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Toward a Coherent Theory of Environmentally Significant Behavior

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This article develops a conceptual framework for advancing theories of environmentally significant individual behavior and reports on the attempts of the author's research group and others to develop such a theory. It discusses definitions of environmentally significant behavior; classifies the behaviors and their causes; assesses theories of environmentalism, focusing especially on value-belief-norm theory; evaluates the relationship between environmental concern and behavior; and summarizes evidence on the factors that determine environmentally significant behaviors and that can effectively alter them. The article concludes by presenting some major propositions supported by available research and some principles for guiding future research and informing the design of behavioral programs for environmental protection.

Recent developments in theory and research give hope for building the understanding needed to effectively alter human behaviors that contribute to environmental problems. This article develops a conceptual framework for the theory of environmentally significant individual behavior, reports on developments toward such a theory, and addresses five issues critical to building a theory that can inform efforts to promote proenvironmental behavior.

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Defining Environmentally Significant Behavior

Environmentally significant behavior can reasonably be defined by its impact: the extent to which it changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself (see Stern, 1997). Some behavior, such as clearing forest or disposing of household waste, directly or proximally causes environmental change (Stern, Young, & Druckman, 1992). Other behavior is environmentally significant indirectly, by shaping the context in which choices are made that directly cause environmental change (e.g., Rosa & Dietz, 1998; Vayda, 1988). For example, behaviors that affect international development policies, commodity prices on world markets, and national environmental and tax policies can have greater environmental impact indirectly than behaviors that directly change the environment.

Through human history, environmental impact has largely been a by-product of human desires for physical comfort, mobility, relief from labor, enjoyment, power, status, personal security, maintenance of tradition and family, and so forth, and of the organizations and technologies humanity has created to meet these desires. Only relatively recently has environmental protection become an important consideration in human decision making. This development has given environmentally significant behavior a second meaning. It can now be defined from the actor's standpoint as behavior that is undertaken with the intention to change (normally, to benefit) the environment. This intent-oriented definition is not the same as the impact-oriented one in two important ways: It highlights environmental intent as an independent cause of behavior, and it highlights the possibility that environmental intent may fail to result in environmental impact. For example, many people in the United States believe that avoiding the use of spray cans protects the ozone layer, even though ozone-destroying substances have been banned from spray cans for two decades. The possible discrepancy between environmental intent and environmental impact raises important research questions about the nature and determinants of people's beliefs about the environmental significance of behaviors.

Both definitions of environmentally significant behavior are important for research but for different purposes. It is necessary to adopt an impact-oriented definition to identify and target behaviors that can make a large difference to the environment (Stern & Gardner, 1981a). This focus is critical for making research useful. It is necessary to adopt an intent-oriented definition that focuses on people's beliefs, motives, and so forth in order to understand and change the target behaviors.

Types of Environmentally Significant Behavior

Much early research on proenvironmental behavior presumed it to be a unitary, undifferentiated class. More recently it has become clear that there are several distinct types of environmentally significant behavior and that different combinations of causal factors determine the different types.

Environmental Activism

Committed environmental activism (e.g., active involvement in environmental organizations and demonstrations) is a major focus of research on social movement participation. This research provides detailed analysis of the "recruitment" process through which individuals become activists (McAdam, McCarthy, & Zald, 1988).

Nonactivist Behaviors in the Public Sphere

Recently, the social movement literature has pointed to nonactivists' support of movement objectives as another important class of behavior (Zald, 1992). Public opinion researchers and political scientists sometimes examine such behavior, but relatively little research has been done to classify the behaviors into coherent subtypes. It seems reasonable as a first approximation to distinguish between more active kinds of environmental citizenship (e.g., petitioning on environmental issues, joining and contributing to environmental organizations) and support or acceptance of public policies (e.g., stated approval of environmental regulations, willingness to pay higher taxes for environmental protection). My colleagues and I have found empirical support for distinguishing these types from each other and from activism (Dietz, Stern, & Guagnano, 1998; Stern, Dietz, Abel, Guagnano, & Kalof, 1999). Although these behaviors affect the environment only indirectly, by influencing public policies, the effects may be large, because public policies can change the behaviors of many people and organizations at once. An important feature of public-sphere behaviors, including activism, is that environmental concerns are within awareness and may therefore be influential.

