

Climate Change: Meeting the Challenge

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The debate over global warming is over.

That was the implicit message of a public letter that appeared in the journal *Science* on May 7, 2010, signed by 255 members of the prestigious National Academy of Sciences, including Lonnie Thompson. The letter declared that “there is compelling, comprehensive, and consistent objective evidence that humans are changing the climate in ways that threaten our societies and the ecosystems on which we depend.” (The NAS members’ letter in *Science* is available online at <http://www.sciencemag.org/cgi/reprint/328/5979/689.pdf>)

The writers acknowledged that “science never absolutely proves anything,” but they identified five conclusions consistently supported by climate research:

- (i) The planet is warming due to increased concentrations of heat-trapping gases in our atmosphere. A snowy winter in Washington does not alter this fact.
- (ii) Most of the increase in the concentration of these gases over the last century is due to human activities, especially the burning of fossil fuels and deforestation.
- (iii) Natural causes always play a role in changing Earth’s climate, but are now being overwhelmed by human-induced changes.
- (iv) Warming the planet will cause many other climatic patterns to change at speeds unprecedented in modern times, including increasing rates of sea-level rise and alterations in the hydrologic cycle. Rising concentrations of carbon dioxide (CO₂) are making the oceans more acidic.
- (v) The combination of these complex climate changes threatens coastal communities and

cities, our food and water supplies, marine and freshwater ecosystems, forests, high mountain environments, and far more.

These scientists go on to say, “We urge our policymakers and the public to move forward immediately to address the causes of climate change, including the unrestrained burning of fossil fuels.” Although the letter has an ominous tone, the authors conclude by adding, “The good news is that smart and effective actions are possible.”

The question arises, What smart and effective actions can behavior analysts contribute to this effort?

WHAT CAN BEHAVIOR ANALYSTS DO?

As we indicated in the introduction to this special section, environmental problems have never been a major area of research for behavior analysts, although several prescient researchers did important work in the area, mainly in the 1970s and 1980s. Scott Geller was especially active in this area, and reviewed the literature in 1976 (Tuso & Geller, 1976) and again in 1990 (Geller, 1990). In the latter paper, subtitled “Where Have All the Flowers Gone?” he called for “renewed efforts to find behavioral solutions to environmental problems” (p. 27).

This work may seem to have had little impact on the environmental movement, but we disagree. Just as positive reinforcement and time-out have made their way into homes and schools, the idea of providing feedback and financial incentives to conserve energy appear to have found their way into the power

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companies (Darby, 2006). The terminology is not behavior analytic (Darby speaks of “information, action, and feedback in synergy,” p. 9), but the ideas are certainly familiar to readers of this journal. Some power companies provide “Smart Meters” that allow customers to monitor their use of electricity. Not surprisingly, the power companies are finding that these efforts produce reductions of from 5% to 15% in energy consumption (Darby). This reduces greenhouse gas emissions, and it helps the company because it can avoid black-outs and the great cost of building new plants to meet customer needs.

We applaud the pioneering work by behavior analysts in environmental protection, and we encourage applied behavior analysts to follow suit. But we also want to recommend that behavior analysts not just imitate what has been done in the past, but look for new ways of studying behavior change. Systematically replicating past experiments is essential to scientific progress, but so is bold innovation. We must not forget that some of Skinner’s most important discoveries (e.g., shaping, chaining, intermittent reinforcement) were not the result of formal research designs but of looking for lawful processes and being alert “to take advantage of accidents” by following the data (Skinner, 1956/1982, p. 97). When you find something interesting, he said, drop everything else and study it. Some would call this “thinking outside the box,” but environmentalist Amory Lovins (in Kolbert, 2007) came closer to the mark when he said, “There is no box” (p. 35).

It was this kind of thinking that we were after when we asked behavior analysts to write essays for this special section. The essays are not likely to be loved by all readers of this journal. No doubt some will consider them poor examples of behavior analysis; some might even say that they are not *any* kind of behavior analysis. But our essayists produced

just what we were after. They threw the guidebook away and asked, What can we suggest as a way to change behavior that rests on behavioral principles, but does so in a fresh way? We hope that these essays will serve as models for others to emulate.

