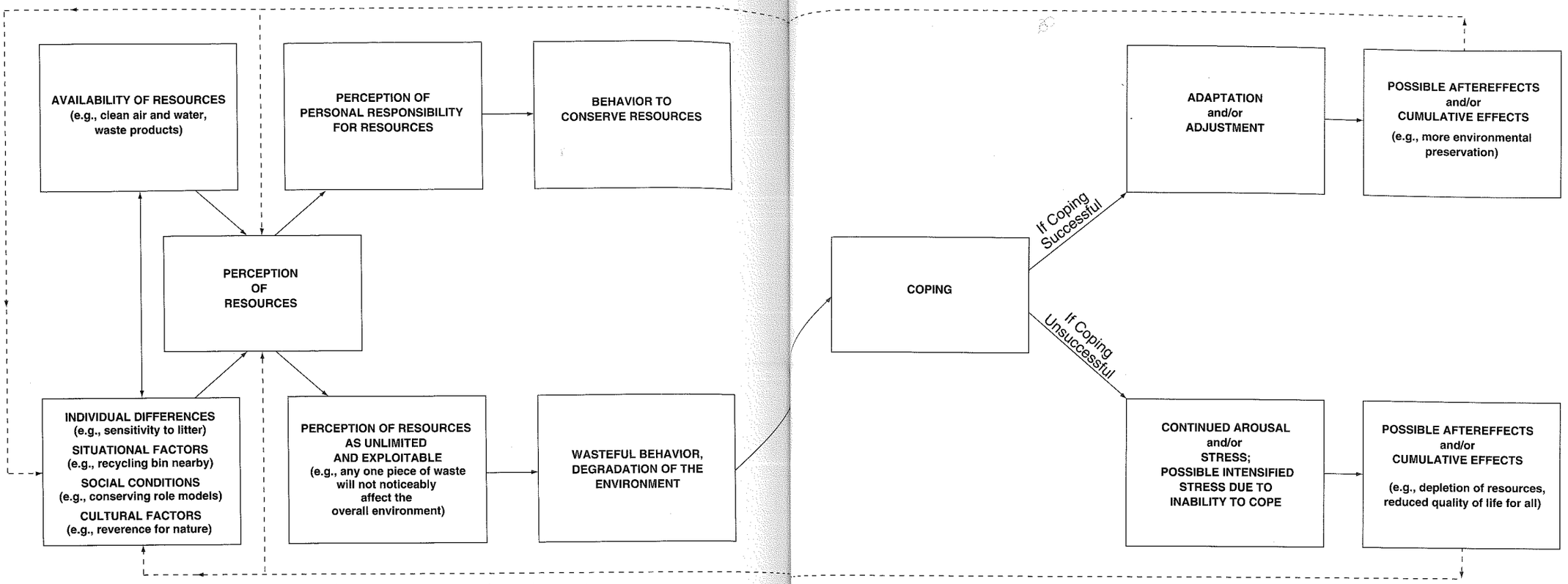


Figure 14–1 The eclectic model applied to behavior change to preserve the environment

nuclear and solar energy, and pollution abatement techniques. Many seem to think that solving our environmental problems only requires the right technologies. In contrast, relatively less attention has focused on strategies for preserving the environment which involve changes in people's behavior. Where these techniques have been used they are often regarded as "stopgap" measures, with the hope that technology will eventually bail us out of our current problems. We will argue that although physical technology certainly has a role, behavior change—sometimes involving substantial modifications in how we act on an "everyday" basis—will have to make a significant contribution if things are to improve. In fact, sometimes behavior change will be more important than physical technology in effecting solutions.

Why do we (and many other environmental psychologists) feel this way? First, in some cases physical technologies have gotten us into this mess. Modern transportation has solved problems in locomotion, but has caused pollution, periodic energy shortages, and unsightly commercial "strips." Modern packaging allows us to preserve all types of food, but has created a tremendous litter problem. Most technologies have unfortunate "side effects," and in this chapter we will see that psychological techniques for behavior change could help eliminate them. Second, in cases (e.g., dealing with littering) where physical technology cannot fix the problem, changing our behavior is the best means of coping. Even when certain efficient technologies promise cures for environmental problems (e.g., building smaller, more efficient homes, retrofitting existing ones), particular behaviors are often necessary to ensure that people use available technology. For example, motorists have disconnected catalytic converters in automobiles in order to increase gas mileage and eliminate attendant smells. By doing so, they subvert pollution control technology. More generally, we could say that the impact of any technology depends on people's behavior—how they *use* the technology. Finally, behavior does have strong effects on the environment: We would not be exaggerating if we asserted that almost everything anyone of us does has either a positive or a negative impact on our environment.

The perspective we take in this chapter can be viewed within the framework of our eclectic model, as depicted in Figure 14–1. Experiencing the environment as outside our ideal—too much pollution or rapidly depleting resources, for example—motivates us to seek change. Additional inputs, such as feedback about our resource consumption or incentives to change our ways, motivate us to modify our own behavior, which in turn changes our perception of the situation.

Two questions remain: (1) Will changing our behavior to save the environment

require a lower quality of life, and (2) can it be done? Generally, the answer to the first is "No." If we changed our behavior so fewer of us drove cars and more used public transportation, there would be less pollution, we would have significantly more money to spend, we could walk or ride bicycles anywhere, inflation would not be particularly linked to the price of foreign oil, and so on. In many ways, the quality of life would actually improve. We rephrase the second question: Do the behavior change techniques that we will be describing in this chapter work? We will leave that for you to decide after reading our presentation of the evidence in the coming pages. We will, however, suggest that there is lots of room for environmental psychologists to improve our environment-relevant behaviors. For example, energy consumption often varies by a factor of two or three for similar people living in identical homes (Socolow, 1978; Winnett et al., 1979). Their apparently different behavior seems to show up in energy use!

If we could influence environmentally relevant behaviors to improve the environment, what would we focus on? We would probably want to promote environmentally protective behaviors (e.g., picking up litter, recycling things), and discourage environmentally destructive ones (e.g., throwing litter on the ground, driving cars that are "gas hogs"; Cone & Hayes, 1980). It should be noted that both types of behaviors impact on the same problems. Encouraging environmentally protective acts (e.g., rewarding people for picking up litter) and discouraging environmentally destructive behavior (e.g., high fines for littering) will improve the litter situation. Unfortunately, programs that encourage protective behaviors do not necessarily inhibit destructive behaviors, and vice-versa (Cone & Hayes, 1980). Also, not all environmentally protective and destructive behaviors have the same impact on the environment. A program that stops people from littering is sure to have direct environmental impact; one that encourages people to vote for conservation-oriented legislators will probably have a more diffuse impact. Finally, we should stress that the effects of any environmentally protective or destructive behavior are complex. Suppose we could get people to recycle all newspapers. This would save trees, but might cause water pollution from the ink removal process. It would save energy since we would not need to process virgin wood, but the recycling process itself uses a great deal of energy. Although most environmentally conscious people probably think that using paper cups causes less damage to the environment than using plastic ones, a case can actually be made that plastic is less harmful (Hocking, 1991)! Sometimes it is hard to figure out whether we are helping or hurting the environment (Figure 14–2).

Figure 14–2 Actions to "save" the environment often involve trade-offs. Actions with low impact on one segment of the environment often have high impact on another segment. For example, using paper plates to save water costs trees; using washable dishes saves trees but costs water. A (controversial) case can actually be made that plastic cups have less impact on the environment than paper cups.

As we proceed in this final chapter, we will have more to say about the reasons people are motivated to reduce environmentally destructive behavior, but at this point we would like to make a few comments about perceived risk, because people's perceptions of high or low risk influence their willingness to engage in destructive behavior (e.g., tampering with antipollution equipment on an automobile) as well as their willingness to engage in behavior that helps preserve the environment (e.g., reducing use of broadly toxic pesticides). Slovic (1987) points out that perception of risk is not the same as risk calculated by experts—the *perceived* risk may be higher or lower. Perceived risks tend to be higher if the activities associated with them are seen as uncontrollable, inequitable, catastrophic, unknown, dread, and likely to affect future generations; such is the case, for example, with people's perceived risks about nuclear power. Perceived risks tend to be lower if the activities associated with them are seen as voluntary, individual, not globally catastrophic, easily reduced, and of low risk to future generations; such is the case for swimming, power lawn mowers, and food preservatives. What is the risk to the individual and to the environment for one act of littering or for one person using an automobile instead of mass transit? People's perception is that the risk is minimal, in part because using the automobile and littering are seen as voluntary and controllable and any negative consequences will probably occur long after the specific act of littering or driving. In reality, the consequences of these activities build over time and increase as more and more people engage in them. We will see what we can do about these consequences in the remainder of the chapter.

What is the range of environmental problems that we would like to improve if we could? These may be categorized as (1) problems of environmental aesthetics (e.g., prevention and control of litter, protection of natural resources, preventing urban deterioration); (2) health-related problems (e.g., pollution, radiation, high levels of noise; and (3) resource problems (e.g., overconsumption of resources such as water or energy; Cone & Hayes, 1980). These categories are neither exhaustive nor mutually exclusive. Often, specific environmental problems, such as overdependence on the automobile, impact on all three categories. While we will not be able to deal with all of the environmental problems needing solutions, later in this chapter we will discuss specific approaches for coping with several of them in detail.

At this point, let us examine the commons dilemma in more detail to see how we can modify the situation to improve the outlook for the environment. We will then consider a range of environmental problems and the ameliorative techniques used by environmental psychologists to help solve them. Some of these techniques may hold great promise for solving the critical problems that now confront us.

THE COMMONS DILEMMA AS AN ENVIRONMENT–BEHAVIOR PROBLEM

Hardin's (1968) depiction of the tragedy of the commons has spawned numerous attempts to examine factors which might help us work out favorable solutions to the commons dilemma. To see how generalizable Hardin's propositions have become, it might be useful to enumerate examples of commons-like behavior beyond that of Hardin's shepherds. Hardin himself was interested in the problem of overpopulation: Seemingly self-serving motives for reproduction (e.g., having more labor to run the family farm)

have a long-term negative consequence if the total population outstrips the food supply. Hardin himself borrowed the analogy of the commons from Lloyd (1833), who was also interested in how a selfish view could lead to disastrous overpopulation. Other examples of the commons dilemma are apparent when we consider some scenes typical on many college campuses. Parking lots are often jammed, with long lines of cars waiting for a space. The parking lot can be thought of as a commons: It is shared by all and owned by none of those who use it. Because parking spaces may be scarce, individuals acting in self-interest may arrive early to get a share of the valued resource. But as demand for parking spaces increases, you must arrive earlier and earlier to be assured of one. The result is that people who really need access early may be deprived of access because others have rushed in before them. Or consider space in campus dining areas around the noon hour. Space is limited, and many students use dining tables to socialize or to study for the next class. If they studied elsewhere, there would be room for all to eat. Libraries are not immune from commons-type behavior. Toward the end of each semester or quarter, demand for certain valued reference materials soars and access becomes constricted. In self-interest, someone may hold the material for an inordinate amount of time. If students (and faculty!) would use these materials throughout the term, the "crunch" disaster would not strike so badly at the end of the term. Scheduling of classes is also a type of commons. It appears that 10 A.M. is the most popular time for faculty to teach and for students to want to be in class. Accordingly, classroom space is scarcest at that hour, but is underutilized at other times of the day. Budgets also have the characteristics of a commons. If the members of a group allocate a fixed amount from which they all draw, such as for phone calls or photocopying, the tendency is for everyone to spend more than their share from that part of the budget. If each participant decides, then, that it is in his or her best interest to spend a fair share before someone else uses it, the resource becomes depleted very quickly—to the detriment of all. Can you think of other examples of this type of dilemma (see Figure 14–3)?