Private-Sphere Environmentalism

Consumer researchers and psychologists have focused mainly on behaviors in the private sphere: the purchase, use, and disposal of personal and household products that have environmental impact. It is useful to subdivide these according to the type of decision they involve: the purchase of major household goods and services that are environmentally significant in their impact (e.g., automobiles, energy for the home, recreational travel), the use and maintenance of environmentally

important goods (e.g., home heating and cooling systems), household waste disposal, and "green" consumerism (purchasing practices that consider the environmental impact of production processes, for example, purchasing recycled products and organically grown foods). Making such distinctions has revealed that some types of choice, such as infrequent decisions to purchase automobiles and major household appliances, tend to have much greater environmental impact than others, such as changes in the level of use of the same equipment: the distinction between efficiency and curtailment behaviors (Stern & Gardner, 1981a, 1981b). Private-sphere behaviors may also form coherent clusters empirically (e.g., Bratt, 1999a), and different types of private-sphere behavior may have different determinants (e.g., Black, Stern, & Elworth, 1985). Private-sphere behaviors are unlike public-sphere environmentalism in that they have direct environmental consequences. The environmental impact of any individual's personal behavior, however, is small. Such individual behaviors have environmentally significant impact only in the aggregate, when many people independently do the same things.

Other Environmentally Significant Behaviors

Individuals may significantly affect the environment through other behaviors, such as influencing the actions of organizations to which they belong. For example, engineers may design manufactured products in more or less environmentally benign ways, bankers and developers may use or ignore environmental criteria in their decisions, and maintenance workers' actions may reduce or increase the pollution produced by manufacturing plants or commercial buildings. Such behaviors can have great environmental impact because organizational actions are the largest direct sources of many environmental problems (Stern & Gardner, 1981a, 1981b; Stern, 2000). The determinants of individual behavior within organizations are likely to be different from those of political or household behaviors.

Evidence for Distinguishing Major Behavioral Types

Research my colleagues and I have conducted suggests that this distinction among behavioral types is not only conceptually coherent but statistically reliable and psychologically meaningful. For instance, a factor analysis of the behavioral items in the environment module of the 1993 General Social Survey revealed a three-factor solution (Dietz et al., 1998). One factor included four private-sector household behaviors (e.g., buying organic produce, sorting household waste for recycling); a second included two environmental citizenship behaviors (signing a petition and belonging to an environmental group); and the third included three items indicating willingness to make personal financial sacrifices for environmental goals, which assess policy support. A different pattern of social-psychological

and socio-demographic predictors was associated with each of the behavioral types, and even the two citizenship behaviors had quite different sets of predictors.

My colleagues and I had similar results using data from a 1994 national environmental survey (Stern et al., 1999). Factor analysis of 17 items measuring self-reported behaviors and behavioral intentions again revealed three factors: consumer behaviors (e.g., buying organic produce, avoiding purchases from companies that harm the environment); environmental citizenship (e.g., voting, writing to government officials); and policy support, expressed as willingness to sacrifice economically to protect the environment (e.g., by paying much higher taxes or prices). Self-reported participation in environmental demonstrations and protests, presumably a measure of committed activism, did not load on any of the above three factors. Each of these factors was predicted by a different pattern of norms, beliefs, and values, and activism had yet a different set of predictors.

The Determinants of Environmentalism

Environmentalism may be defined behaviorally as the propensity to take actions with proenvironmental intent. Some theories treat environmentalism as a matter of worldview. Perhaps the most prominent example in social psychology is the idea that it flows from adopting a New Environmental (or Ecological) Paradigm, within which human activity and a fragile biosphere are seen as inextricably interconnected (Dunlap, Van Liere, Mertig, & Jones, this issue). Another worldview theory explains environmentalism in terms of an egalitarian "cultural bias" or "orienting disposition" (Dake, 1991; Douglas & Wildavsky, 1982; Steg & Sievers, 2000). Recently, some researchers have begun to explore affective influences on environmental concern and behavior, including sympathy for others (Allen & Ferrand, 1999), "emotional affinity" toward nature (Kals, Schumacher, & Montada, 1999), and empathy with wild animals (Schultz, this issue).