Now we want to make a proposal of our own. Skinner pointed out that evolution has prepared us for a very different world than the one in which we live (see Chance, 2007). For example, we are designed to modify our behavior in response to consequences that are intense, immediate and certain, but many of the problems that we face today, including climate change, involve consequences that are weak, delayed, and uncertain. We also evolved to respond best to direct contact with important environmental events. The development of language made it possible for our ancestors to benefit from the experiences of others, and warnings such as “Don’t eat the green meat” are useful even today. But we did not evolve to respond to warnings about events that might be a decade or more away, such as “Don’t eat a lot of meat because it produces greenhouse gases that can change the climate.” We evolved in a world in which nourishment was not easy to come by, and as a result we developed a strong preference for high calorie foods. In developed countries today, calories are available in abundance, yet we still eat as if starvation were a major threat. One result is that in the U.S. and certain European countries obesity is epidemic, and raising, processing, and transporting food and disposing of its waste products are significant contributors to greenhouse gases.

Some behavior analysts look at these characteristics and despair at getting sufficient numbers of people to make the drastic changes in behavior necessary in time to save the planet. We suggest that behavior analysts think differently about these innate behavioral tendencies. We

suggest looking for ways of turning them to advantage, that is, of using them to get the desired behavior. If evolution has given us a lemon, let us see if we can make lemonade.

We offer here a few ideas to illustrate what we have in mind. Except for the first one they are speculative. We realize that we will be criticized for speculating, but there are precedents: B. F. Skinner speculated about the design of culture, verbal behavior, compulsive gambling, and the nature of the ideal society. We do not claim that our efforts are on a level with Skinner's, and we are sure that many readers of this journal can do far better. In fact, it's our hope that they—you—will do just that.

MAKING GREED GREEN

We begin with Carrotmobbing, the best example we can offer of what we have in mind. It did not come from us or from any other behavior analyst. It came from a young man in San Francisco named Brent Schulkin. He wanted to do something to help the environment, and thought that one way to do that would be to get businesses to spend money on eco-friendly things. But most businesses are not interested in helping the environment; they are interested in making money. In fact, the problem is that "companies will do anything for money." Then it occurred to him that perhaps the solution to the problem was that "companies will do anything for money." What if consumers could reward companies for going green by helping the companies make money?

Schulkin launched Carrotmob, self-described as "a network of consumers who buy products in order to reward businesses who are making the most socially responsible decisions" (<http://carrotmob.org>). As the Web site puts it, "We harness consumer power to make it possible for the most socially responsible business practices

to also be the most profitable choices. It's the opposite of a boycott."

Carrotmobbing works like this: Someone calls stores of a particular type (e.g., convenience stores) and asks them what percentage of their profits they are willing to spend on helping the environment if the group mobs their store. The highest bidder gets mobbed: On a given date, participants go to that particular store and buy whatever they need, thereby distributing disproportionate profit to that store. The store then spends the designated share of profit as agreed. For example, they might install solar panels to generate power for their lights or they might add insulation or energy-efficient lighting. Mobbing participants are not asked to donate anything to the store, nor are they asked to buy things they would not ordinarily buy. They buy what they would have bought anyway, but the green store benefits (their improvements are paid for by their additional profits), as does the environment.

For the first test of the program, Schulkin contacted 23 liquor stores in San Francisco. Hundreds of people showed up at the highest bidder, K & D Market. The owner and his son had little if any interest in helping the environment; their only interest was in helping their bottom line. And they did. The result of the mobbing was that the business took in far more money than they normally would and the store made some improvements that will save them money on electric bills.

Carrotmobbing might be dismissed as one of those San Francisco hippie things that would not work anywhere else. Not so. The program has been, or is scheduled to be, implemented in cities around the United States and the world, including Bern, Buenos Aires, New York, Paris, Quebec, and Washington, D.C.

