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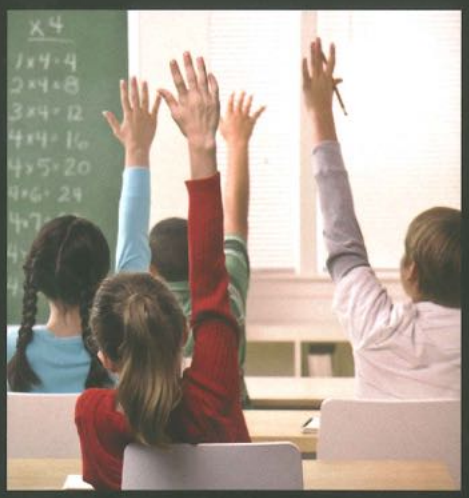
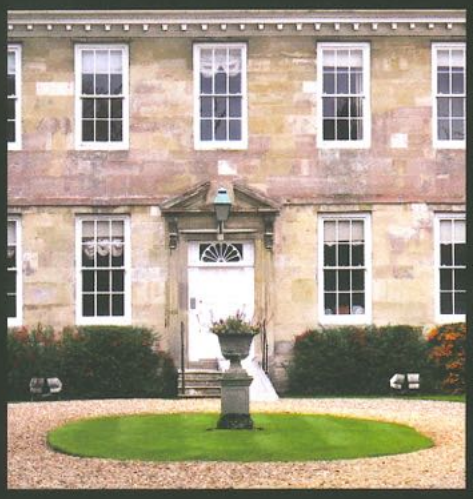


The Behavioral Foundations of Public Policy



The Behavioral Foundations of Public Policy

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CHAPTER 22

Doing the Right Thing Willingly

Using the Insights of Behavioral Decision Research for Better Environmental Decisions

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Policy makers from local to supranational levels are being asked to address behavior that impacts economic and social outcomes on multiple scales and, increasingly, also environmental outcomes. Attempts to reduce a country's dependence on foreign oil, for example, may generate multiple options that all satisfy this policy goal but can have varying impacts on the economic viability as well as on air quality and carbon dioxide emissions. Custodians of the water available in a system of reservoirs need to regulate release times and levels in a way that satisfies stakeholders with different needs and sources of power, while safeguarding future availability of water, given projected future upstream rainfalls. At other times, environmental issues pose themselves as the primary problem for policy intervention. For example, national legislation or supranational agreements may mandate that regional emissions of harmful substances such as sulfur or carbon dioxide be capped at specific levels, and regional or industry-specific policy makers need to generate interventions that will reduce emission-generating activities or introduce technologies that reduce emission levels of continuing activities.

These examples illustrate several important points: (1) Environmental policy decisions typically have impacts on a range of dimensions, from economic to social and environmental ones and involve trade-offs between these dimensions. (2) Many of these decisions have distributional implications and involve considerations of fairness or equity. (3) Many of these decisions involve considerable uncertainty about the likely consequences of different actions and require intertemporal trade-offs on both the cost and benefit side. (4) Implementation of such policies typically involves persuasion, for example, convincing people or groups to reduce consumption in situations where economic models of rational behavior argue against such reductions. Environmental goods such as clean air, drinkable water, species diversity, and a life-sustaining climate are common-pool resources, and rational economic analysis prescribes short-sighted, selfish depletion of such resources (or failure to invest in their upkeep to ensure their continued existence or quality) as the dominant behavior, even though more long-sighted and cooperative behavior would be socially desirable (Bowles, 2004). While most policy decisions possess these four characteristics to some extent, they seem to loom particularly large for policy decisions in the environmental domain.

Theoretical Background and Assumptions

In describing environmental decision-making processes in their possible variations, this chapter draws on theory in social cognition. Behavior is assumed to be determined by unconscious and conscious inference and decision processes, which are elicited by conditions in the external environment in combination with internal factors that include prior experience, expectations, and goals (Weber and Johnson, 2009). This body of theory is informed by insights from behavioral decision research that has documented people's limitations in attention, memory, and information processing. It is a perspective often referred to as bounded rationality (Simon, 1982). When preferences are constructed while decisions are made, the processes used to do so are different and often simpler than the as-if calculations implicitly assumed by rational-economics models of choice (Kahneman, 2003; Lichtenstein and Slovic, 2006).