Some theories look to values as the basis of environmentalism. Inglehart (1990) suggests that it is an expression of postmaterialist values of quality of life and self-expression that emerge as a result of increasing affluence and security in the developed countries. Some accounts emphasize religious values, arguing either that certain Judaeo-Christian beliefs predispose adherents to devalue the environment (Schultz, Zelezny, & Dalrymple, 2000; White, 1967) or that beliefs that the environment is sacred enhance environmental concern (e.g., Dietz et al., 1998; Greeley, 1993; Kempton, Boster, & Hartley, 1995). Others have linked environmental concern and behavior to general theories of values (e.g., Schwartz, 1994) and have found that values those that focus concern beyond a person's immediate social circle (values called self-transcendent or altruistic) are stronger among people who engage in proenvironmental activities (e.g., Dietz et al., 1998; Karp, 1996; Stern & Dietz, 1994; Stern, Dietz, Kalof, & Guagnano, 1995). A related line of research finds greater evidence of environmental concern among individuals with

"prosocial" rather than individualistic or competitive social value orientations (e.g., Joireman, Lasane, Bennett, Richards, & Solaimani, in press; Van Vugt & Samuelson, 1998).

Theories of altruistic behavior have also been used to explain environmentalism. This approach, first articulated by Heberlein (1972), presumes that because environmental quality is a public good, altruistic motives are a necessary for an individual to contribute to it in a significant way. The best developed example of this approach builds on Schwartz's (1973, 1977) moral norm-activation theory of altruism. The theory holds that altruistic (including proenvironmental) behavior occurs in response to personal moral norms that are activated in individuals who believe that particular conditions pose threats to others (awareness of adverse consequences, or AC) and that actions they could initiate could avert those consequences (ascription of responsibility to self, or AR). Substantial evidence supporting the theory's applicability to a range of environmental issues has accumulated over two decades (e.g., Black, 1978; Black et al., 1985; Guagnano, Stern, & Dietz, 1995; Schultz & Zelezny, 1999; Widegren, 1998).

My colleagues and I have developed a value-belief-norm (VBN) theory of environmentalism that builds on some of the above theoretical accounts and offers what we believe to be the best explanatory account to date of a variety of behavioral indicators of nonactivist environmentalism (Stern et al., 1999). The theory links value theory, norm-activation theory, and the New Environmental Paradigm (NEP) perspective through a causal chain of five variables leading to behavior: personal values (especially altruistic values), NEP, AC and AR beliefs about general conditions in the biophysical environment, and personal norms for proenvironmental action (see Figure 1). The rationale and empirical support for this causal ordering is drawn from previous work (Black et al., 1985; Gardner &

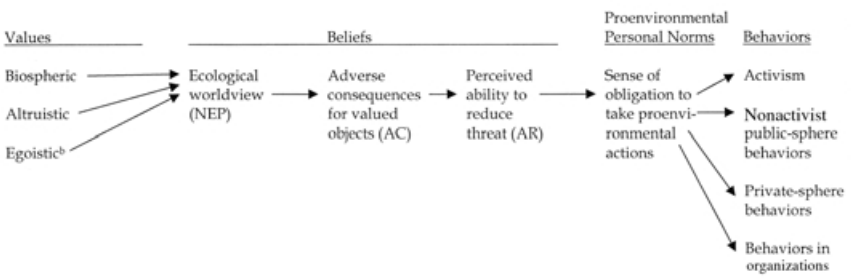

Fig. 1. A schematic representation of variables in the VBN theory of environmentalism[a]

[a]Arrows represent postulated direct effects. Direct effects may also be observed on variables more than one level downstream from a causal variable.

[b]Empirically, measures of egoistic values have been negatively correlated with indicators of environmentalism.

Stern, 1996; Stern, Dietz, & Guagnano, 1995; Stern, Dietz, Kalof, & Guagnano, 1995; Stern & Oskamp, 1987). The causal chain moves from relatively stable, central elements of personality and belief structure to more focused beliefs about human-environment relations (NEP), their consequences, and the individual's responsibility for taking corrective action. We postulate that each variable in the chain directly affects the next and may also directly affect variables farther down the chain. Personal norms to take proenvironmental action are activated by beliefs that environmental conditions threaten things the individual values (AC) and that the individual can act to reduce the threat (AR). Such norms create a general predisposition that influences all kinds of behavior taken with pro-environmental intent. In addition, behavior-specific personal norms and other social-psychological factors (e.g., perceived personal costs and benefits of action, beliefs about the efficacy of particular actions) may affect particular proenvironmental behaviors, as discussed below.