Two other examples of a commons-type tragedy show how broadly applicable the analogy is to environmental problems. Pringle et al. (1993) document the tragic consequences of shared use of the Danube River. The Danube stretches 2,860 kilometers through nine different countries; about 12 percent of Europeans—86 million people—live within its basin. Through a canal, it links the North Sea to the Black Sea. It is a major transportation pathway but also provides drinking water, irrigation water, and hydroelectric power. However, it is also used to dispose of industrial and municipal waste. Any one nation's exploitation of the river has an environmental impact that is not terribly noticeable, but the sum of abuse by all nations is tragically detectable in the delta. Among other things, the fish harvest is down by as much as half, and some species show a 90 percent decline. Another interesting example of a commons tragedy comes from an attempt to use an environmentally friendly source of energy. Kerr (1991) describes how geothermal energy has been exploited at The Geysers, a natural steam-generating geological formation in Northern California. Production of electricity from this relatively clean energy bonanza began with one company in the 1960s, and today it provides 6 percent of California's electric power. But by 1988 the number of organizations tapping the energy source had increased to 11 users. Too many companies exploiting the limited resource will soon cut total electricity output by half, and a $3.5 billion investment may be lost. The problem once again is that whereas individual use of a resource can be

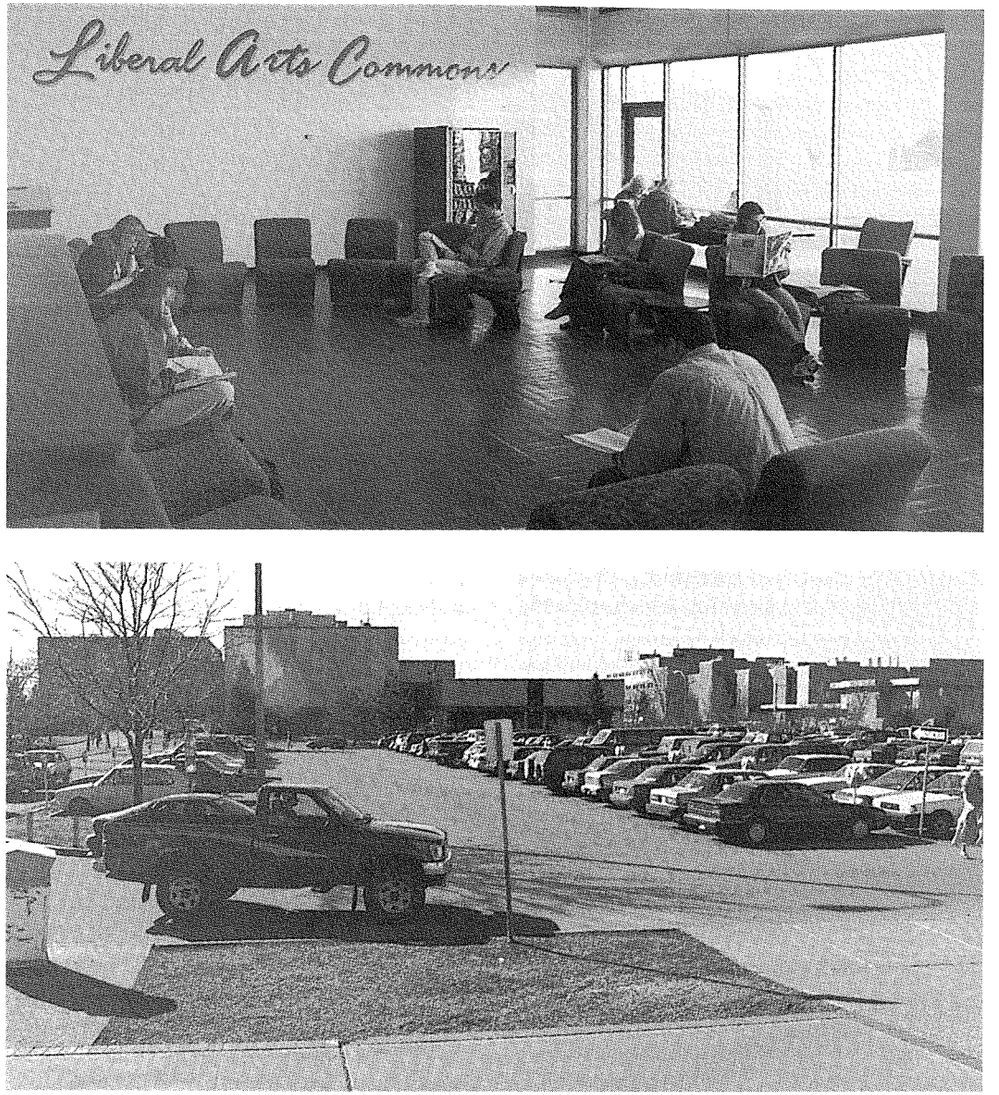


Figure 14–3A & 3B Some examples of a "commons" on a college campus. What other examples can you think of?

tolerated by the environment, the combined exploitation by a group often leads to overuse and tragic disaster.

We mentioned that Platt (1973) conceptualized the commons dilemma as a type of social trap. Platt described three such categories of social traps, each of which is relevant to environmentally destructive behavior. The *commons* type of trap, or **individual good–collective bad trap**, involves a group competing for a valued resource, such that destructive behavior by one participant

has minor impact on the whole, but if all engage in the same individual behavior, the impact on the commons is disastrous. The **one-person trap**, or **self-trap**, involves a disastrous consequence to one person. Typical of these traps is addiction to drugs or food. The momentary pleasures of the present have disastrous consequences in the long run. The third type of trap is the **missing hero situation**. Whereas the commons trap and self-trap involve unfortunate actions which we take, the missing hero trap involves an action which we fail to take, such as refusing to help someone in need or failing to warn others of the toxicity of a substance with which they work.

Interestingly, Platt (1973) notes that all three of these traps can be analyzed in terms of the rewards and punishments (i.e., reinforcements) associated with them. There is a positive side to the situation which we seek, and a negative side which we want to avoid. The problem is that the positive and negative have become separated in time, or the negative has been diluted across the members of a group, so that the behavior leading to the short-term positive consequence is more likely to occur. For example, in the commons problem of overharvesting whales, the immediate reward of taking one whale seems more prominent than the long-term consequence of everyone else taking more whales. In a self-trap of overconsuming food, the short-term pleasure of an extra dessert seems overwhelming relative to the long-term consequence of damage to the body and to our appearance. In a missing-hero trap, there is an unpleasant component to the behavior we should be performing: The punishment is short term but the reward is long term, so we avoid the behavior. For example, we may fail to pick up litter because the inconvenience seems to outweigh the long-term benefit of an aesthetically pleasing environment.

How, then, do we resolve social traps? Platt argues that we simply rearrange the positive and negative consequences of our behavior. If we engage in a destructive behavior because it has immediate rewards, such as using an automobile rather than mass transit, we can impose a system of penalties for automobile use (such as heavy freeway tolls) and rewards for mass transit use (such as free rides on high-pollution days). Or, we could increase the unit cost of a resource, such as electricity, for those who use a large quantity, and reduce the unit cost for those who use little. For example, Oskamp et al. (1994) found that financial gain—that is, monetary reward—was a major motivator for businesses engaging in office paper recycling; similarly, Grasmick, Bursik, and Kinsey (1991) found that shame and embarrassment—that is, negative consequences—were significant motivators in an antilittering campaign. We will examine these ideas in more detail when we discuss specific use of rewards and punishments to prevent environmentally destructive behavior.

Edney (1980) points out that although this reinforcement interpretation of the commons dilemma is appealing in its simplicity, it ignores a number of human elements. For one, it ignores the long-established evidence that individuals are different from one another: They do not all respond in the same way to the same rearrangement of the circumstances for rewards and punishments. Reinforcement approaches also sidestep questions of conscience, altruism, ethics, and humanistic tendencies, and suggest that reason is dominated by questions of reward. Hopper and Nielsen (1991), for example, observed that altruistic motives influenced recycling behavior, and Axelrod and Lehman (1993) found that deeply held personal principles could guide environmentally conscious behavior. Similarly, Stern, Dietz, and Kalof (1993) observed that concern for consequences to others and to the environment, as well as concern for consequences to oneself, guide environmental consciousness.

We should mention that there are other

formulations of commons-type problems. To social psychologists, the problem is one of a class of **social dilemmas**, where individual interests are pitted against group interests (e.g., Messick et al., 1983). The entire September-October, 1990 issue of *Social Behaviour* is dedicated to social dilemmas, if you are interested in further reading. Economists refer to a variation of the issue as the **public goods problem** (e.g., Marwell & Ames, 1979). In this situation, individuals must all contribute to a common cause, such as paying taxes for mutual self-defense or contributing to a public television station. Any one person can fail to contribute, and the public cause will survive. However, if too many people get the idea of not contributing, the common good suffers. Those who do not contribute are termed **free-riders**, since they not only do not contribute, but also benefit from the public cause. For example, a person who sneaks onto a subway without paying or who poaches wildlife without a hunting license could be termed a free-rider.

In our discussion above we showed how Platt would rearrange rewards and punishments to solve the commons dilemma. Hardin (1968) suggests that some form of governance is necessary to manage the commons in a nondestructive manner. In his terms, we must have "mutual coercion mutually agreed upon" in order to regulate our tendencies toward overconsumption. Laboratory investigations using commons dilemma simulations (see box on page 530) have explored a number of factors, including forms of "governance," which might help us conserve the commons. It is instructive to review some of these laboratory findings.

Consistent with Platt's notions, laboratory studies do show that adding rewards for cooperative behavior and punishments for selfish behavior can help preserve the commons (e.g., Bell, Petersen, & Hautaluoma, 1989; Birjulin, Smith, & Bell 1993; Harvey, Bell, & Birjulin, 1993; Kline et al., 1984; Komorita, 1987; Yamagishi, 1986). It has been found that cooperation among players is essential for pro-ecological (preservation) outcomes; consequently, there must be trust between participants (Edney, 1979; Moore et al., 1987; Mosler, 1993). Those who have a trusting and cooperative nature seem most able to manage the commons together (Parks, 1994). Also, if groups are allowed time to study the game and to communicate, they derive their own strategies, which frequently are pro-ecological; communication promotes commitments to cooperate in managing the commons (Brechner, 1977; Dawes, McTavish, & Shaklee, 1977; Edney & Harper, 1978a, 1978b; Kerr & Kaufman-Gilliland, 1994). Other research shows that giving groups immediate and detailed resource feedback about the effects of their behavior (Kline et al., 1984; Seligman & Darley, 1977; Stern, 1976) leads to maintaining the commons for a longer period of time. Groups who are afforded both feedback and communication are especially successful at maintaining the commons (Jorgenson & Papciak, 1981).

When one's individual behavior in a commons dilemma situation is subject to the scrutiny of others, he or she is less apt to overexploit the commons (Jerdee & Rosen, 1974). Other studies have explored the effects of knowing one is interdependent with others for a resource, rather than having his or her own supply (e.g., Edney & Bell, 1984). Generally, individually owned resources are handled more efficiently than common or "pooled" resources. In fact, obtaining knowledge of resource interdependence seems to increase the intensity of behaviors aimed at "getting as much as possible for oneself," which ends up depleting the commons (Brechner, 1977; Cass & Edney, 1978). This suggests that rationing resources could be a useful strategy.

Structural changes to the commons are usually more effective management strategies than trying to influence individuals (e.g., Messick et al., 1983; Samuelson et al.,

SIMULATING THE COMMONS DILEMMA: *How It's Done and What Is Found*

To test different techniques for helping us break out of the commons dilemma, a number of simulations have been developed which incorporate the central elements that people face in such contexts. In these simulations, various interventions are attempted to determine those which would cause us to behave in a more constructive way. Thus far, the simulations have included computer analogs (e.g., Brechner, 1977; Cass & Edney, 1978; Fusco et al., 1991; Gifford & Wells, 1991), as well as noncomputerized methods involving portable (e.g., Edney, 1979) and nonportable apparatus (e.g., Edney & Harper, 1978b). In addition to being useful for exploring strategies for helping us to break out of the commons dilemma, simulations can be used as teaching devices to aid us in understanding the dynamics of our environmentally destructive behaviors.

To give you a feel for these simulation techniques, we will discuss Edney's (1979) "nuts game" simulation in some detail. Recall that commons dilemmas include: (1) a limited resource that may regenerate itself somewhat, but which can be endangered through overconsumption; and (2) people who have the choice between restricting current individual consumption for the good of society (and the future of the resource pool), and exploiting the resource for their own immediate good. A successful simulation would have to include these elements.

How can this be done? Edney's **nuts game** accomplishes it quite nicely. A small number of subjects enter the lab and sit around an open bowl that originally contains 10 hexagonal nuts, obtained from a hardware store. The bowl symbolizes the pool of resources (e.g., trees, whales, or oil), and the nuts symbolize the individual resources themselves. Participants are told that their goal is to obtain as many nuts as possible. (This simulates the fact that typically we try to maximize our outcomes in life.) Players can take as many nuts as they want at any time after a trial begins. The experimenter also states that the number of nuts remaining in the bowl after every 10-second interval will be doubled by him or her. This replenishment cycle simulates natural resource regeneration rates. The above events continue until the time limit for the game is exceeded, or until the players empty the bowl.