The first part of the chapter will review some behavioral phenomena likely to be at play in environmentally relevant decisions that should *increase* our concern about the challenges faced by environmental policy makers beyond those already established by a rational-expectations analysis of common-pool resource dilemmas (Hardin, 1968). In particular, we will examine the negative impact of the following phenomena: (1) People lack appropriate visceral

reactions to important classes of environmental risks. (2) Cognitive and affective myopia, coupled with loss aversion, makes the immediate costs and sacrifices typically required for environmentally responsible behavior loom large, whereas future benefits have little appeal because people apply extremely high discount rates. (3) The uncertainty of future risks or benefits complicates the task even more, with ambiguity aversion and the underweighting of small probabilities in decisions based on personal experience of consequences playing important roles in people's environmentally relevant decisions. As a result, decision makers who approach environmentally relevant decisions in either an analytic or an affect-based mode will not likely voluntarily modify existing problematic behavior, for example, reduce their energy consumption.

Fortunately, this is not where the story ends. The second part of this chapter will ask whether Hardin's (1968) "tragedy" of the commons could perhaps be downgraded to a "drama" (Ostrom et al., 2002). We will see that people might be induced to act in more collective ways that also increase their own long-term individual benefits if three sources of cognitive abundance with which they are equipped are used to shape the decision environment in ways that will facilitate more environmentally sustainable behavior: (1) the multiple ways in which they can look at information (e.g., framing, mental accounting), (2) the broad range of goals (e.g., individual vs. social goals, promotion vs. prevention goals) they have that can be selectively activated, and (3) their ability to decide upon a course of action in multiple and qualitatively different ways (e.g., using habits, rules, roles, affect, and calculations).

Insights derived from these sources of cognitive abundance can guide the design of environmental policies. This might include interventions to induce the American public to implement a long list of existing energy-efficiency innovations (e.g., home insulation or different lighting technology like LED or CFL bulbs) that would result in no reduction of their standard of living, produce a net cost savings over a multiyear period, and sizably reduce U.S. energy-use and carbon dioxide emissions (Granade et al., 2009). The ways in which people process information about uncertain events removed in space and time will be discussed in the next section and may help explain why these alternative actions, which appear to be economically and environmentally dominating ("low-hanging fruit"), are not being adopted by the overwhelming majority of the American public.

Behaviors of Concern

The different ways in which people process information when making judgments or arriving at decisions have been classified into two contrasting categories, sometimes referred to as two "systems" (Chaiken and Trope, 1999; Kahneman, 2003; Sloman, 1996). The first category of processes works on the basis of temporal and spatial associations and similarity. It uses real-world experience as input. Its basic mechanisms are automatic, that is, associations are established, stored, and retrieved essentially without effort and conscious awareness. Such associative processes teach us, for example, to dislike food eaten just prior to symptoms of food poisoning and to avoid foods of similar taste or smell in the future. Associative processes map uncertain and adverse aspects of the environment into affective responses (e.g., fear, dread, anxiety) and thus represent *risk* as a *feeling* (Loewenstein et al., 2001).

Many contemporary environmental or technological risks (e.g., climate change or nuclear power) do not (yet) provide direct experience of adverse consequences most of the time, either because of successful risk management or because the adverse consequences have a small probability and often lie in the future. Such risks, based on model-based predictions, are typically communicated to the public in an abstract and symbolic way, for example, as probability distributions of possible consequences. Such information needs to be processed by the second category of processes people have at their disposal. This second class of processes works on the analytic algorithms and rules specified by normative models of judgment and choice (e.g., the probability calculus, Bayesian updating, formal logic, and utility maximization) and also on simpler versions of such algorithms that explicitly combine information. They are slower than automatic associative processes and require conscious awareness and control. The algorithms that these analytic processes implement need to be taught explicitly, and the appropriateness of their use for a given situation needs to be apparent, that is, they do not get triggered automatically.

Hardin and Banaji (this volume) similarly distinguish between visible conscious and invisible unconscious (implicit) processes. Such dual-process accounts have been very useful as a conceptual framework, although one has to be careful not to take the dichotomy too literally. While elements of the two processing systems can operate in parallel, it is unclear whether they can operate in isolation, and they also interact with each other in complex ways (Evans, 2007; Weber and Johnson, 2009). Analytic reasoning is often guided and assisted by automatic processes that include associations and affect (Damasio, 1994), and few decisions are made in a completely reflexive way. When both types of processing are in operation but their outputs disagree, the output of the associative system typically prevails, because its output has greater vividness and emotional salience.