Carrotmobbing uses a basic principle of behavior that would seem to work against going green (people tend to be selfish) to get people to help the

environment, acts that selfishness would not ordinarily inspire. We think that behavior analysts will conceive of many other ways in which this tactic could be used to help the environment. Behavior analysts can also contribute by doing research on practices such as Carrotmobbing to provide objective data about effectiveness, evidence that could improve the design of future efforts.

POPULAR AVERSIVES

Millions of years of evolution have taught us to avoid, escape, and despise things that are injurious to us. One of the things most people consider aversive today is taxes. But it is not taxes in general that people object to, but taxes that they themselves must pay. Russell Long, former Congressman from Louisiana, captured this sentiment with the words, "Don't tax you, don't tax me, tax that fellow behind the tree." (And the truth may be that most believe it would be all right to tax *you*, too, if necessary.) We can see this anecdotally in tobacco taxes. As more and more people gave up smoking, the taxes on cigarettes increased. Smokers objected, but they were badly outnumbered by non-smokers so their objections went unheeded. So, are there ways of levying taxes that the majority of voters will not strenuously oppose and might support?

One possibility is to levy a "green" tax on gasoline with the guarantee that all green tax dollars would be refunded to taxpayers. Each taxpayer, regardless of income, would receive an annual check or a tax credit equivalent to the amount of green tax taken in divided by the number of taxpayers. This idea, which has been around for years, would likely be opposed by the oil companies and by those who drive commercial vehicles and gas-guzzling SUVs, but welcomed by those who bike, drive fuel-efficient vehicles, or rely heavily

on public transportation. The complaints of the former group might be muted somewhat by the check or tax credit, which would help defray the added expense. As people come to enjoy their annual tax refund, they would likely buy more efficient cars, drive more efficiently, and turn more and more to public transportation, thereby maximizing their green tax benefits. And as they make these changes, it is likely that they would begin to support, or at least not oppose, increases in the green tax. After all, the tax is not on *them*; it's on that fellow behind the tree.

Taxes are not the only aversive events people might learn to love. Penalties can be used to reduce consumption (Agras, Jacob, & Lebedeck, 1980), but it is difficult to get them put into effect because they provoke a public outcry. Suppose penalties were levied only against those who use a truly excessive amount of electricity, perhaps the top 10% of households, and the funds from the penalties were distributed to households that had used a more modest amount of electricity, say, the bottom 60%. Thus, 60% of users would then have an incentive to support the penalty, and only about 10% have good reason to oppose it.

It would be important to publicize the plan carefully before it is put into effect, because anything that hints of penalty will elicit objections. But once people understand that they are likely to profit from the plan, chances are they will support it. One nice thing about this proposal is that the people most likely to pay penalties are those who choose to pay them rather than conserve energy. This should help with public support.

We realize, of course, that as behavior analysts you are not in a position to levy a gas tax or impose penalties on the use of energy. But you could create a laboratory analogue or set up an analogous program in a college dorm. We will leave that to you. But if your efforts are

successful, be sure to share that information with people who *are* in a position to levy taxes and impose penalties.

EFFORTLESS GREEN

Another basic principle of behavior that often works against us is the principle of least effort (Friman & Poling, 1995; Zhou, Goff, & Iwata, 2000). Given a choice, people usually take the easier option. If you have clothes to dry, you can put them in a dryer, or hang them on a clothesline or on a drying rack outside. Air drying uses no fossil fuels and produces no greenhouse gases, but throwing clothes in the dryer is easier so chances are that is what you do. If you have dishes to wash, you can wash them by hand in the sink and that will use less water and less energy (the water won't be boiling hot), but the electric dishwasher is easier, so... If you have to get to work, there's a bus stop two blocks away that will take you practically to your office door, but it's easier to take the car, so ...