How do subjects behave during the "nuts game"? We would hope that they would take at most a few nuts out of the pool per 10-second period, which would allow the game to continue and maximize the long-term outcomes. However, in his research, Edney (1979) found that 65 percent of the groups depleted the pool completely before the first replenishment stage! They took out all 10 nuts (i.e., depleted the resource pool completely) during the first few seconds of the game. As in the "real world," people exploit the commons, with unfortunate results.

1984). For example, experiments have studied whether educating people about the optimal strategy for using resources in commons dilemma situations leads to pro-ecological action. As we will see later when we discuss environmental education, often it is quite ineffective (Edney & Harper, 1978b). Moral exhortation to be altruistic

helps, but not much (Edney & Bell, 1983). On the other hand, when the structure of the situation is changed to promote communication, subjects arrive at an optimizing strategy themselves (Edney & Harper, 1978a, 1978b). Another structural change, that of breaking down the commons into individually owned territories, also improves conservation (e.g., Edney & Bell, 1983). This territorial or "privatization" solution actually eliminates the commons, and is not very practical for some resources, such as national parks or the air we breathe. It does, however eliminate the need to have an intricate system of rewards and punishments for harvesting behavior (Martichuski & Bell, 1991). Another structural solution, that of requiring that all members harvest in equal amounts, also has pro-ecological results (Edney & Bell, 1983). Freedom of choice and equality of harvesting outcomes also seem to improve harvesting efficiency (Edney & Bell, 1987).

The nature of the social relationship between participants can influence the fate of the commons. If those sharing the commons like each other, they seem to manage it more efficiently (Smith, Bell, & Fusco, 1988). If those sharing the commons identify with each other as a group, preservation is more likely (Brewer & Kramer, 1986; Kramer & Brewer, 1984). Also, different leadership and decision-making rules have been related to commons dilemma outcomes. A study by Shippee (1978) found that personal participation in choosing a group's leadership and in implementing decisions to limit resource use led to quite successful conservation results. This, coupled with the earlier findings on being involved in choosing an optimizing strategy, highlights the importance of individual participation.

What does all of the above mean? Clearly, commons dilemma analogs can give us useful hypotheses regarding how to deal with "real-life" situations. They might eventually provide important partial solutions to pressing contemporary problems. However, we must keep in mind that the external validity of these laboratory simulations has not been demonstrated, and thus it is still an open question as to whether or not the sorts of interventions which are successful in simulations would work in the real world. There is certainly some evidence that these laboratory studies have implications for the real world, although the linkage is not complete. Clearly, social—as opposed to technological—solutions must be considered. For example, we mentioned that numerous researchers (e.g., Edney & Bell, 1983) demonstrated the efficacy of dividing the commons into territories. Acheson (1975) observed that Maine lobstermen who were highly territorial in defending their ocean claims were more successful in maintaining productivity than those who were less territorial. In addition, Thompson and Stoutemyer (1991) found that focusing on long-term consequences improved water conservation, an issue they interpret as a commons dilemma. Such outcomes raise the question of whether some environmental policies might be better than others in achieving desired outcomes. We must also keep in mind that outcomes involve trade-offs. For example, if we divide a national park into privately owned territories as a strategy for preserving it, we would defeat the purpose of holding the park as a "common" good. Moreover, Edney and Bell (1983) found that a strategy of everyone sharing equally preserved the commons as well as did dividing it into territories. However, Edney (1981) observed that the sacrifices that must be made to preserve the commons are often unequally shared among the population (i.e., some harvest less than others; see Samuelson & Messick, 1986), and concluded that honesty and interpersonal trust are extremely important psychological qualities in any solution to the commons dilemma.

We conclude this section by noting that as individual action has more and more

THE WORLD AS A COMMONS: *New and Old Ecology*

Aside from a number of examples of individual commons dilemmas, we might also consider the entire world as a commons. Environmental sociologist Riley Dunlap, drawing on the views of others, has suggested that a shift is occurring in how we view world resources (e.g., Dunlap, 1980; Dunlap & Van Liere, 1978, 1984). This shift takes the form of a contrast between a long-held **dominant Western world view** and a **new ecological paradigm** approach to the world's resources. We summarize these contrasting attitudes below.

The dominant Western world view holds that:

1. Humans are unique and have dominion over all other organisms.
2. We are masters of our own destiny—we have the intellectual and technological resources to solve any problem.
3. We have access to an infinite amount of resources.
4. Human history involves infinite progress for the better.

The new ecological paradigm holds that:

1. Humans are interdependent with other organisms, such that their preservation is to our advantage.
2. Many things we do have unintended negative consequences for the environment.
3. Some things, such as fossil fuels, are finite.
4. Ecological constraints, such as the carrying capacity of an environment, are placed upon us.

You may agree or disagree with some of the above contentions. The ones you endorse probably have much to do with how palatable you find the various strategies for managing the commons.

impact globally, the relevance of the commons dilemma becomes more and more apparent. As examples, (1) in connection with the greenhouse effect, individual use of fossil fuels seems harmless but collective use dangerously warms the entire planet (Kerr, 1988a); (2) the individual use of chlorofluorocarbons (e.g., for air-conditioning) seems harmless but collectively it creates an ozone hole over the planetary poles (Kerr, 1988b), which is why such refrigerants are being phased out; (3) the locally harmless use of fossil fuels creates acid rain when the collective output of the fuels precipitates over neighboring areas (Schindler, 1988); and (4) the singular launch of a space vehicle seems strictly an advancement of science, but the total output of waste products left in orbit from multiple launches endangers future launches (Marshall, 1985) and, along with night lighting from urbanization, interferes with astronomical studies of outer space (Waldrop, 1988). While it is easy to adopt a fatalistic attitude that we are hopelessly locked into one collective ecological disaster after another, there remains hope. Research has indeed shown that a variety of strategies can modify environmentally destructive behavior. We turn now to some strategies that have known outcomes in their applications, with the knowledge that the commons dilemma is a useful foundation for the implications of these strategies. Moreover, some of the same factors that influence outcomes in the commons are important for these strategies, such as rewards and punishments, communication, feedback, and social cohesion or attraction toward those who participate in the strategy.

ENCOURAGING ENVIRONMENTALLY RESPONSIBLE BEHAVIOR

How can psychologists use what they have learned to encourage environmentally appropriate behavior? Consider solid waste (garbage) as just one example that illustrates many of the characteristics of environmental problems in general. Estimates vary, but the typical American generates about 25 pounds of solid waste a week (Carless, 1992). All of this trash has to go somewhere, but landfills, which dispose of more than 70 percent of the waste stream, often leak toxic substances and fewer and fewer are being opened—at least in some geographic areas. Figure 14–4 shows one estimate of American municipal waste by weight. What should be apparent is that a large proportion of the waste stream could be eliminated, reused, recycled, or reclaimed. As a general principle, "preventing" environmental problems is usually more effective than "curing" them (Blumberg & Gottlieb, 1989). A joy ride avoided is energy saved; it requires less energy and fewer natural resources to reuse a bottle than to recycle it; and it costs far less to recycle an aluminum can than to manufacture one from virgin aluminum ore. Thus, in order of desirability, our behavioral goals should be to: (1) reduce our demands for energy, water, and other natural resources; (2) reuse rather than discard whenever possible; (3) reclaim or recycle what we cannot reuse; and (4) dispose of the remaining trash as safely as our knowledge will allow (Figure 14–5).

Figure 14–4 One estimate of municipal waste by weight
Adapted from Carless, 1992.

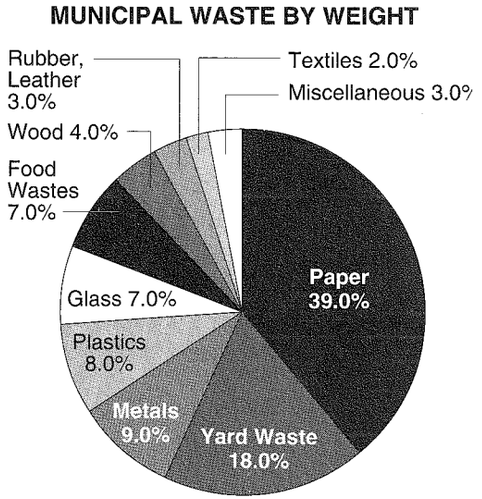
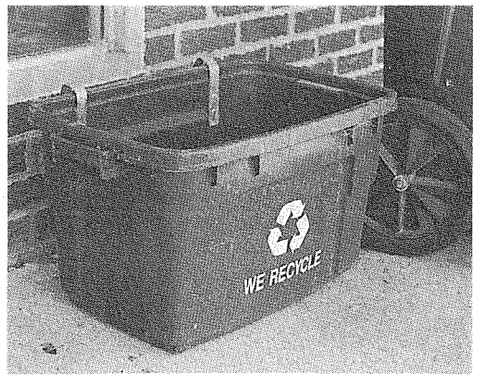


Figure 14–5 Reduction of the waste stream requires that we reduce the manufacture of unnecessary products, reuse what we can, and try to recycle the rest.



Of course, psychologists have not limited their investigations to solid waste management. The field can help encourage environmentally responsible behavior across the spectrum of human-created environmental problems with interventions aimed at individuals, groups, or even our whole society. However, we will limit our present discussion to selected topics that have attracted considerable psychological research: conservation, recycling, litter reduction, and vandalism. For further reading, we suggest you consult the March 1995 issue of *Environment and Behavior*, which is devoted entirely to psychologists' perspectives on litter control and recycling.

CONSERVING ENERGY AND WATER

Minerals, oil, water: these are part of an incomplete list of valuable natural resources. In the case of oil, known reserves fluctuate but the total resource is in increasingly short supply, at least in some parts of the world. Water, similarly, is abundant globally, but the supply of fresh water is inadequate in critical areas of human habitation and agriculture. In each case, the by-products of production and delivery create problems (some of catastrophic proportions) of their own. As we said, the most comprehensive strategy for avoiding the costs of production is to reduce our requirements for these resources.

CONSERVING ENERGY

In introducing Chapter 11 we remarked that one of the primary characteristics of humans as a species is our ability to modify the environment to meet our needs. For example, expending energy allows us to inhabit a variety of environments and increases our productivity and personal comfort. Unfortunately, overuse of energy may also be our undoing. Power plants contribute significantly to air pollution and global warming, and our dependence on fossil fuels for transportation and the generation of electricity makes us susceptible to the whims of the political climates in fuel-producing countries. At best, accidents in nuclear generation facilities like Chernobyl and Three Mile Island make us uneasy. Yet we are addicted. Consider the lowly lightbulb. Edison's invention allows us to push back the night, to remain productive after sunset and safer in our streets (Howard et al., 1993). We will not do without it, but can we do with less?

In the 1970s North Americans were faced with an oil shortage, and various forms of rationing were imposed. The new field of environmental psychology responded to the "energy crisis" with a flurry of research aimed at reducing energy consumption. During the 1980s, however, oil reserves increased, prices for oil decreased, and government funding for research into energy conservation was reduced. In addition to the reduction in both the sense of urgency and funding, some researchers felt ineffectual as they encountered deeply entrenched cultural practices and governmental policies. Sadly, research dwindled (Dwyer et al., 1993; Kempton, Darley, & Stern, 1992; Stern, 1992b). Of course a long-term concern about the availability of fossil fuels remains, but an additional new challenge in the 1990s is to reduce the side effects of energy production including air pollution, acid rain, and global warming. Unfortunately, it remains true that most methods for generating energy have negative consequences for the environment. In the case of carbon dioxide (the most important contributor to the "greenhouse effect"), the only feasible present method of reducing emissions is to burn lower quantities of fossil fuels like coal and oil. Consumption is the result of a number of individual behaviors, and it will become increasingly important for psychology to join the effort to reduce the consequences of our thirst for energy (Kempton et al., 1992).

Estimates vary, but households account for about one-fourth to one-third of direct energy use in the United States, with industry and commercial users accounting for the rest (Cone & Hayes, 1980; Stern, 1992b; Stern & Oskamp, 1987). Thus, private residences do not directly account for most of the energy used. Psychology is primarily a science of individual behavior, however, and the vast majority of published studies of psychological interventions are aimed at changing the use behaviors of individuals or households (Kempton et al., 1992; Stern, 1992b; Stern & Oskamp, 1987). Certainly there is ample reason to reduce residential consumption; according to one estimate, the energy consumption of the "typical" American home could be reduced by 50 percent by making some simple physical and behavioral changes (Socolow, 1978).