The VBN theory links value theory to norm-activation theory by generalizing the latter. It postulates that the consequences that matter in activating personal norms are adverse consequences to whatever the individual values (AC). Thus, people who value other species highly will be concerned about environmental conditions that threaten those valued objects, just as altruists who care about other people will be concerned about environmental conditions that threaten the other people's health or well-being. VBN theory links the NEP to norm-activation theory with the argument that the NEP is a sort of "folk" ecological theory from which beliefs about the adverse consequences of environmental changes can be deduced (for empirical support, see Stern, Dietz, & Guagnano, 1995).

In a recent study (Stern et al., 1999), my colleagues and I used the VBN theory, as well as measures from three other theories (indicators of four cultural biases, postmaterialist values, and belief in the sacredness of nature), to account for three types of nonactivist environmentalism: environmental citizenship, private-sphere behavior, and policy support (willingness to sacrifice). The VBN cluster of variables was a far stronger predictor of each behavioral indicator than the other theories, even when the other theories were taken in combination (see Table 1). None of the theories, however, was very successful in predicting the sole indicator of activism (participation in an environmental demonstration), which appears to depend on other factors in addition to an environmentalist predisposition.

The results provide strong initial support for the VBN theory's contentions that personal moral norms are the main basis for individuals' general predispositions to proenvironmental action (other studies supporting this conclusion include Bratt, 1999b, and Widegren, 1998) and that these norms are activated as the theory specifies. The personal norm variable was the only psychological variable of the 14 in the study that is associated with all three types of nonactivist environmentalism when the other variables are held constant. Moreover, values, NEP, and AC beliefs accounted for 56% of the variance in personal norms.

Table 1. Explained variance in Three Indicators of Proenvironmental Behavior

Source of explanatory variables	Dependent measures		
	Private-sphere behavior	Policy support	Environmental citizenship
VBN theory	.194	.346	.302
Three other theories[a]	.094	.199	.187
Added variance from other theories[b]	.033	.033	.091

Note. From "A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmental Concern," by P. C. Stern, T. Dietz, T. Abel, G. A. Guagnano, and L. Kalof, 1999, *Human Ecology Review*, *6*, p. 90. Copyright 1999 by Society for Human Ecology. Reprinted with permission.
[a]Postmaterialist values, four cultural biases, and beliefs about the sacredness of nature.
[b]Difference between R^2 value for model combining VBN theory variables with the variables from the other three theories and value for model with VBN theory alone.

Data from several studies indicate that the values most strongly implicated in activating proenvironmental personal norms are, as norm-activation theory presumes, altruistic or self-transcendent values (Karp, 1996; Stern, Dietz, Kalof, & Guagnano, 1995; Stern et al., 1999). However, other values are sometimes linked as well. Self-enhancement or egoistic values and "traditional" values such as obedience, self-discipline, and family security are negatively associated with proenvironmental norms and action in some studies. The ways these values affect behavior are not well understood, but they may be important bases for principled opposition by some individuals to environmental movement goals. Another potentially important issue, as yet unresolved empirically, is whether a set of biospheric values is emerging, distinct from altruistic values about other people, that might provide a distinct basis for people's support for preserving endangered species and habitats.

An important element of the VBN theory is that the link from values to environmentalism is mediated by particular beliefs, such as beliefs about which kinds of people or things are affected by environmental conditions (AC) and about whether there are individual actions that could alleviate threats to valued persons or things (AR). Thus, environmentalist personal norms and the predisposition to proenvironmental action can be influenced by information that shapes these beliefs. This proposition suggests how environmentalism can be affected by the findings of environmental science (about consequences), publicity and commentary about those findings, and the actual and perceived openness of the political system to public influence (which may affect perceptions of personal responsibility). It also suggests an interpretation of environmentalist and antienvironmentalist rhetoric as efforts to activate or deactivate people's environmental norms by highlighting certain kinds of values or consequences (Stern, Dietz, Kalof, & Guagnano, 1995). The VBN theory offers an account of attitude formation that can deal with new or changing attitude objects (Stern, Dietz, Kalof, & Guagnano, 1995) and,

more generally, with how environmental concern and environmental issues are socially constructed (Dietz, Stern, & Rycroft, 1989). The VBN theory is thus compatible with the constructed-preference tendency in cognitive psychology (Dietz & Stern, 1995; Fischhoff, 1991; Payne, Bettman, & Johnson, 1992).