Is it possible to use the principle of least work to promote green behavior? When Jacob Keller (1991/2010) did his experiment on increasing recycling 20 years ago, people had to sort their items (glass, paper, cardboard, cans, plastic), and that discouraged participation. In some recycling programs, people often had to take the items to a center miles away and put each type of item in a different bin. Today, recycling is often much simpler. You don't have to sort anything, the recycling centers are usually close by, and if you are willing to pay a small fee, you can put your items in a container at the curb and someone will pick them up. The alternative to recycling the items is to put them in a trash bin with the rest of your trash, so recycling adds almost no work. Recycling has been made easier for us, and many more of us do it.

Is there any way of making it easier for people to air dry clothes? We haven't come up with anything yet, but we hope you will.

DISCOUNTED MORTGAGES

Builders have many options in constructing a house. They can, for example, put in different kinds of lightbulbs. Incandescent bulbs (60 W) retail for about \$0.50 each, CFLs are \$2.00, and the new LEDs go for \$43.00. They can put in a standard refrigerator (20 cubic feet) that costs about \$500 or a low-end energy-efficient refrigerator of the same size with a price of about \$800. And so it goes: washer, dryer, dishwasher, water heater, windows, doors, microwave, oven, range, exhaust fan. The list goes on, and if the builder consistently chooses the most energy-efficient option, the increase in the price of the house is substantial. The higher the price of the house, the harder it is to sell, so builders typically buy the less expensive, more energy wasteful items; thus, new homes are far less energy efficient than they could be.

But why are buyers reluctant to pay the extra price now, when they will save money on energy later? The answer, of course, is that *now* comes before *later*. This is another of those well-established behavioral principles that tend to undermine green decisions: Immediate consequences have a greater impact on behavior than delayed consequences. Can we turn this principle, called discounting, to our advantage? Can we, for example, make the savings come now and the higher price come later?

We're not bankers, but we think it might be possible to do that, or at least to reduce the discrepancy between short- and long-term consequences. One way would be to make the additional cost of energy-efficient appliances tax deductible. If buyers pay an additional \$5,000 for appliances and can deduct that expense from their taxes that year or over a

few years, the pain of the higher price is sharply reduced.

Another approach might be to add a tax to all appliances, with the tax based on energy efficiency, so that there is little or no tax on the most efficient appliances but a substantial tax on the least efficient. This would reduce the difference in price between an energy-wasteful house and an efficient one.

THE GREEN CLASSROOM

The effort to protect the planet will, if we are lucky, last a very long time, possibly hundreds of years. One of the things we have to do is prepare young people for the challenge. That means doing a better job of teaching people about our connection to the environment, but it also means teaching them the basic principles of behavior. We are experiencing climate change because of human behavior, and if the earth recovers it will likely be because of changes in human behavior.

Unfortunately, our learning histories can make it difficult for us to accept new ideas, including ideas about behavior. Every day people see the apparent movement of the sun across the sky and deduce or are taught that the sun revolves around the earth every 24 hours, giving us our day and night. We also learn that when we approach a warm object, such as a fire, we feel warmer, so most of us conclude that summers are warm because the earth is closer to the sun. This learning history, whether taught or acquired on our own, can interfere with learning the established scientific facts about these matters (Sadler, 1992). In the same way, we learn all sorts of things about behavior that are not so, and this increases the difficulty of learning what *is* so. If we want people in the future to understand behavioral principles better than they do today, we had better find ways of teaching those principles starting in the early

grades. This will not be easy, but we are confident that it can be done, because it has been done (Miller & Cheney, 1996).

Of course there also need to be educational programs aimed at children about how their behavior affects the planet. One idea is suggested by a program developed by Sarah Dunkel-Jackson and her colleagues in Michigan (<http://greatlakesenergyservice.org>). With a million-dollar grant from the Michigan Public Service Commission, they renovated a trailer and equipped it with solar panels, cellular batteries, and various hands-on and interactive exhibits that teach students about electricity and its conservation. The program, which we came to call the Green Bus, is strictly informational, but there is no reason why a behavior analyst could not develop a mobile program that would attempt to shape green behavior in schoolchildren. Not only are kids who learn the importance of being eco-friendly likely to behave in greener ways as adults, but as children they may influence their parents' behavior, including their purchase of items ranging from lightbulbs to cars (Foderaro, 2008).