Antecedent Strategies

Antecedent strategies precede the behavior they are attempting to change. In many cases the primary targets are attitudes. These are the evaluative or affective (emotional) reactions of individuals to energy conservation. For instance, we might try to change attitudes through persuasive or informational messages. Simply stated, the goal of these strategies is to "make people care." Other approaches assume that people have a positive attitude, but aim to show them how to behave in ways consistent with what they already "care" about. For example, information about the energy efficiency of certain appliances can improve the success of individuals who are already trying to conserve. Of course, many types of information can serve both functions, and one recurring hope is that those who are well informed are more likely to adopt environmentally responsible views (Newhouse, 1990).

Attitude Change and Education

Environmental education involves making people aware of the scope and nature of environmental problems and of behavioral alternatives that might alleviate them. Even though people are frequently misinformed about energy use and its consequences (e.g., they believe that turning down thermostats in evenings during the winter will lead to increased "rebound" energy use when turned up in the morning), studies have suggested that simply educating them is not effective at changing energy-relevant behaviors (e.g., Dwyer et al., 1993; Heberlein, 1975; Kempton et al., 1985; Palmer, Lloyd, & Lloyd, 1978; Winnett et al., 1978). For example, Heberlein (1975) gave people either a booklet of energy-saving tips prepared by the electric company, an informational letter educating them about the personal and social costs of not conserving energy, or an informational pamphlet actually urging people to use more energy. What were the effects of the educational strategies? None of them had any appreciable effect on behavior. In a similar vein, Geller (1981) conducted educational workshops on energy use and found that they were very effective in changing reported attitudes and intentions regarding energy use, but follow-up audits of participants' homes revealed that the changes suggested in the workshops had not been implemented. Simple persuasion has been tried with some success. In two studies of college classrooms, a letter from a fellow professor (Luyben, 1980a) or from the college president (Luyben, 1980b) made it more likely that college professors would turn off classroom lights following their lectures. Somewhat less encouraging was a

study of three Australian cities that evaluated the effect of two intensive persuasive television campaigns aimed at reducing gasoline consumption. One campaign emphasized the money-saving aspects of conservation, and the other presented gasoline conservation as a "civic duty." Despite some small reductions in gasoline consumption, the authors concluded that the television campaigns had not been cost effective. Of course, correct information is necessary if behavior is to be efficient and accurate, but information and even oral persuasion do not seem to be sufficient to ensure changes in behavior. Information also seems to affect attitudes, but it is not sufficient alone to promote behavior change (Syme et al., 1987).

Before we more carefully evaluate the success of attitude change and other educational strategies in promoting energy conservation, we should reconsider a question we posed earlier: Does an individual's attitude predict the likelihood that he or she will actually behave in ways that conserve energy? In the United States, general concern for the environment is high (Dunlap & Scarce, 1991), but the relationship between general pro-environmental attitudes and energy conserving behavior is uncertain. In fact, several researchers have concluded that general attitude toward energy use is not very predictive of eventual behavior (e.g., Geller, Winnett, & Everett, 1982; Newhouse, 1990; Olsen, 1981). Other researchers are more optimistic (e.g., Samuelson & Biek, 1991; Seligman, 1986; Stern & Oskamp, 1987). Whether or not general attitudes toward the environment predict specific behaviors, there is reason to believe that specific attitudes can be successful in predicting related energy consumption. One series of studies suggests that the primary attitudinal dimensions of specific energy concern are comfort and health, the trade-off between effort and savings, the perceived efficacy of individual conservation efforts (i.e., can one person make a difference?), and the perceived legitimacy of the energy problem (Samuelson & Biek, 1991; Seligman, 1991). Our comfort and health seem to be particularly important. You will probably not be surprised to learn that messages that ask people to sacrifice comfort or health are often ineffective, even among people who express generally positive attitudes about the environment (cf. Kempton et al., 1992; Stern & Gardner, 1981).

Although the tie between general attitudes and behavior is often weak, interventions aimed at changing attitudes persist. Perhaps ironically, one attraction of attitude change is its potential for generalizability. That is, behavioral change would be efficient if we could change a few global attitudes which might then promote a variety of responsible behaviors across a number of settings. If they worked, such broad programs would be more efficient than those (based on consequent reinforcement strategies, perhaps) tailored to dozens of different situations. In particular, some theorists believe that it will ultimately be more important to teach consumers to recognize social traps (using the powerful metaphor of the commons dilemma) than to establish a number of consequent programs to promote conservation.

Under what conditions do educational programs on home energy conservation have the greatest potential for success? We think attitudes that are formed from direct behavioral experience are more predictive of later behavior than those that are more passive and abstract. For example, an educational program for high school students which included an energy audit and teaching students how to monitor home consumption positively affected student behaviors and those of parents (Stevens et al., 1979). This program may have been productive because it taught specific conservation behaviors, not general ones. An energy audit (especially a Type A audit in which an auditor comes to the home, makes specific suggestions, and discusses them with the owner or occupant) also shows special promise, though more evaluation is needed (Geller et al., 1982). Involving homeowners actively in an energy audit (e.g., having them go up to the attic with the auditor to examine it) also makes a difference (Stern & Aronson, 1984). In addition, one study (Gonzales, Aronson, & Costanzo, 1988) compared homeowners' reactions to auditors trained to utilize certain social psychological principles (e.g., to personalize their recommendations, to induce commitment, and to frame recommendations in terms of loss rather than gain). Auditors were also trained to use "vivid" language (e.g., telling people that the cracks under their doors were equivalent to having a hole the size of a basketball in their living room, or that their attic, which had little insulation, was "naked"). Unfortunately, although the trained auditors elicited greater compliance with their recommendations and generated more applications for finance programs to pay for home retrofitting, no differences were found in actual energy use.

Commitment

A theoretically different approach to energy savings in the home relies on the finding in social psychology that the greater one's degree of commitment to an issue (e.g., energy conservation), the more likely it is that his or her future behavior will follow (Lepper et al., 1973). In a series of studies, Pallak, Cook, and Sullivan (1980) manipulated the degree of commitment to energy conservation and measured subsequent energy use. One group of homeowners (high commitment) was told that the list of people participating in an energy conservation study would be made public along with the experiment's results; a second group (low commitment) was assured of anonymity. Subjects in the high commitment condition used less energy than those in the low commitment or a third, control condition, and the effects persisted for as much as six months after the study had terminated.

Mass-transit systems typically consume far less fuel per passenger than private automobiles. One study (Bachman & Katzev, 1982) compared people who made a personal commitment to ride the bus, individuals who received free bus passes, and people who were both committed to riding the bus and who received free tickets. Although all three treatments increased bus use over a control group, those making a personal commitment seemed to show the most bus use, an effect that was still observed 12 weeks later. Thus, the more committed we can make people to conserve energy, the more likely they will be to engage in energy-saving behaviors.

Modeling

In addition to environmental education, the use of models has been used as an antecedent strategy to encourage residential energy conservation. Research tells us that **modeling** is most effective when the model is perceived positively, but is similar to the subject (cf. Bandura, 1977). Presumably, this similarity leads the subject to expect to receive rewards similar to the model if he or she performs the modeled behavior (Newhouse, 1990). In one modeling application, Winnett et al. (1981) produced a series of videotaped programs on how to adapt to cooler temperatures at home (e.g., change thermostats gradually, wear warmer clothing, use extra blankets). Models who enacted these behaviors were rewarded (i.e., the vignette ended with them being happy with each other); those who approached the situation inappropriately were punished (i.e., the vignette ended with them being angry with each other). Did the modeling intervention work? Yes, overall electricity use was down 14 percent and energy used for heating decreased 26 percent. Other studies (Winnett

et al., 1984; Winnett et al., 1985) show that a videotaped presentation can result in energy savings for up to nine weeks.

Prompts

Prompts (cues that convey a message) have also been used to influence conservation. Modeling can be considered a type of prompt. Other types are **approach prompts**, which imply an incentive for engaging in a specific behavior (e.g., "Thank you for keeping the park clean"), and **avoidance prompts**, which imply a disincentive (e.g., "We frown on those who trample the grass"). Television announcers may prompt us to use energy wisely, or signs in university dormitories may remind us that "Empty rooms love darkness." These procedures are certainly cheaper than some other strategies we will discuss, but do they work? Sometimes—especially if they are specific, well timed, well placed, and the behavior they request is easily enacted (Geller et al., 1982; Stern & Oskamp, 1987). For example, the "Empty rooms love darkness" prompt would work best if placed on the back of the door you open to leave (well placed), and if it also said, "Turn off the lights when going out" (suggesting a specific behavioral response). An effective use of prompts to curtail unnecessary use of air conditioners was devised by Becker and Seligman (1978) who strategically placed a light in the kitchens of homes that would turn on when air conditioning was on and outside temperatures were below 68 °F (20 °C). The prompt indicated that air conditioning was unnecessary, and the light went off only when the air conditioner was turned off. This achieved an energy savings of 15 percent.

Contingent Strategies

So far, we have talked about antecedent strategies where the intervention occurs *before* the destructive or constructive behavior. **Contingent** or **consequent interventions**, on the other hand, occur *after* the target behaviors are observed. These strategies include reinforcement techniques and feedback; we will also include policy change and innovation here, since they are usually developed after the problem arises and seek to provide an incentive for change. **Positive reinforcement** uses reward—the person gains something valuable (e.g., money) for performing environmentally constructive acts (e.g., recycling). **Negative reinforcement** offers relief from a noxious situation (e.g., high energy bills) in exchange for desirable behavior (e.g., turning down the thermostat). **Punishment**, on the other hand, means an unpleasant consequence occurs (e.g., a fine) as a result of an undesirable behavior (e.g., bypassing a catalytic converter). **Feedback** simply provides information about whether one is attaining or failing to attain an environmental goal (e.g., lower fuel consumption). Often, a specific program implements several of these strategies at once. For example, high-occupancy vehicle lanes on freeways (lanes reserved for vehicles with several occupants) reward those who carpool, prompt those who do not carpool, and subject those who abuse them to fines. Let us see how successful these different types of interventions have been.

Rewards and Punishments

In the case of energy use, consumption carries built-in disincentives (the expense of natural gas, oil, or electricity). Large energy consumers such as companies and institutions have responded to incentives (rewards) and disincentives (fines) in predictable, rational ways (Dennis et al., 1990). For individuals the price incentive is not irrelevant, and at least some energy conservation measures may become common simply because they save money (Kempton et al., 1992). Unfortunately, individuals seem not to be as purely rational as companies, and this market approach does not seem to be very effective in reducing overall consumption. For

instance, one study found that doubling the price of energy led to only a 10 percent decrease in use (Stern & Gardner, 1981). Individual consumers are more complex than institutions, reacting not only to economic changes, but to idiosyncratic personal factors as well (Dennis et al., 1990). Furthermore, market imperfections (for example, the landlord who buys a refrigerator may not be the person paying for the electricity it consumes if it is an inefficient model) and the low energy prices that have prevailed since the 1970s reduce the effectiveness of energy cost alone in changing consumer behavior. Finally, the costs of high utility rates fall disproportionately on the poor (e.g., Francis, 1983). In sum, relying on prices to guide behavior is ineffective and potentially unfair, so some researchers have examined the utility of adding additional consequent strategies.

Some of these reinforcement-based strategies (e.g., financial payments) have demonstrated consistent behavioral change. For example, Foxx and Hake (1977) offered subjects various rewards (e.g., cash, tours) to lower the number of miles they drove in private automobiles. The rewards led to a 20 percent reduction in miles driven, compared to a control group where mileage increased by about 5 percent. Other studies have found that competitions between teams enhance mileage reductions, and that giving lottery tickets (instead of cash payments) can be an effective motivator to drive less (Reichel & Geller, 1980). In housing, much of the research focuses on individually metered residences (e.g., private homes or apartments with separate meters). For example, some studies have simply paid residents of individually metered residences to lower their energy utilization. These techniques have proven quite effective in changing energy use both alone, and when combined with feedback (Cone & Hayes, 1980). Although paying people for lowering residential energy use is often effective in changing behavior, it may be difficult to implement these consequent payments in a way that is cost effective. In addition, the effect is probably reduced if the rewards seem abstract or are not immediate. For example, in one study financial incentives in the form of tax credits were offered for home retrofitting, but were not sufficient to encourage a high level of this behavior (Stobaugh & Yergin, 1979).