The Causes of Environmentally Significant Behavior

Because environmental intent and environmental impact are two different things, theories explaining environmentalism are necessarily insufficient for understanding how to change environmentally important behaviors. Environmentalist intent is only one of the factors affecting behavior, and often, it is not one of the most important. Many environmentally significant behaviors are matters of personal habit or household routine (e.g., the setting of thermostats or the brand of paper towels purchased) and are rarely considered at all. Others are highly constrained by income or infrastructure (e.g., reinsulating homes, using public transport). For others, environmental factors are only minor influences on major actions (e.g., choosing an engine size option in a new automobile, deciding whether to centrally air condition a home), or the environmental effects are unknown to the consumer (e.g., choosing between products that have different environmental impacts from their manufacturing processes). Sometimes, as with spray cans, people may act in ways that are proenvironmental in intent but that in fact have little or no positive environmental impact. Environmentally beneficial actions may also follow from nonenvironmental concerns, such as a desire to save money, confirm a sense of personal competence, or preserve time for social relationships (De Young, this issue). And environmental concerns may fail to lead to proenvironmental action for various reasons (Gardner & Stern, 1996; Kempton, 1993). To understand any specific environmentally significant behavior requires empirical analysis. The evidence suggests that the role of environmentalist predispositions can vary greatly with the behavior, the actor, and the context.

ABC Theory

A first step toward understanding the complexities is to elaborate on the truism that behavior is a function of the organism and its environment. In one formulation (Guagnano et al., 1995), behavior (B) is an interactive product of personal-sphere attitudinal variables (A) and contextual factors (C). The attitude-behavior association is strongest when contextual factors are neutral and approaches zero when contextual forces are strongly positive or negative, effectively compelling or prohibiting the behavior in question (an inverted U-shaped function). We found supportive evidence for this formulation in a study of curbside recycling (Guagnano et al., 1995).

This "ABC theory" formulation implies that for personal behaviors that are not strongly favored by context (e.g., by being required or tangibly rewarded), the more difficult, time-consuming, or expensive the behavior, the weaker its dependence on attitudinal factors. Supporting evidence for this implication exists in studies that have used the same attitudinal variables to account for different proenvironmental behaviors. For example, in a study of household energy conservation, the relative explanatory power of social-psychological variables declined as effort or cost increased, from 59% of the explainable variance in self-reported home thermostat settings to 50% for minor curtailments such as shutting off heat in unused rooms, 44% for low-cost energy efficiency improvements such as caulking and weather-stripping, and 25% for major investments such as adding insulation or storm windows (Black et al., 1985). There are similar findings for public-sphere behaviors. The social-psychological variables of the VBN theory accounted for 35% of the variance in expressed policy support for environmentalism and 30% of the variance in environmental citizenship behaviors but only 4% of the variance in committed activism (Stern et al., 1999). These findings suggest a provocative hypothesis that is worthy of further exploration, namely that the more important a behavior is in terms of its environmental impact, the less it depends on attitudinal variables, including environmental concern.

Four Types of Causal Variables

It is useful to refine the personal-contextual or organism-environment distinction and to group the causal variables into four major types. *Attitudinal factors*, including norms, beliefs, and values, are one. The VBN theory provides a good theoretical account of one such factor, the general predisposition to act with proenvironmental intent, which can influence all behaviors an individual considers to be environmentally important. Other attitudinal variables affect only certain environmentally relevant behaviors. These include behavior-specific predispositions (e.g., specific personal moral norms in the terms of norm-activation theory, attitudes toward acts in the terms of the theory of planned behavior) and behavior-specific beliefs (e.g., about the difficulty of taking certain actions or about their consequences for self, others, or the environment). Several social-psychological theories, including cognitive dissonance theory, norm-activation theory, and the theory of planned behavior, have been shown to explain variance in specific proenvironmental behaviors. This research has demonstrated that proenvironmental behaviors can be affected by personal commitment and the perceived personal costs and benefits of particular actions (e.g., Katzev & Johnson, 1987) as well as by behavior-specific beliefs and personal norms (e.g., Black et al., 1985). As already noted, environmentally significant behavior can also be affected by nonenvironmental attitudes, such as those about attributes of consumer products that are correlated with environmental impact (e.g., speed, power, and luggage