There are, of course, college and graduate programs in environmental science, but it is unlikely that courses in behavior analysis are required or encouraged. Fortunately, Mark Alavosius (personal communication, August, 2010) and his colleagues at the University of Nevada, Reno are working with the university's environmental sciences department to put together a sequence of courses to couple behavior analysis and environmental science. The program is expected to begin in fall of 2010, and might provide a model for others around the country. The program should produce environmental scientists who know more about behavior, and behavioral scientists who know more about the environment. This is bound to lead to effective collaborations in the future, and we're sure

behavior analysts will learn from this example.

As educators, behavior analysts can find many ways to help the environment. They can talk about applications of behavioral principles to environmental issues in the courses they teach, design and teach new courses, develop continuing education and distance learning programs, give public lectures on behavior and the environment, and most important of all, they can collaborate with experts in other fields, including not only environmental scientists but also economists, sociologists, anthropologists, and social psychologists to design and test ways of increasing green behavior.

The point is that education is an important arena for influencing the impact people have on the environment in the short run and for decades to come, and we hope behavior analysts will find ways to make the most of it.

FINDING THE BIGGEST SMALL

Nevin (2005) has argued that societal contingencies have little effect on individual behavior. If, during hot weather, the local power company warns that there may be blackouts if people do not reduce consumption of electricity, everyone in the community should push their thermostat up. You may do so, but your neighbors may not. If too many people set their thermostat low, all suffer when the power goes off, but you will have suffered more. The contingencies for the group are different from the contingencies for the individual and so are often not effective in producing the desired behavior change (Slavin, Wodarski, & Blackburn, 1981).

But what would happen if you and your neighbor were the only ones at risk of experiencing a blackout? Now it seems likely that you will both turn up the thermostat. If only one of you does so and there is a power failure, the other knows whom to blame, and

the guilty party has a price to pay. What if three neighbors were involved? Four? Ten? Presumably, as Nevin suggests (2010; see also Van Vugt & Samuelson, 1999) the smaller the group, the more likely the contingency will affect behavior in the desired way. But how large can the group get before the contingency becomes ineffective?

Laboratory and applied research on this question could have a tremendous impact. For instance, it may be possible for power suppliers to limit blackouts to relatively small groups of people, depending on their total use. Then the contingencies for the group are similar to the contingencies for the individual, and everyone benefits by cooperating.

THE POLITICS OF GREEN

According to a Pew Research Center survey (2009a), only 57% of Americans believe there is solid evidence for global warming. This figure is much lower than in many other countries (Pew Research Center, 2009b). However, there is a strong connection between views on global warming and politics: 49% of Republicans believe global warming is real, compared to 75% of Independents and 84% of Democrats (Pew Research Center, 2008). Moreover, it is conservative Republicans who are skeptics; 69% of liberal and moderate Republicans believe in global warming compared to 43% of conservative Republicans.

This raises an interesting question: What does global warming have to do with politics? What does political ideology have to do with the interpretation of scientific evidence? Many conservative Republicans are Christian fundamentalists, so we wonder if it is not political ideology that comes into play, but rather religion.

The issue is important because if we understood why Christian fundamentalists reject global warming, it might suggest ways to reduce their

objections. One possibility is that the objection is not based on religious dogma but is the result of emotional conditioning. There is an outspoken minority today that speaks on behalf of atheism. Harris (2008) and Dawkins (2008) are not only outspoken in their defense of atheism, but they are also openly hostile toward religion. They do not say that theism is merely wrong, but that it is bad. It is hardly surprising, then, that religious fundamentalists feel they are under attack. The atheist writers tend to be intellectuals, as do environmentalists. Is it possible that the association of environmentalism with atheism has led to a negative emotional response to anything environmentalists support, including the idea that global warming is real? If so, we wonder if a form of counterconditioning (Verplanck, 1955) might help global warming deniers to look more objectively at the scientific evidence. For example, getting political and religious conservatives who accept global warming to advocate for protecting the environment might help to reduce the negative emotional response to environmentalism. That could be a major step toward winning support for necessary environmental measures, including some that would reduce greenhouse gases.