In addition to adjusting utility rates, some studies have used reinforcers to change the pattern of our energy use. Utilities save money when they can rely on their least expensive sources of power, which is typically the case during hours of "nonpeak" demand. When demand "peaks," they must augment their supply with more expensive sources of power. Therefore, it is advantageous to utilities to shift the pattern of energy use from peak to nonpeak periods. To decrease peak demand in some places, financial incentives are provided (i.e., rates are lowered for consumers during nonpeak hours and raised during peak demand hours). These price incentives and disincentives may be effective in switching some discretionary energy-consuming activities (e.g., washing and drying clothes) from peak to nonpeak periods, with benefits to both the utility and the consumer.

Promoting energy conservation might seem to be more difficult in master-metered apartments where people do not get information about their energy use and frequently do not directly pay for it. One energy conservation method used in such master-metered apartments is rebating all or some part of the money saved by energy conscious residents. If $10,000 is saved through energy conservation in an apartment building, half might be divided among residents, the other half kept by management. This procedure becomes more effective for conservation as the proportion of savings given to residents increases, and when there is greater cohesion among residents (Slaven, Wodarski, &

Blackburn, 1981). Walker (1979) tried another reinforcement strategy with people living in master-metered apartments. It was publicized that people with thermostats set above 74 °F (23 °C) in summer who had their windows closed when air conditioning was on would receive a $5.00 payment. Apartments were selected randomly for inspection, and those meeting the criteria were reinforced. This technique led to a 4 to 8 percent savings in energy use throughout the apartment complex.

Feedback

Environmental feedback serves several consequent functions. Of course, it provides information about the relative effectiveness of different behaviors. It may also be reinforcing because it provides competency information; that is, it tells us when we are doing a good job. Of course feedback about energy consumption will be more effective if people know the relative importance of each of the components of total energy use (Dennis et al., 1990). For example, Costanzo et al. (1986) found that many consumers thought that turning off lights would save as much energy as using less hot water, but lighting accounts for less than 7 percent of most residential electric bills. Because this percentage is small it may be swamped by other energy expenditures. This may lead consumers to conclude incorrectly that their other conservation efforts are ineffective if their utility bills do not reflect savings from their efforts to turn out lights (Kempton & Montgomery, 1982; Seligman et al., 1979). Often, energy use feedback compares our consumption this year with the same period last year. Good feedback should correct for differences between current weather and weather during the corresponding period of the previous year so that doing better or worse is not an artifact of warmer or cooler temperatures. Although the focus should probably be on individual outcomes rather than on those received by a group, combining both individual and group-based feedback can be very effective (Winnett, Neal, & Grier, 1979).

In the 1970s, primarily in response to a crisis in the supply of oil, the United States imposed a reduced highway speed limit of 55 miles per hour. Compliance with these reduced speed limits should save gasoline, but compliance was spotty and speed limits have now increased on some highways. Feedback is also one approach to encouraging fuel conservation. For example, Van Houten and Nau (1981) posted signs reading NUMBER OF PEOPLE SPEEDING LAST WEEK: _____ BEST RECORD TO DATE: _____. According to these researchers, the signs were effective in reducing traffic speed—even more effective than increasing the number of tickets issued by police (Van Houten, Nau, & Marini, 1980). In another study, Rothstein (1980) arranged for a graph of gasoline consumption to be displayed during the evening news for seven successive nights. During the feedback period, local service stations reported a consumption decrease of 31.5 percent.

Studies have typically given energy consumption feedback in written form at agreed upon intervals, although in other experiments more sophisticated feedback devices (e.g., convenient mechanical energy meters) have been used. At present, we do not know which mode is most effective, or whether feedback on energy use is more effective if represented as a percentage change in use (compared to the previous year), the amount of money saved, absolute differences in kilowatt hours consumed, and so on (Cone & Hayes, 1980). The more frequent the energy consumption feedback, the more conservation occurs (Seligman & Darley, 1977), though relatively infrequent feedback can sometimes be surprisingly effective (Hayes & Cone, 1981). Feedback is more effective at decreasing energy use when the cost of energy relative to peoples' incomes is high (Winkler & Winnett, 1982), when people believe that the feedback accurately reflects their energy-consuming behavior, and when the household has made a commitment to save energy (Stern & Oskamp, 1987). Some studies suggest that feedback is especially effective during periods of high energy use (e.g., hot, humid days of summer; the coldest days of winter; Cone & Hayes, 1980), and giving customers energy reduction goals along with feedback enhances its effect (Becker, 1978). Conservation efforts due to feedback may be retained for as long as 12 weeks after the feedback program ends (Winnett et al., 1981).

While feedback is often effective in reducing energy use, giving it in some forms is not cost effective. Having someone read the meter and supply written feedback, at least on a frequent basis, can be quite expensive (Geller et al., 1982). Sometimes mechanical recording and/or signaling devices may be more cost effective, at least in the long run (cf. Becker & Seligman, 1978). But the least expensive form of feedback is self-monitoring—teaching people how to read their own power meters and encouraging them to do it regularly. Although much prompting may be necessary to get people to do this consistently, studies show that such procedures can result in conservation (Winnett, Neale, & Grier, 1979). Overall, research suggests that feedback is an effective technique for promoting residential energy conservation. Ellis and Gashell (1978) posit that to conserve energy in the home, people must be motivated to conserve and must learn how the home energy system works (i.e., what behaviors have what consequences for energy use). Thus, information and prompts do not motivate people, incentives motivate them but do not teach them the necessary relationships, and only feedback can (under ideal circumstances) provide both the necessary motivational and informational elements.

Policy and Technological Innovations

As desirable as changes in energy-using behavior are, direct consumptive behavior may not be the most effective target for intervention. Some social traps may be so potent that only some form of mutual coercion or managerial decision can achieve effective change. For instance, our use of private automobiles corresponds in many ways to the social trap analysis we described earlier. The short-term benefits of the private passenger car (e.g., convenience, privacy, and prestige) accrue to the driver, while some of its negative consequences (e.g., pollution, energy consumption) are longer range, and the costs are shared by the driver and others.

Some researchers believe that the greatest savings in energy use by individuals comes from changes in technology, regulations, or building codes (Kempton, Darley, & Stern, 1992; Stern, 1992a, 1992b; Stern & Gardner, 1981). In general, these require a one-time legislative or purchasing decision with savings that accrue automatically to each subsequent instance of energy-consuming behavior. For instance, more was probably accomplished by forcing automobile manufacturers to adopt more stringent fuel efficiency standards than could have been done by any conceivable effort to change the behavior of individual drivers (Stern, 1992b). In private residences, the 1980s saw the introduction of condensing pulse combustion furnaces that have efficiencies in excess of 90 percent compared to the 63 percent efficiency ratings of typical standard natural gas furnaces sold in the 1970s. Because space heating is the most important single energy expense in the home, the benefits of more efficient furnaces and better insulation can be substantial (Hirst et al., 1986). According to Stern and Gardner (1981), replacing six major home appliances with the most efficient substitute yields an energy savings of 33.2 percent, compared to a 12.5 percent savings from the most successful behavioral interventions aimed at encouraging consumers to use energy in the most efficient way. As Stern (1992b) reminds us, builders and manufacturers decide which consumer products to produce, but they do not themselves pay

for the energy used by their products, so they may lack sufficient incentive to manufacture efficient products or to build efficient homes. Of course consumers can demand more efficient designs, but their ability to change the efficiency of buildings or appliances through their purchasing patterns is indirect. Legislated standards are also sometimes flawed. For example, because light trucks are not covered by the same fuel economy standards as cars, some manufacturers market certain light trucks as carlike recreational vehicles, lowering the fuel economy of United States vehicles overall (Kempton et al., 1992).

The value of even simple technological improvements was demonstrated by Howard et al. (1993), who devised a plan to replace incandescent bulbs in the University of Notre Dame dormitories with compact fluorescent bulbs that fit in the existing fixtures. Although the fluorescent bulbs are initially more expensive, they last longer and are more efficient, so over the lifetime of a fluorescent bulb the energy savings far exceed the initial higher cost. In spite of considerable resistance from university administrators and building supervisors, over 2,000 bulbs were initially placed in five experimental dormitories, each of which was paired with a similar untreated control condition dorm. According to the researchers, each fluorescent bulb saved an average of $2.30 in energy costs each month, quickly paying back its higher cost. Following this demonstration, Notre Dame instituted a plan to replace 8,000 incandescent bulbs, designed to save more than $190,000 between August 1994 and February 1997.

In spite of this apparent success, the Energy Star program to reduce the energy used by computers (discussed in the box on page 543) and the lighting efforts of Howard and his associates also illustrate some of the difficulties in establishing energy-saving technological innovations in homes and workplaces. A survey of potential computer purchasers, for example, showed enthusiasm for computers that are designed to use less electricity, but only if they were no more expensive than standard models (Nadel, 1994). In extensions to the incandescent light replacement program at Notre Dame, Howard and his colleagues attempted to sell the new energy-saving fluorescent bulbs to private households. Despite an explanation of the environmental benefits and the promise of long-term savings, relatively few residential customers agreed to buy even one replacement bulb, and these purchases were primarily by individuals with higher incomes. Free-trial offers raised the participation by middle- and lower-income homes somewhat, but participation remained low (Howard et al., 1993). Individuals are cautious, often looking to their peers to separate genuine technological innovations from those that are scams or gimmicks (Dennis et al., 1990). Simply demonstrating technical superiority is not likely to be as successful as an approach that makes use of persuasive techniques from social psychology and marketing. Of course, persuasive communication may not have to be directed at all consumers. As we said, building supervisors and administrators were initially reluctant to install new energy-saving fluorescent bulbs, but once just a few individuals became convinced, large-scale changes were instituted. Thus, one effective approach seems to be a concentrated effort aimed at individuals who have the time and resources to evaluate new technologies and who make decisions resulting in high-volume purchases.

Although Stern and others (e.g., Kempton et al, 1992) may be correct in singling out technological innovations as an excellent source of energy savings, an approach that relies on improved technology also carries liabilities. Geller et al. (1982) suggest that we may underestimate the savings from behavioral interventions to promote conservation, and that some researchers have not considered all the energy waste involved in replacing old equipment with new (e.g., costs of disposal, energy used in the manufacturing process). More generally, we fear that misapplied programs focused on technological innovation might decrease the likelihood that individual consumers will accept personal responsibility for conserving energy, undermining other conservation efforts. Regardless of these points of contention, there is much to be said for developing psychological and other techniques for encouraging our purchase of the most energy-efficient equipment available.

COMPUTERS: A New Environmental Challenge

Few things have changed so much in the past two decades as the use of computers. Personal computers have gone from being rarities to common appliances in businesses, faculty offices, homes, and student rooms. The U.S. Environmental Protection Agency and the computer industry are cooperating in an energy conservation initiative with potential for both residential and commercial users. The Energy Star program aims to reduce computer power consumption by requiring the computer system unit and its monitor to switch to a power-down mode when turned on but not actually in use. In order to meet Energy Star compliance, neither the system unit nor the monitor can consume more than 30 watts in the power-down mode. System modifications are inexpensive and do not harm the performance for most computers, so manufacturers have been eager to offer Energy Star PCs. Some estimate that if everyone used only Energy Star compliant PCs, $2 billion could be saved annually (Nadel, 1994). In addition to becoming more common, personal computers have enjoyed dramatic increases in computing power. This (or even the Energy Star program) creates a tremendous incentive to replace yesterday's computer with something newer and more powerful. Of course almost all electric appliances eventually get replaced, but for computers this often happens long before they are worn out. In order to avoid burdening the waste stream, manufacturers are being encouraged to adopt a holistic program to minimize the generation of toxic chemicals during the manufacture of computers and to encourage recycling of computers and their accessories (PC Magazine, August, 1994).

Conserving Water

Unlike fossil fuels, water is abundant. Nevertheless, the amount of available fresh water is a small fraction of the total in oceans or locked in polar ice. In many areas of North America water use exceeds the amount provided by rain and snow. In the West, the demands of agriculture, industry, and residential use require either expensive diversion of water or drilling to drain water from underground aquifers at a rate that greatly exceeds their natural recharge (Parfit, 1993; see Figure 14–6).