capacity in motor vehicles), or about frugality, luxury, waste, or the importance of spending time with family.

A second major type of causal variable is external or *contextual forces*. These include interpersonal influences (e.g., persuasion, modeling); community expectations; advertising; government regulations; other legal and institutional factors (e.g., contract restrictions on occupants of rental housing); monetary incentives and costs; the physical difficulty of specific actions; capabilities and constraints provided by technology and the built environment (e.g., building design, availability of bicycle paths, solar energy technology); the availability of public policies to support behavior (e.g., curbside recycling programs); and various features of the broad social, economic, and political context (e.g., the price of oil, the sensitivity of government to public and interest group pressures, interest rates in financial markets). It is worth nothing that a contextual factor may have different meanings to people with different attitudes or beliefs. For example, the higher price of "organic" produce may be an economic barrier to purchase for some people, whereas for others it is a marker of a superior product.

Personal capabilities are a third type of causal variable. These include the knowledge and skills required for particular actions (e.g., the skills of a movement organizer for activism, mechanical knowledge for energy-conserving home repairs), the availability of time to act, and general capabilities and resources such as literacy, money, and social status and power. Sociodemographic variables such as age, educational attainment, race, and income may be indicators or proxies for personal capabilities. Although these variables have very limited explanatory power for many environmentally significant behaviors (e.g., Dietz et al., 1998), they may be important for behaviors that depend strongly on particular capabilities. For instance, in a recent study (Stern et al., 1999), sociodemographic variables were found to be unrelated to consumer behavior and policy support when social-psychological variables were held constant, but environmental citizenship was found to be positively associated with income and with White race. The findings reflect the fact that the efficacy of environmental citizenship depends on an individual's social and economic resources. Also, environmental activism, for which attitudinal variables had very little explanatory power, was significantly associated (negatively) with age and income.

Finally, *habit or routine* is a distinct type of causal variable. Behavior change often requires breaking old habits and becomes established by creating new ones (Dahlstrand & Biel, 1997). Habit, in the form of standard operating procedure, is also a key factor in environmentally significant organizational behavior.

The evidence suggests that different types of causal variables are important, depending on the particular behavior (Gardner & Stern, 1996; Stern, 2000). Expensive behaviors such as reinsulating homes are likely to be strongly influenced by monetary factors; difficult behaviors such as reducing automobile use in the suburbs are likely to be strongly influenced by public policy supports (e.g., for

alternative transport modes); behaviors that require specialized skills are likely to be strongly influenced by whether or not one possesses those capabilities; and so forth. Such hypotheses, though fairly obvious, do not go without saying. They offer a good starting point for efforts to understand particular environmentally significant behaviors.

Different causal variables also appear to work different ways in influencing behavior. For example, certain attitudinal factors create a general predisposition to act, which may be shaped into specific action largely by personal capabilities and contextual forces. A new context may make old habits untenable and lead someone to consider his or her attitudes and values explicitly in developing new ones (Dahlstrand & Biel, 1997). Or financial incentives may favor behaviors that nevertheless do not occur unless information makes individuals aware that the incentive is available (Stern, 1999).

The insight of the ABC formulation, that the different types of causal factors may interact, implies that interpretations based only on main effects can be seriously misleading. Studies that examine only attitudinal factors are likely to find effects only inconsistently, because the effects are contingent on capabilities and context. Similarly, studies that examine only contextual variables, such as material incentives, social norms, or the introduction of new technology, may find effects but fail to reveal their dependence on individuals' attitudes or beliefs. Single-variable studies may demonstrate that a particular theoretical framework has explanatory power but may not contribute much to the comprehensive understanding of particular environmentally significant behaviors that is needed to change them. I return to this point later.