Research along these lines is certainly far from what we usually see in behavior-analytic journals, but before we can change behavior, it is necessary to know something about the contingencies that maintain it, and that is something behavior analysts can study and, possibly, change.

Would this or any of the other proposals for reducing greenhouse gases in this special section work? We don't know. They need to be carefully examined, then tested in a laboratory or simulation, and then field tested. We hope behavior analysts will do just that. However, we do know that none of these proposals is a silver bullet; rather, they are examples of what has been called

“silver buckshot.” The consensus is that there is no silver bullet, and that we have to produce lots of silver buckshot. Behavior analysts are as well equipped as anyone to do that.

We have one more idea for restoring the health of the planet that we would like behavior analysts to consider working on: Nudging the societies of the world toward sustainability.¹ That means moving toward a stable population and reducing the rate of consumption (Dietz & Rosa, 1994, 1997). Like it or not, to reduce greenhouse gas emissions, we must downsize (Brown, 2009; Diamond, 2008; Latouche, 2003; Worldwatch Institute, 2010).

The transition to a less lavish, more sustainable lifestyle does not mean that we must be miserable. Rates of consumption are not closely tied to the standard of living. “Much American consumption,” writes Jared Diamond (2008), geography professor and author of *Collapse: How Societies Choose to Fail or Succeed*, “is wasteful and contributes little or nothing to quality of life. For example, per capita oil consumption in Western Europe is about half of ours, yet Western Europe's standard of living is higher by any reasonable criterion, including life expectancy, health, infant mortality, access to medical care, financial security after retirement, vacation time, quality of public schools and support for the arts.”

We cannot deny that material things can add to the comfort of our daily lives, but the American (and increasingly the world's) obsession with things has not made us notably happier than previous generations. As Canadian social psychologist Elizabeth Dunn and her colleagues (Dunn, Gilbert, & Wilson,

¹ We are encouraged by an effort currently underway to establish a special interest group within ABAI called Behavior Analysis for Sustainable Societies and by the establishment of an Environment/Green Solutions Group at the Cambridge Center for Behavioral Studies (www.behavior.org).

in press) write, “Money buys happiness, but it buys less than most people think” (see also Aknin, Norton, & Dunn, 2009; Diener & Biswas-Diener, 2002; Frey & Stutzer, 2000).

Indeed, there is reason to believe that a less opulent lifestyle will add to our enjoyment of life. When the recession hit America hard in 2008, people cut back on spending to reduce their debt and to save money in case of job loss. Instead of *buying* things, they *did* things. Instead of going out to a restaurant for a meal, they had a picnic in the park; instead of going to the arcade, they played basketball in the driveway; instead of shopping at the mall, they played cards with friends. They went back in time and discovered that not all pleasures come from the possession of the latest electronic gadget or a \$400 pair of basketball shoes. Simple, small, inexpensive, or free activities add a great deal to our lives (Dunn et al., in press).

There are other ways that scaling back may improve our lives. Christopher Steiner (2009), a staff writer for *Forbes*, looked at the effects that rising oil prices are apt to have on our lives. With rapidly increasing demand, the price of oil and everything derived from oil (including not only gasoline, heating oil, and jet fuel, but lubricants, clothes, shoes, carpets, you name it) will go up. Steiner thinks gasoline may reach \$20 per gallon in this century, but he notes that the increase in gas prices is likely to have a number of positive side effects. It is likely, for example, to improve our health: We will walk and bike more and drive less, which will improve fitness and lower rates of obesity, and we will breathe cleaner air and eat more locally grown food.

So there are solid grounds for hope; there *are* “smart and effective actions” we can take to deal with our problems. No one thinks that restoring the health of Earth will be easy or accomplished quickly, and there will undoubtedly be many failures along

the way. But as we make the effort we should remember advice often attributed to Skinner: “A failure is not always a mistake. It may simply be the best you can do under the circumstances. The real failure is to stop trying.”

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