One study (Geller et al., 1983) investigated the effectiveness of water use feedback, an educational campaign encouraging conservation, and the installation of water conservation devices. Although the water conservation devices reduced subsequent consumption, neither feedback nor the educational intervention had an appreciable effect. In another

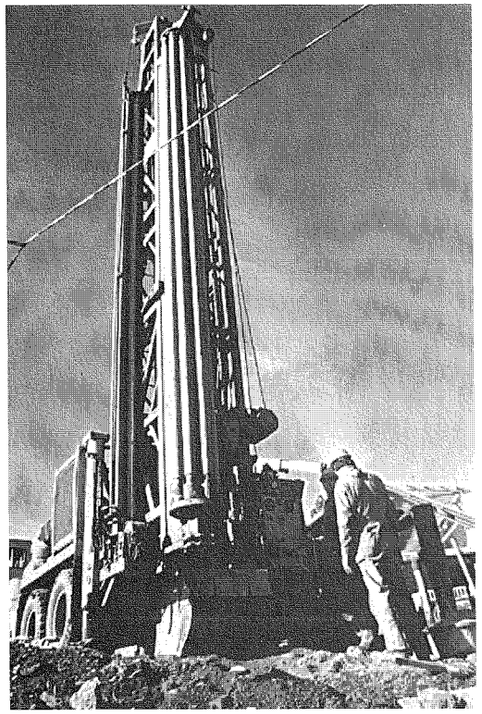


Figure 14–6 Particularly in the North American West, water use exceeds its replenishment.

study consumers received information about measures to conserve water, including information about a shower water restrictor designed to reduce the use of hot water. A second group received the same conservation suggestions, but these participants were actually given a water restrictor. Not surprisingly, those in the second group were more likely to install the water conservation devices than those who were only told about them. More interestingly, this group was more likely to adopt other conservation measures such as reducing their thermostats.

A California study examined a commons education group which received educational messages that focused on the long-term benefits of conservation and emphasized the effectiveness of individual action using Hardin's tragedy of the commons metaphor. A second group received information emphasizing the short-term economic advantage of water conservation. Participants in a third group received no educational messages, but were encouraged to conserve and were made aware that their water use was being monitored. For lower-middle-class residents, the appeal that focused on the long-term consequences of conservation and the necessity for individual action yielded less water consumption than did either the economic-based appeal to conserve or the control appeal (no educational message). For reasons that are unclear, the upper-middle-class residents did not show increased water conservation in response to any of the treatments (Thompson & Stoutemyer, 1991).

SOURCE REDUCTION AND RECYCLING

Among the least positive effects of industrialization are the interrelated problems of material resource depletion and solid waste disposal. Some materials or goods are too rare to squander or lose, so we should promote their reuse to protect a dwindling resource. Others seem cheap and are regularly thrown away. When disposed of thoughtlessly these become litter; but even when disposed of "properly" they contribute to a crisis in solid waste management (Figure 14–7).

In some instances materials are so valuable or durable that a high percentage are reused. The silverware and china you used as a child are probably good examples. Less familiar to younger generations are the refillable milk and soft drink bottles that were phased out in the 1960s and 1970s. Relatively

Figure 14–7 Even trash that is disposed of properly becomes part of the crisis of solid waste.

little psychological research has targeted reuse. In one Michigan study, however, volunteers from a small village received pamphlets advocating source reduction (for example, purchasing items in reusable containers, reusing aluminum foil, and avoiding overpackaged products). For some participants the arguments for source reduction were primarily economic, some were given environmental reasons, and some were provided with both economic and environmental reasons to source reduce. Subsequently, those in all three treatment groups reported more conservation behavior, and those receiving both economic and environmental rationales reported the most conservation (De Young et al., 1993).

Other items are not directly reused, but their material is recovered and remanufactured. Gold, for example, has been used and reused by humans for centuries. There is an intriguing and real possibility that some of the gold in the jewelry you or your friends own was once part of a Spanish, Roman, or Egyptian treasure. There are two broad categories of resource recovery. In recycling a material is reused for its original purpose. For example, recycling aluminum cans instead of making them from raw aluminum ore saves money, energy (recycling aluminum cans uses 95 percent less energy than refining raw materials), and conserves the world's reserves of aluminum. Other materials are more difficult to recycle for their original use. For instance, the possibility that plastic food and beverage containers may accidentally become contaminated with pesticides or other harmful chemicals raises concerns about their reuse, but reclamation allows their material to be remanufactured into diverse products. Reclamation can be effective for less valuable materials as well. A bidding war broke

out for used plastic soda bottles in the United States in 1995 and their price rose from $40 to $460 per ton (Miller, 1995). Polyethylene terephthalate (PET) soft drink bottles can be made into insulating fiberfill or yarns, and high-density polyethylene (HDPE) like that in plastic milk jugs can be reused as containers for products such as detergents and shampoo. Generally, the necessary consumer behavior is the same whether materials are separated for recycling or reclamation, so we will use the term "recycling" to refer to both.

Recycling of even seemingly mundane materials is not new. During World War II metal, newspaper, and glass were commonly collected for remanufacture (Burn, 1991; Oskamp et al., 1994). Unfortunately, recycling habits prompted by the war (or the depression that preceded it) began to fade in the postwar prosperity, and more and more products became disposable. Now many North American landfills are nearing their capacity, creating a "landfill crisis" (Oskamp et al., 1994). Presently three primary approaches to the management of solid waste are feasible. We could delay the confrontation by developing landfills, but new landfills can raise disposal costs, and old ones eventually leak. A second approach is to turn waste into energy through incineration. Although this remains attractive to some, opposition to incineration has grown with fears that incinerators expel toxic fumes or concentrate deadly pollutants in residual ash that has to be sent to landfills (see Blumberg & Gottlieb, 1989). The remaining approach, and the one now supported by many federal and state agencies, is to try to change the behavior of people (Porter, Leeming, & Dwyer, 1995; Vining & Ebreo, 1992).

Methods of recycling differ from place to place. Initially, many programs required individual households to transport their recyclables to a centralized drop-off facility. More recently, many municipalities have adopted recycling programs that only require households to separate their recyclables and leave them beside the street for curbside pickup. The specifics of collection and the materials that can be recycled vary from place to place. What nearly all approaches have in common, however, is a requirement for public participation (Howenstine, 1993).

Antecedent Interventions

How do those who recycle differ from those who do not? As you might expect, those who are better informed about recyclable materials and local recycling programs are probably more likely to be recyclers themselves (Vining & Ebreo, 1990). Although this suggests that at least some form of education might be important in facilitating recycling, there is little evidence that environmental education alone enhances recycling behavior.

As with energy conservation, several researchers have investigated the effects of commitment on recycling (e.g., Burn & Oskamp, 1986; Katzev & Pardini, 1987–1988; Pardini & Katzev, 1983–1984). In particular, the strength of commitment seems to be important to sustaining long-term recycling. In one study (Pardini & Katzev, 1983–1984), for example, those who made a strong (written) commitment to recycle newspapers and a group making only weaker verbal commitments both recycled more than a third group that received only information. Weeks later, however, only the strong-commitment group showed continued increases in paper recycling. In another study, Wang and Katzev (1990) asked residents of a retirement home to sign a group pledge to participate in a four-week recycling project. For the four weeks of the commitment, the weight of recycled material increased 47 percent over baseline measures. Additional observations indicated that recycling continued at a similar high rate for at least four weeks

ENCOURAGING RECYCLING VIA THE FOOT-IN-THE-DOOR TECHNIQUE

The above findings have some interesting implications. We might view responding to prompts, such as reminders to turn off lights, as analogous to initial requests in the foot-in-the-door technique. This would suggest that responding to the multiple "small requests" being made of us to improve the environment these days may in some way "prime" us to comply with the larger, more important environmental demands we will face in the years ahead. The phenomenon also suggests some potential problems with the use of reinforcement techniques for encouraging pro-ecological behavior. Self-perception theory in social psychology implies that often we infer our attitudes from observing our behavior and the circumstances under which it occurs (Bem, 1972). Arbuthnot et al. (1976–1977) proposed that people in their study agreed to the larger requests because after complying with the initial request, they inferred from their behavior that they had pro-environmental attitudes. They had no incentives for their initial compliance, thus they must really care about the environment. This pro-ecological self-perception may have been why long-term changes in recycling occurred in the foot-in-the-door study. On the other hand, what would people infer about themselves from their behavior after recycling because they were offered a financial reward or reinforcement? Bem would say that instead of inferring that they care about the environment—a conclusion which could be associated with continued recycling—they might conclude they merely did it for the money. Such a self-perception could lead them to stop recycling as soon as the rewards for it were removed.

following the group commitment. In a second study of college students, the same researchers compared two different commitment procedures and a reinforcement strategy. Some participants attended a five-minute talk about paper recycling, and were then asked to sign a group commitment to participate in the program. Individuals in a second treatment condition were approached individually, told of the recycling program, and were asked to sign a personal pledge to participate in the program. In addition, a third (incentive) treatment group was given a flyer explaining that everyone on their dorm hall would receive discount coupons for local businesses if 50 percent of the people on their hall recycled during a given week. All three treatment groups recycled more often than a control group, but individuals who had committed to recycling showed greater recycling than those who had signed the group pledge. Perhaps the most interesting finding was that at least some of the students assigned to the individual-commitment group continued to recycle for some weeks after their commitment had expired, whereas more of both the reinforcement and the group commitment subjects reverted to near pretreatment levels.

Goal setting is a related technique. Motivation theorists (e.g., Locke, 1968, 1970) tell us that specific and challenging goals are likely to result in more behavioral change than easy or general goals. Although goal

setting is not a common variable in studies of conserving behavior (Dwyer et al., 1993), there is some evidence that both children (Hamad et al., 1980–1981) and college students (McCaul & Kopp, 1982) show higher compliance when they are assigned recycling goals. In fact, college students in the McCaul and Kopp study recycled 37 percent more.

One final related approach to encouraging recycling involves the **foot-in-the-door technique**, which has been used in some classic studies in social psychology on gaining compliance. Like the salesperson who stands a better chance of making the sale by initially getting a "foot in the door," environmental psychologists may be more apt to get people to recycle (or engage in other pro-ecological behavior) after eliciting a small commitment from them. The standard "foot-in-the-door" paradigm goes like this. The experimenter first makes a small request of the subject which very few are likely to refuse (e.g., sign a petition for a highly respectable pro-environmental cause). This is followed by progressively larger requests (e.g., recycle your soft drink containers). Because people who comply with the small initial request come to view themselves as interested in preserving the environment, they are more apt to agree to the second, larger request than are subjects who are never presented with the initial request. Arbuthnot et al. (1976–1977) used this strategy to increase recycling behavior. Their initial smaller requests were to have people answer survey items favoring environmental protection, to save aluminum cans for a week, and to send in a postcard urging officials to expand a local recycling program. Did being confronted with these initial requests affect long-term use of a recycling center? The answer is "yes." As long as 18 months after the initial request, subjects were more apt to use the center than those not exposed to the foot-in-the-door strategy.

CONTINGENT STRATEGIES

Reinforcement

Perhaps the most persuasive demonstrations of the usefulness of contingent rewards occur in those American states that have adopted "bottle bills." For instance, New York state began requiring a 5-cent returnable deposit on soft drink and beer containers in 1983. Before the law went into effect, recycling rates for the state were 5 percent for cans, 3 percent for glass, and 1 percent for plastics. During the first year after implementation, 59 percent of cans, 77 percent of glass, and 33 percent of plastic containers were recycled, accounting for about a 5 percent reduction in solid waste by weight (Wolf & Feldman, 1991). In addition to these widespread incentives, several researchers have demonstrated that monetary rewards or punishments can promote short-term recycling (e.g., Jacobs & Bailey, 1982; Luyben & Bailey, 1975). Unfortunately, behavior often quickly returns to baseline levels when the reinforcements are removed (e.g., DeYoung, 1986; Jacobs & Bailey, 1982).

Feedback

Katzev and Mishima (1992) investigated the effects of feedback on paper recycling on a small college campus. The mailroom's recycling containers labeled RECYCLABLE PAPER ONLY were located near both exits in the central mailroom. During the treatment period, a large sign reading: RECYCLABLE PAPER: _____ POUNDS COLLECTED YESTERDAY was placed between the two exits and updated each day during the treatment. During the week that feedback was posted, the weight of recycled paper increased 76.7 percent. Although records were maintained only for one week following the feedback treatment, the amount of recycled paper remained about 46 percent above baseline.