Toward a Synthesis

The field now needs synthetic theories or models that incorporate variables from more than one of the above broad classes, postulate relationships among them, and use them to explain one or more types of environmentally significant behavior. Researchers are beginning to propose such models (e.g., Dahlstrand & Biel, 1997; Fransson & Gärling, 1999; Gardner & Stern, 1996; Hines, Hungerford, & Tomera, 1987; Ölander & Thøgerson, 1995; Stern & Oskamp, 1987; Vlek, 2000). Some of the models expand on familiar theories of altruistic behavior (e.g., Schwartz, 1977) or planned behavior (e.g., Ajzen, 1991), which emphasize attitudinal factors almost exclusively. Because the new models also take into account personal capabilities, context, and habits, they are more suitable for explaining behaviors that have significant environmental impacts, which are often strongly influenced by such nonattitudinal factors.

A dialogue among such models is needed to move the field toward synthesis. It is also likely to build links to other psychological theories. For example, the distinction between attitudes and habits as causes of behavior closely parallels the

distinction in a variety of "dual-process" models (Smith & DeCoster, 2000) between conscious and effortful behaviors and automatic or associative ones. Dual-process models may therefore have something to say about pro-environmental behavior.

Changing Environmentally Significant Behavior

Many approaches toward changing individuals' environmentally significant behavior have been tried. Gardner and Stern (1996) reviewed the evidence on four major types of intervention: religious and moral approaches that appeal to values and aim to change broad worldviews and beliefs; education to change attitudes and provide information; efforts to change the material incentive structure of behavior by providing monetary and other types of rewards or penalties; and community management, involving the establishment of shared rules and expectations. They found that each of these intervention types, if carefully executed, can change behavior. However, moral and educational approaches have generally disappointing track records, and even incentive- and community-based approaches rarely produce much change on their own. By far, the most effective behavior change programs involve combinations of intervention types.

These findings underline the limits of single-variable explanations for informing efforts at behavior change. The behavior is determined by multiple variables, sometimes in interaction. There is strong evidence, for example, that incentives and information interact, with the combination sometimes being much more effective than the sum of the two interventions (Stern, 1999). In one evaluation study, increased financial incentives for major investments in home energy conservation were necessary but far from sufficient for programs to be successful. Even when electric utility companies offered to subsidize 93% of the cost of home insulation, consumer response varied from 1% to almost 20% adoption per year, apparently depending on how the subsidy was made known to householders (Stern et al., 1986).

Often the nature of the interaction can be well described in terms of barriers or limiting conditions to behavior change (Gardner & Stern, 1996). Interventions do little or nothing until one of them removes an important barrier to change. To promote investments in home insulation, for example, it is necessary to reduce the financial barriers, provide accurate information on which actions would be effective, and reduce the difficulty of getting the information and finding a reliable contractor. Programs that did all these things were vastly more successful than programs that did only one or two (Stern et al., 1986). Since different individuals face different impediments to behavior change and the impediments are often multiple, little happens until the right combination of intervention types is found. The concept of limiting conditions also implies that particular kinds of interventions have diminishing returns after they have fulfilled their major function. For example,

once financial incentives are large enough to demonstrate a clear personal benefit, increasing the incentive may be far less effective in producing behavior change than providing information through marketing (see Stern, 1999).

Theory has progressed to the point at which it is possible to identify useful and practical principles for intervention (see Table 2; for a guide to the application of these principles, see McKenzie-Mohr & Smith, 1999). Space does not permit elaboration of all the principles here. The admonitions to combine multiple intervention types, to understand the situation from the actor's perspective, to continually monitor and adjust programs, and to use participatory methods all suggest ways to make practical progress with incomplete theory.

For researchers who would like to advance the understanding necessary to make behavioral approaches to environmental protection more successful, a related set of principles applies (see Gardner & Stern, 1996, chap. 10). First, identify target behaviors that are environmentally significant in terms of impact. Then analyze the behaviors to identify the responsible actors and actions. Then consider the full range of causal variables and explore their possible relevance to the target behavior from the actor's standpoint. By exploring the possibilities directly with representatives of the population whose behavior is to be changed, it is possible to find promising strategies for intervention without trying them all out experimentally.