Even in seemingly very analytic contexts, such as financial investment decisions, subjective and largely affective factors have been shown to influence perceptions of risk (Holtgrave and Weber, 1993) and the choice of investment options (Weber, Siebenmorgen, and Weber, 2005). Hersch and Viscusi (2006) connect affective factors to seemingly analytic considerations in the environmental domain, showing that national differences in worry about global warming correlate with willingness to pay more for gasoline, if such price increases would result in less harm to the environment.

Insufficient Visceral Reactions to Environmental Risks

As suggested by Peters and Slovic (2000), affect—and, in particular, negative affect—is the wellspring of action. The feeling of fear powerfully motivates us to remove ourselves from a dangerous situation (Loewenstein et al., 2001). The absence of any affective or visceral response to such environmental risks as radon contamination, coastal plains flooding, or climate change may well be responsible for the arguably less-than-optimal allocation of personal and collective resources to deal with such issues (Dunlap and Saad, 2001). Behavioral decision research over the past thirty years provides some answers as to why the general population and their public officials may show less concern about some risks considered significant by domain experts, but then overreact to other risks, which experts consider insignificant.

People's affective reactions to risky situations often do not agree with more objective measures of risk that quantify either the statistical unpredictability of outcomes or the magnitude or likelihood of adverse consequences (Sunstein, 2006 and this volume). Instead, visceral judgments of risk are determined by other (psychological) risk characteristics that elicit affective reactions as part of our evolutionary heritage. The psychological risk dimensions that strongly influence judgments of the riskiness of material risks in ways that go beyond their objective consequences (Fischhoff et al., 1978) are described by two factors (Slovic, 1997). *Dread risk*, the first factor, is experienced in the face of hazards associated with a perceived lack of control over risk exposure and with consequences that are potentially catastrophic: terrorist attacks, nuclear reactor accidents, or nerve-gas attacks. *Unknown risk*, the second factor, is associated with how much is known about the hazard, how easily exposure and adverse consequences are detectable, and whether it is natural or man-made. At the high (top) end, we find chemical hazards and radiation, which might kill exposed parties without their awareness, and DNA technology, which might have serious consequences not yet tested by time. Slovic, Lichtenstein, and Fischhoff (1984) suggest that these more affective reactions to risk are forward-looking in ways not always captured by the expected value calculations of experts based on actuarial figures or scientific models. A large accident portends possibly even larger future trouble, and concern about catastrophic potential or lack of control may play a useful societal function.

The risks analyzed to infer these psychological (more visceral than analytic) reactions were mostly technological and household health risks. It is instructive to try to place some important environmental risks into this two-dimensional space. If people conceive of climate change, for example, as a simple and gradual change on variables such as average temperatures and precipitation or the frequency or intensity of specific extreme weather events (frosts, hurricanes, or tornadoes), then the risks posed by climate change would appear to be well known and exposure, at least in principle, to be controllable at the individual level ("move from Miami to Vancouver when things get too hot or dangerous in Florida"). While some of the perceived control may be illusory, the perceived ability or inability to take corrective action is an important component of vulnerability.

The main conclusion from this section is that, without sufficiently strong visceral reactions to many environmental risks (if they are considered "natural" and well known), people may not be motivated to take corrective or evasive actions. In the section on potentially useful behavioral insights, I will argue that risks can be reframed, and environmental risks can be presented as more uncontrollable, or man-made, to activate the feelings that something is amiss, which is known to result in greater risk management.

Appeals to fear are problematic for reasons beyond the fact that people do not naturally worry about environmental risks like climate change, one such reason being that people appear to have a *finite pool of worry* (Weber, 2006). As concern about one type of risk increases, worry about other risks frequently decreases, as if people had a limited budget to spend on worry. A Pew Research Center opinion poll (2009) found that levels of concern about climate change had declined in October 2009 relative to a high in 2006 that had been maintained as late as May 2008. Presumably that decline in concern with the climate was the result of increased concern about the national and world economy and unemployment. Hansen, Marx, and Weber (2004) found evidence that was consistent with a finite pool of worry among farmers in the Argentine Pampas. As concern about climate risk increased in the course of a two-day farm decision workshop that provided information about the potential impacts of increased climate variability, concern about political risk went down (post- vs. pre-workshop) even though the level of political risk had not changed over those

two days. In addition, those who stated greater worry about political risk (either pre- or post-workshop) worried less about climate risk. If people's capacity for worry or concern is finite, then efforts to raise greater concern to motivate protective or mitigation action against some risk by, for example, providing concrete images of possible damages, come at the cost of potentially reducing concern about other risks. The finite pool of worry concept is related to, though certainly not identical to, the concept of risk homeostasis (Wilde, 1998).