LITTERING

Part of the huge volume of trash generated by North Americans ends up as litter. It collects in public parks and forests, alongside highways and waterways, and in private land. In addition to being profoundly ugly, litter represents a hazard to our health and safety and may cause damage to plant and animal life (Geller et al., 1982). Who helps to create these unseemly conditions? Young people litter more than older ones; some studies suggest that males litter more than females; and people who are alone litter more than those in groups (Osborne & Powers, 1980). The whole range of strategies we have discussed (e.g., prompts, reinforcers) has been used in attempts to prevent people from littering, and to motivate them to clean up litter left by careless individuals. As we discuss the various techniques, we will see that some methods have been more effective than others (for detailed reviews, see Brasted, Mann, & Geller 1979; Cone & Hayes, 1980; Geller, 1987; Huffman et al., 1995; Osborne & Powers, 1980).

ANTECEDENT INTERVENTIONS

State bottle bill legislation has been effective in reducing roadside litter by 75 percent and in saving energy through recycling (Levitt & Leventhal, 1984; Osborne & Powers, 1980). Many studies have employed prompts and cues as antecedent strategies to prevent littering. For example, handbills with an antilitter prompt are less apt to be littered than those without a prompt (Geller et al., 1982). Generally, prompts that state the specific antilitter response desired (e.g., "Place this paper in a trash can") are more effective than less specific ones (e.g., "Keep the area clean"). Antilitter prompts are also more effective when given in close temporal proximity to an opportunity to dispose of litter, when proper litter disposal is relatively convenient, and when the prompt is phrased in polite, nondemanding language (Geller et al., 1982; Stern & Oskamp, 1987). Even under optimal circumstances, the absolute magnitude of change effected by these sorts of prompts is often relatively small (though statistically significant), and to have a meaningful effect they may have to be experienced by many people over a long time frame. Other antecedent factors which may serve as prompts include the amount of litter already in a setting, the behavior of models, and the presence of trash receptacles. Generally, "litter begets litter"—the more littered an environment the more littered it becomes. In fact, studies have shown up to a five-fold increase in littering in "littered" as opposed to "clean" settings (e.g., Finnie, 1973; Geller, Witmer, & Tuso, 1977; Krauss, Freedman, & Whitcup, 1978).

In addition to the pattern noted in the box on page 550, an exception to the "litter begets litter" finding has been reported in some natural settings, where people are less apt to litter and more apt to pick up other people's trash when their picnic areas are littered than when clean. This may be because in such settings environmental cleanliness plays an especially important role for people, since they are there to appreciate natural beauty (cf. Geller et al., 1982). Directly observing the behavior of models can serve as a prompt that reduces or produces littering. Cialdini (1977) exposed subjects to a model who littered or did not litter in a clean or dirty environment. After seeing the model fail to litter in the clean setting, subjects littered the least; after seeing him litter in the dirty setting they littered the most. And Jason, Zolik, and Matese (1979) found that

IS A LITTLE LITTER A MORE EFFECTIVE PROMPT THAN NONE AT ALL?

We suggested that more environmentally destructive behavior typically occurs when there is evidence of previous misdeeds (litter on the ground) than when there is not. Whereas this is usually true, work by Cialdini, Reno, and Kallgren (1989) brought out an interesting caveat. While they found (like previous investigators) that a perfectly clean environment produces less littering than a dirty environment, they also observed that the least littering occurs in a setting that is clean except for one piece of litter. The studies were run as follows: Subjects were handed a public service-related circular as they walked down a path. Beforehand, the experimenter had positioned 0, 1, 2, 4, 8, or 16 pieces of litter in front of them. Surprisingly, 18 percent of the subjects littered in the "no litter" condition, but only 10 percent littered in the "one piece of litter" condition. Beyond that, littering by subjects increased proportionate to the amount of litter positioned by the experimenter. Why did Cialdini et al. observe such a "check mark" pattern for the relationship between the amount of litter in the environment and subsequent littering? They reasoned that while a perfectly clean environment makes the "no littering" norm salient, an environment clean except for one violation makes it even more salient. With increasing violations, however, the norm becomes undermined, and littering is facilitated. These findings are provocative, and if replicated in other contexts they could have practical implications for environmental education as well as environmental design. For example, do you think you would be more likely to return your shopping cart at the supermarket if all but one of the remaining carts were neatly stacked, or there were no violations of the "return your cart" norm?

observing a model who showed people how to pick up dog droppings with a "pooper scooper" led to a target area more free of feces. Unfortunately, other studies are less optimistic about the potential of models to prevent environmentally destructive behavior (cf. Geller et al., 1982).

A final antecedent strategy to prevent littering is the presence of waste receptacles. Finnie (1973) reported that compared to a condition in which no trash cans were in sight, their presence reduced littering by about 15 percent along city streets and by nearly 30 percent on highways. When a greater number of trash cans were present, littering decreased still more. The value of trash cans or similar objects as antilitter prompts may depend on their attractiveness or distinctiveness. Finnie (1973) observed that colorful garbage cans reduced littering by 14.9 percent over baseline levels, whereas ordinary cans led to a reduction of only 3.15 percent. Similarly, Miller et al. (1976) reported that brightly colored cans resembling birds were much more effective than plain cans in eliciting appropriate disposal. Finally, an ingenious garbage can in the shape of a hat worn by students to Clemson University

football games greatly reduced trash in the area of the college football stadium (Miller et al., 1976; O'Neill, Blanck, & Joyner, 1980). Unfortunately, picking up someone else's litter and putting it in a receptacle is often a more costly behavior than depositing one's own litter, and it seems to be relatively unresponsive to prompts. For example, 10 experiments by Geller and associates (Geller, 1976; Geller, Mann, & Brasted, 1977) found that prompts have minimal effects on people's likelihood of picking up others' litter and disposing of it. The only exception may be in natural areas, such as campgrounds, where prompts may elicit such behavior (cf. Crump, Nunes, & Crossman, 1977). The ineffectiveness of prompts is especially unfortunate, since much money is spent on them by state litter control authorities and organizations such as Keep America Beautiful.

Consequent Strategies

We turn now to consequence strategies for litter control (i.e., methods to encourage people to pick up existing litter), which (at least in the short run) have generally been more effective than antecedent techniques (Cone & Hayes, 1980). In the Clemson study just cited, for instance, the hat cans served both as prompts to prevent litter and as the sources of consequent reinforcement because the Clemson hat dispensed a mechanical "Thank you" to anyone who deposited litter (Miller et al., 1976; O'Neill, Blanck, & Joyner, 1980).

Reinforcement-based techniques are more successful than prompts in motivating people to clean up littered environments. In fact, when prompts are coupled with reinforcements for obeying them, they can be rather effective. Kohlenberg and Phillips (1973) positioned a prompt which said, "Depositing Litter May Be Rewarded," and then proceeded to reward litter depositors on different reinforcement schedules. This technique precipitated a dramatic cleanup. Another study involved a combination of prompts, environmental education, and reinforcers (in this case feedback). Investigators organized local newspaper coverage about the littering problem (which served as a prompt and a form of education), along with daily feedback on littering in certain target areas. These methods accounted for a decrease in litter compared to baseline conditions (Schnelle et al., 1980). Other experiments have similarly coupled reinforcers with educational techniques and prompts. In these studies, the rewards generally account for much more of the resultant improvement in the litter situation than the other methods (Cone & Hayes, 1980). However, while reinforcement methods are useful, they sometimes require costly supervision to monitor behavior and dispense reinforcers. What alternatives are there for reinforcing litter depositors without supervision? Reinforcements can also be administered on the "honor system." A sign in a United States national forest area offered people either 25 cents (sent to them by mail) or a chance to win a larger reward if they filled a plastic trash bag with garbage and completed an information card stating their name and address. Compared to a prompt-only condition (which asked people to fill up a bag but offered no reward), the "honor system" reinforcement condition was much more successful (Powers, Osborne, & Anderson, 1973).

A clever and effective use of positive reinforcement that motivates people to pick up litter is the "litter lottery." A litter lottery offers people an opportunity to win valuable prizes just for depositing litter appropriately. In one version of the technique (Bacon-Prue et al., 1980; Hayes, Johnson, & Cone, 1975), experimenters distribute specially marked items on the ground amidst the litter that

is habitually present. People are told some litter is marked in an undetectable fashion, and if an experimenter verifies that they have collected a marked item, they will be awarded a substantial prize. In another version (Kohlenberg & Phillips, 1973), the experimenter merely observes litter deposits and rewards ecologically minded people intermittently. Both techniques have achieved dramatic results toward cleaning up the environment, but both require costly human intervention. The "marked-item" strategy can, however, be "automated" and introduced widely. Imagine the following scenario for improving litter control throughout the world. Litter with invisible identifying marks could be distributed at random, as would special trash cans (indistinguishable from ordinary ones) that would deliver valuable reinforcers automatically if a marked item were deposited. Whenever you had some spare time, you might find yourself absentmindedly picking up garbage, throwing it in a trash can, and fantasizing about future wealth! Of course, the "novelty" of such a program might wear off after awhile, and it would be expensive to administer, which could detract from its overall usefulness. In conceiving of any technique for improving environmental conditions, one should be careful to think about ways in which it could be "subverted." One problem with the litter lottery is that it may not prevent people from throwing litter on the ground because the piece they throw away cannot possibly be "marked." Children participating in a litter lottery still disposed of litter inappropriately (La Hart & Bailey, 1975). On the other hand, the more garbage litter lottery participants deposit inappropriately, the more difficult it should be to find "marked" items. Adults may be aware of this contingency, and it may keep them from littering. Reinforcements based on the number of bags of litter collected may be problematic because people are encouraged to pick up large but not small pieces of litter. In fact, some individuals may not pick up litter from the target area at all, but may bring it from home. Even when rewards are based on some criterion for success such as a clean campsite, some people may "clean" the area by throwing trash somewhere else. However, even though these behavioral techniques can be subverted, they are still valuable tools for improving the environment for all.

VANDALISM

Vandalism can be defined as the "willful or malicious destruction, injury, disfigurement, or defacement of any public or private property" (Uniform Crime Reporting Handbook, 1978, p. 90). Thus, unlike failures to conserve resources or even thoughtless littering, vandalism is intentional. The results of a vandal's work may seem completely senseless, but their intent may reflect deep personal frustrations or even a calculated political expression (consider the Boston Tea Party). We might distinguish between several types of vandalism: acquisitive vandalism (looting, petty theft), tactical ideological vandalism (to draw attention to oneself or to an issue of concern), vindictive vandalism (aimed at revenge), play vandalism (to combat boredom), and malicious vandalism (due to diffuse frustration and rage, often occurring in public settings). Because the motives of vandals vary, so must society's response. How big a problem is vandalism? The challenges faced by the U.S. National Park Service provide an example. Most Civil War era battle fields in the United States continue to be sites of conflict—conflict between rangers and looters who dig through graves looking for buttons and other objects to sell on the black market. In the American Southwest, thousands of ancient Native American sites have been damaged or destroyed, and in Yellowstone National Park geysers and hot pools are destroyed by material people throw into them (Wilkinson, 1991). Overall, the cost in American schools, parks, recreation areas, public housing and transit systems is estimated at billions of dollars per year, and these costs are increasing rapidly. Unfortunately, the penalties for vandalizing sites of even national historic importance were, for many years, very low. It has been only recently that the U.S. Congress passed legislation making many acts of vandalism felonies.

In spite of its costs, relatively little empirical research has tried to address the problem, though it has been found that several physical and social conditions promote vandalism. As discussed in Chapter 10, when the design of a setting allows residents little territorial control, vandalism becomes more common (Ley & Cybriwsky, 1974a; Newman, 1972). Thus, preventative strategies could focus on increasing territorial control (e.g., designing areas to promote defensible space). Aesthetic factors associated with an object's appearance (e.g., physical beauty) and the extent to which a site is hardened (made difficult to vandalize), also affect the level of vandalism (Pablant & Baxter, 1975). Just as aesthetic variables affect how much we enjoy socially acceptable interactions with an object, they affect the pleasure we experience from vandalizing it. Objects that break in aesthetically interesting or pleasing ways may be more apt to be vandalized than those that break in dull, uninteresting ways (Allen & Greenberger, 1980; Greenberger & Allen, 1980). Designing objects (e.g., street lights) that will not break in a satisfying manner may be another way of decreasing vandalism (Figure 14–8).