This research strategy offers the best approach to developing useful theory about specific behavioral types that have important environmental impacts. In addition to its practical value, such small-scale theory provides the essential building blocks for broader, inductively developed theory about environmentally significant behavior.

Table 2. Principles for Intervening to Change Environmentally Destructive Behavior

A.	Use multiple intervention types to address the factors limiting behavior change	
	1.	Limiting factors are numerous (e.g., technology, attitudes, knowledge, money, convenience, trust)
	2.	Limiting factors vary with actor and situation, and over time
	3.	Limiting factors affect each other
B.	Understand the situation from the actor's perspective	
C.	When limiting factors are psychological, apply understanding of human choice processes	
	1.	Get the actors' attention; make limited cognitive demands
	2.	Apply principles of community management (credibility, commitment, face-to-face communication, etc.)
D.	Address conditions beyond the individual that constrain proenvironmental choice	
E.	Set realistic expectations about outcomes	
F.	Continually monitor responses and adjust programs accordingly	
G.	Stay within the bounds of actors' tolerance for intervention	
H.	Use participatory methods of decision making	

Note. From *Environmental Problems and Human Behavior* (p. 159), by G. T. Gardner and P. C. Stern, 1996, Boston: Allyn and Bacon. Copyright 1996 by Allyn and Bacon. Reprinted with permission.

Conclusions

Environmentally significant behavior is dauntingly complex, both in its variety and in the causal influences on it. Although a general theory lies far in the distance, enough is known to present a framework that can increase theoretical coherence. This framework includes typologies of environmentally significant behaviors and of their causes (see Table 3) and a growing set of empirical propositions about these variables. For example:

- The VBN approach offers a good account of the causes of the general predisposition toward proenvironmental behavior.
- Environmentally significant behavior depends on a broad range of causal factors, both general and behavior-specific. A general theory of environmentalism may therefore not be very useful for changing specific behaviors.
- Different kinds of environmentally significant behavior have different causes. Because the important causal factors may vary greatly across behaviors and individuals, each target behavior should be theorized separately.

Table 3. Major Types of Environmentally Significant Behaviors and Causal Variables Influencing These Behaviors

Causal variables	Environmentally significant behaviors
Attitudinal	*Environmental activism*
General environmentalist predisposition[a]	*Nonactivist public-sphere behaviors*
Behavior-specific norms and beliefs[b]	Environmental citizenship
Nonenvironmental attitudes	(e.g., petitioning, joining groups)
(e.g., about product attributes)	Policy support
Perceived costs and benefits of action	
Personal capabilities	*Private-sphere environmentalism*
Literacy	Consumer purchase behaviors
Social status	Maintenance of household equipment
Financial resources	Changes in equipment use, lifestyle (curtailment)
Behavior-specific knowledge and skills	Waste disposal behaviors
	"Green consumerism"
Contextual factors	*Other*
Material costs and rewards	Behaviors affecting organizational decisions
Laws and regulations	
Available technology	
Social norms and expectations	
Supportive policies	
Advertising	
Habit and routine	

[a]The VBN theory incorporates various attitudinal variables believed to create this predisposition.
[b]These norms and beliefs figure prominently in applications of norm-activation theory and the theory of planned behavior to specific proenvironmental behaviors.

- The causal factors may interact. Attitudinal causes have the greatest predictive value for behaviors that are not strongly constrained by context or personal capabilities. For behaviors that are expensive or difficult, contextual factors and personal capabilities are likely to account for more of the variance.

In addition to such empirical principles, past research has yielded important insights for research and action on environmental protection, as described above and in Table 2. One cannot overemphasize to behavioral scientists the importance of identifying target behaviors from an environmental perspective (in terms of their impact), even though understanding them requires an actor-oriented approach that focuses on their causes. It is also critical to underscore the need to draw on insights from across the behavioral and social sciences, because the important causal variables lie in the domains of various disciplines and because the variables interact. Thus, interdisciplinary research is necessary for full understanding.

By following these insights and elaborating on the above principles, behavioral researchers can further advance understanding of environmentally significant individual behavior and can provide useful input to practical programs for environmental protection. They are also likely to make contributions to the broader project of behavioral science.

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