Appeals to fear are also problematic because of the *single-action bias* (Weber, 1997), which is the propensity to take only a single action in response to a fear signal, even in situations where a broader set of remedies might be called for. Taking the one action to respond to a problem at hand seems to reduce or remove the feeling of worry or concern. Without the latter affective marker, motivation for further action is reduced. Weber (1997) found that Midwestern farmers engaged in only one of three plausible classes of protective actions against climate change. Hansen, Marx and Weber (2004) similarly found that farmers in Argentina employed only one of several protections against climate variability and climate change. If they had the capacity to store grain, for example, they were less likely to also irrigate and invest in crop insurance. Thus fear appeals may also backfire because they motivate people to take simpler actions than are warranted by the complexity of contemporary problems.

Cognitive Myopia, Loss Aversion, and Hyperbolic Time Discounting

Sunstein (this volume) depicts cost-benefit analysis as a solution against "misfearing," that is, against people's incorrectly calibrated reactions as described in the previous section, as well as others. "The problem of misfearing," according to Sunstein, "results from use of the availability heuristic, from informational and reputational cascades, from intense emotional reactions, from processes of reasoning in which benefits are salient but costs are not, or from miscalculating the systemic effects of one-shot interventions." However, the behavioral evidence to be presented in this section suggests that environmental decisions are problematic not just when addressed affectively but also when based on calculations that trade-off costs against benefits, outcomes against probabilities, or generally evaluate the consequences of choice options in a more analytic fashion. Sunstein's remedy may make some sense when applied to the cost-benefit analyses done by domain experts, but not to the on-the-fly (and hence more fallible) calculation-based decisions described in this section, although some of the issues (e.g., about the correct discount rate to value future costs and benefits) encountered with intuitive calculations also surface in debates about expert-based cost-benefit analyses (e.g., Weitzman, 2007)

What the behavioral regularities described in this section have in common is that they bias the analytic evaluation of choice options in environmentally impactful situations against socially responsible and long-term, individually and socially beneficial behavior, which typically involves immediate costs and sacrifices that loom large, while their much delayed and uncertain future benefits get unreasonably discounted.

COGNITIVE MYOPIA

Myopia, or shortsightedness, has been cited as an explanatory construct in the context of loss aversion, most prominently by Benartzi and Thaler (1995) in their explanation of the equity premium puzzle, that is, of the puzzling fact that investors hold bonds to the degree that they do, given that the returns on stocks are significantly larger, albeit riskier. That behavior, which is inconsistent with reasonable assumptions about risk aversion, can be explained by the assumption that investors do not apply sufficiently long time horizons to their investment decisions but, instead, compare and contrast the outcomes of risk-free and risky investment opportunities on a quarterly basis and get disproportionately agitated by losses. Such shortsightedness in their time horizon also contributes to people's reluctance to save adequately for their retirement, unless such saving is legally mandated or encouraged by nudges that take advantage of people's myopia in some form of psychological judo (Thaler et al., this volume). Failures to integrate the outcomes of a series of decisions that should be considered in combination (e.g., the returns on an investment across a series of months or the returns across all investments in one's portfolio) are another example of myopia, which focuses attention on just the most recent return or the single investment (Read, Loewenstein, and Rabin, 1999; Thaler and Johnson, 1990).

Cognitive myopia thus prevents people from accurately perceiving the future benefits of immediate costs or of reductions in immediate benefits. As a result, people fail to buy more-energy-efficient appliances or make a host of other energy efficiency investments, where higher up-front purchase costs are more than compensated for by future energy savings (Gillingham, Newell, and Palmer, 2009).