Figure 14–8 Sturdy or protected objects may be less susceptible to damage.

As with our "litter begets littering" generalization, the presence of graffiti may encourage new "artists" (Samdahl & Christensen, 1985; Sharpe, 1976). Thus, one priority of both parks and cities is to clean up the signs of vandals as quickly as possible. Anaheim, California established an aggressive anti-graffiti campaign that included undercover police officers, rewards for information leading to the arrest and conviction of graffiti artists, a computerized database for tracking known graffiti "taggers" and their associates, and aggressive programs to remove graffiti (Molloy & Labahn, 1993). Other factors have been implicated as causes of vandalism. Allen and Greenberger (1980) suggest that low perceived control (see Chapter 4) will under certain conditions elicit vandalism. When we come to believe we cannot control our outcomes (e.g., college students may not feel that they have enough

control over policies in the dormitories), we sometimes resort to vandalism as a way of showing ourselves and others that we can control at least certain things (Warzecha, Fisher, & Baron, 1988). This would suggest that the greater people's control over a setting, the less vandalism. Also, it has been suggested that vandalism results when there is a lack of fit between the person and the environment; for example, school vandalism may be due to poor congruence between personal characteristics of students and the social or physical environment of the school. Increasing the goodness of the fit through social and/or environmental means could help lower vandalism, according to this conceptualization. Work by Richards (1979) has identified peer relationships (i.e., associations with antisocial peers) and adult–child conflict as major causes of vandalism by middle-class adolescents. Vandalism may also occur due to financial need, in the pursuit of social causes, due to nonmalicious play, or due to poor achievement (cf. Cohen, 1973; Sabatino et al., 1978).

A rather complete model of vandalism has been proposed (Baron & Fisher, 1984; Fisher & Baron, 1982). This model encompasses many of the reasons suggested above for why vandalism occurs, under the concept of perceived inequity. What is perceived inequity? Equity theories in social psychology imply that we are socialized to believe we should treat others fairly (or equitably), and should be treated equitably by others. When this does not occur (i.e., when we perceive we are being inequitably or unfairly treated), we become upset and try to restore equity. This can be done in several ways, but it typically involves our attempting to get more out of the relationship for what we put into it, or trying to ensure that the other gets less out of the relationship for what he or she puts in. Fisher and Baron's model implies that vandalism may be one way of restoring equity in settings characterized by perceived inequity (or unfairness) between the parties. Vandalism can therefore be viewed as a way to restore equity by responding to one type of perceived rule-breaking unfairness in interpersonal relations with another type (i.e., disregard for another's property rights). In effect, some vandals seem to say, "If I don't get any respect, I won't give you any either." What kinds of inequity are apt to promote vandalism? It may occur as a product of ordinary economic exchange (e.g., between a shopkeeper and a customer), from discriminatory practices and inequitable rules and regulations (e.g., between employer and employee; housing authority and resident), and from aspects of the physical environment in and of itself (e.g., defective machines or facilities that cause an inequitable input/output ratio). Inflexible environmental settings such as windows that will not open, thermostats we cannot adjust, or dormitory furniture that will not move may also make it difficult for us to receive a fair level of outcomes relative to our inputs, and may promote vandalism. Will every instance of inequity result in vandalism? Obviously not. Fisher and Baron suggest that inequity will result in vandalism only when the person who feels inequitably treated has low perceived control—that is, little likelihood of influencing whether equity will be restored. When we have high perceived control we restore equity within the system (e.g., complain to the authorities), and when we have very low perceived control we become helpless, and simply accept our fate. But when we have moderate to low control, we are likely to opt for a way of restoring equity. For some, this method is vandalism—an immediate, low-effort, and certain means of paying society back. Fisher and Baron suggest that increasing perceptions of control, decreasing perceived inequity, or both, can be effective means of lowering vandalism (see Figure 14–9).

Figure 14–9 Intentional damage from vandalism is both unsightly and costly. Increasing perceptions of control, decreasing perceived inequity, or both, can be an effective means of lowering vandalism.

ENCOURAGING ENVIRONMENTALLY RESPONSIBLE BEHAVIOR: AN ASSESSMENT OF THE PRESENT AND THE FUTURE

How can we sum up the state of the art that deals with applying environmental psychology to moderate environmentally destructive behavior? The techniques discussed in this chapter give us a good start toward improving many adverse environmental conditions, but we still have a long way to go. Each of the methods we have presented has important strengths and weaknesses, and each needs to be refined and improved by researchers in the future. Presently, few studies directly compare the methods we have discussed for changing environmental behavior and attitudes (Dwyer et al., 1993). More complete comparisons and models remain as necessary first steps toward the creation of an overriding theory to help us conceptualize environmentally destructive behavior (e.g., Dwyer et al., 1993; Geller, 1990). Such a formulation would greatly enhance our efforts and could lead to a more focused approach by both researchers and practitioners. Current evidence suggests that the interventions we have reviewed differ substantially in their relative impact. Environmental education generally has the weakest impact, followed by prompts. Consequent or reinforcement strategies are much stronger, but the most impactful of all is probably policy and technological innovation. Yet often, the more effective the strategy, the more difficult and expensive it is to implement. In most cases, we find that combinations of strategies offer the most effective interventions in terms of both feasibility of outcome and favorability of results.

CHAPTER SUMMARY

Much environmentally destructive behavior can be conceptualized in terms of social traps. These are situations in which personal interests with a short-term focus conflict with societal needs with a long-term focus. For example, littering and purchasing nonreturnable bottles are instances in which short-term individual convenience conflicts with the long-term needs of society. How can we escape from such traps? Research on the commons dilemma suggests dividing some common resources into territories helps, although this is not always practical. Increasing communication and trust and fostering attraction toward and group identification with those who share the commons also are valuable strategies. Altering reinforcements or consequences is also an exceptionally effective approach; adding positive consequences for conservation behavior or punishments for exploitative behavior helps preserve the commons for all. In this chapter, environmental education, use of environmentally relevant prompts, reinforcement-related techniques, and other methods are considered as potential means of altering environmentally destructive behavior. Each of these techniques has unique costs and benefits. Environmental education seems to be a relatively ineffective method, but may be less costly than some other methods. The use of environmentally related prompts is somewhat effective and relatively inexpensive. Finally, reinforcement techniques (positive reinforcement, negative reinforcement, punishment, and feedback) appear to be very effective in creating short-term change, but have several drawbacks. For example, reinforcement techniques may be quite expensive, and evidence shows that the effects often disappear when the reinforcement contingency is withdrawn. In reviewing the major techniques for encouraging environmentally responsible behavior, we considered specific strategies used to cope with the overconsumption of resources, the waste stream crisis, litter, and vandalism. Behavioral solutions to some of these problems offer promise of significantly improving aspects of our environment.

SUGGESTED PROJECTS

1. Design an environmental education program that you feel would have an optimal chance of effectively changing behavior in an environmentally constructive direction. Use whatever media you like, focus on whatever population you desire, and choose a target behavior that corresponds to your area of major interest in environmental psychology.
2. Select an environmentally destructive target behavior and design a prompt that would help alleviate the problem. If you can get the necessary permission from authorities, attempt to test the effectiveness of your technique.
3. Test Cialdini et al.'s hypothesis that a setting with a single violation of a norm serves as a more effective prompt than one with no evidence of norm violation. Some possible subjects for your investigation are the appropriate return of shopping carts at a local supermarket, graffiti in a restroom, or vandalism in a university building.
4. If you have lived in a college dormitory, design a program (using the techniques described in this chapter) to help alleviate noise. Keep in mind the relative effectiveness of education, prompts, reinforcements, and policy changes and innovations.

GLOSSARY

acclimation – adaptation to one specific environmental stressor, such as temperature.
acclimatization – adaptation to multiple stresses in an environment, such as humidity, temperature, and wind.
accretion measures – unobtrusive indications of behavior, involving traces of additions to the environment, such as litter or fingerprints.
adaptation – weakening of a reaction (especially psychological) to a stimulus; becoming accustomed to a particular degree of a given type of stimulation; in Wohlwill's ideas, a shift in optimal stimulation.
adaptation level (AL) – an ideal level of stimulation that leads to maximum performance or satisfaction.
adaptive reuse – rehabilitation and recycling of old buildings for new uses, such as turning an old warehouse into apartments or a shopping center.
adequately staffed – in ecological psychology, a condition in which the number of applicants is between maintenance minimum and capacity.
adjustment – Sonnenfeld's idea of technological change of a stimulus, as opposed to adaptation, which refers to change in the response to the stimulus.
adrenal – of the adrenal glands, endocrine glands that sit on top of the kidneys; catecholamine secretions from the adrenal glands are characteristic of stress reactions.
affect – feelings or emotional states.
affective appraisals – emotions directed toward some component of the environment.
affiliative behavior – interactions with others; attachment.
affordances – in Gibson's theory of ecological perception, the properties of an object or place that give it constant and automatically detectable functions; the possibilities of use an environment provides.
aftereffects – consequences of a stimulus that occur after the stimulus has stopped; effects of a stressor on mood or behavior, often measured by task performance, that occur after termination of the stressor.
age-segregated – residential settings restricted to the elderly.
air ionization – condition in which molecules of air partially "split" into positively and negatively charged particles, or positive and negative ions.
air pollution syndrome (APS) – headache, fatigue, insomnia, depression, and the other symptoms occurring together and caused by combinations of air pollution.
alarm reaction – a startle response to a stressor; the first stage of Selye's GAS.
alveolar walls – portion of the lung where oxygen and carbon dioxide are exchanged between the blood and the atmosphere.
Alzheimer's disease – the most common progressive dementia, occurring primarily in the elderly, and accounting for half of all nursing home admissions.
ambient stressors – chronic, global stressors such as pollution, noise, or traffic congestion.
ambient temperature – surrounding or atmospheric temperature.
amplitude – the amount of energy in a sound, as represented by the height of the sound wave, perceived psychologically as loudness.
analog representation – the theoretical case in which a cognitive map is stored in memory in a picture form that corresponds point for point to the physical environment.
annoyance – in noise, the irritating or bothersome aspect.
antecedent behavioral change techniques – behavioral change techniques that occur before the target behavior and that are designed to increase the likelihood of favorable acts.
anthropocentric, anthropocentrism – viewing the natural environment from the perspective of how it meets human needs; *see also* homocentric, ecocentric.
anticipated crowding – when people expect to be crowded.
applicability gap – a two-way communications breakdown that occurs when scientists fail to ask questions with direct application to design problems or when designers neglect to employ those principles that have empirical support.
applicants – in ecological psychology, those who meet the membership requirements of a behavior setting and who are trying to become a part of it.
appraisal – cognitive assessment of a stressor along the dimensions of harm or loss, threat, and challenge.
approach prompts – prompts that supply an incentive for engaging in a particular behavior.
archival data – data that researchers may find in others' historical records, such as police crime reports, weather records, or hospital records.
arousal – a continuum of physiological or psychological activation ranging from sleep to excitement; crowding, personal space intrusions, or other stressors can lead to overarousal.
assigned workspace – designating a particular machine or area to a particular worker in order to create a feeling of ownership.
assisted living – a type of care for the elderly in which they can handle some daily functioning on their own but need assistance with other functions; also called residential care or intermediate care.
attitude – a relatively stable tendency to evaluate a person, object, or idea in a positive or negative way; many definitions stress the interrelationship of feelings, cognitions, and behaviors.
attraction gradient – the likelihood that the design of an exhibit will attract museum visitors to view it.
augmentation – the addition of nonexistent features to a cognitive map based on expectations of what "should" be there.
avoidance prompts – prompts that supply a disincentive for enacting a particular behavior.
background stressors – persistent, repetitive stressors whose impact is relatively gradual, including daily hassles.
barometric pressure – atmospheric pressure, as read by a barometer.
Beaufort Scale – a scale of wind force developed by Admiral Sir Francis Beaufort in 1806.
behavioral control – availability of a behavioral response that can change a threatening environmental event.
behavioral interference – the notion that under high density conditions, many negative effects are due to "getting in people's way" and similar mechanisms for blocking goals.
behavioral sink – area in which the negative effects of high density are intensified.
behavior constraint – a model that emphasizes how the environment (e.g., urban life, personal restrictions) may limit or interfere with activities, leading to loss of perceived control.
behavior mapping – a structured observational technique in which behaviors are observed, recorded, and located on a map of the setting being observed.