LOSS AVERSION

Loss aversion is the label given to an important property that distinguishes prospect theory (Tversky and Kahneman, 1992) from expected utility theory (von Neumann and Morgenstern, 1944), namely a much

greater (dis)utility for outcomes that are encoded as losses relative to a reference point than for outcomes of the same magnitude but encoded as gains relative to a different reference point. Loss aversion explains a broad range of choices observed in both the laboratory and the real word that deviate from the predictions of rational-economic choice theory (Camerer, 2000). Employees may be willing to forgo projected future increases in salary (forgone gains) but will fight tooth and nail to avoid any cuts in their current salary (losses). With the status quo as a very salient reference point, loss aversion makes it hard for policy makers to convince people to reduce consumption or, more generally, their standard of living below current levels. While naturally used reference points in combination with loss aversion can be problematic in a range of policy domains (see Thaler, this volume), prospect theory also provides policy makers with a design tool, namely the ability to change decision makers' reference points, with implications for the way in which outcomes get evaluated. The purchase of an insurance policy against drought by a farmer, for example, involves a sure out-of-pocket loss of money (the insurance premium) for the unsure and low-probability benefit of avoiding a much larger loss in the case of drought. Prospect theory predicts risk seeking in the domain of losses, which would mean choosing the probabilistic loss over the sure loss. Skillful insurance salespeople have long known that they need to move a farmer's reference point away from its usual position at the status quo, down to the level of the possible large loss that could be incurred in case of drought. By focusing the insuree's attention on the severity of the possible loss and the resulting consequences, all the smaller losses (including the insurance premium) are to the right of (thus less negative than) this new reference point, making this a decision in the domain of (forgone) gains, where people are known to be risk averse and will choose the sure option of buying the insurance.

Attribute framing can have similar effects. Levin and Gaeth (1988) showed that people rated the taste of minced beef higher when it was described to them as 75% lean than as 25% fat, presumably because the discrepancy between 25% and 0% fat (a relative loss) is considered more severe than the discrepancy between 75% and 100% lean (a foregone gain). A recent study showed that Republicans were much more likely to purchase a more expensive plane ticket that included a fee to compensate the carbon dioxide emissions generated by the flight when that fee was called an offset (which was presumably encoded as a foregone gain) rather than a tax (which most people, and especially Republicans, encoded as an out-of-pocket loss) (Hardisty, Johnson, and Weber, 2010).

HYPERBOLIC TIME DISCOUNTING

Future financial costs and benefits ought to be discounted in value (e.g., by the current rate of interest offered by banks), ideally by a constant amount per period of time delay, as described by an exponential discount function. Empirical research shows, however, that people apply sharp discounts to costs or benefits that will occur at some point in the future relative to obtaining them immediately (e.g., a year into the future vs. now) but discount much less when both time points are in the future, with one occurring later than the other (e.g., two years versus only one year into the future) (Loewenstein and Elster, 1992). Such behavior has been described by a hyperbolic discount function that shows its steepest decrement in current value as we defer immediate consumption (Ainslie, 1975). Actions to mitigate negative environmental consequences are unattractive within this framework because they require immediate sacrifices in consumption that are compensated only by heavily discounted and highly uncertain benefits at a much later point in time.

In many situations, including those of intertemporal choice, people do not have firmly established preferences for choice options but, instead, construct them as they go by recruiting arguments for different choice options, by examining external evidence, and by recruiting internal evidence from memory (Lichtenstein and Slovic, 2006; Payne, Bettman, and Johnson, 1993; Weber and Johnson, 2009). Trope and Liberman (2003) showed that when people recruit evidence internally, events in the future elicit different arguments for and against them than imminent events. Events in the distant future (e.g., an invitation to give a paper at a conference next summer, or the prospect of coastal flooding thirty years from now, to use an environmental example) are construed in abstract terms, whereas events close to us in time (the upcoming trip on Monday to attend the long-scheduled conference, or the prospect of a major hurricane passing through town this afternoon) are construed in very concrete terms. Abstract representations of consequences in the distant future lack the concrete associations that are connected to emotional reactions. In contrast, concrete representations of consequences in the present tend to be saturated with affective associations. This difference in the affective richness and concreteness of the representation of temporally close versus distant consequences may well lie at the root of observed problems of self-control, be they impatience and impulsivity in obtaining desirable outcomes (Laibson 1997; Mischel, Grusec, and Masters, 1969) or procrastination with undesirable tasks (O'Donoghue and Rabin, 1999). Mitigating

actions against environmental problems are often perceived as requiring the sacrifice of concrete, immediate benefits for the sake of abstract, distant goals. As will be discussed in the section on useful behavioral insights, there are other and more positive ways of framing such choices. However, when pro-environmental behaviors are framed as involving sacrifices, the strong negative affect associated with the concrete, immediate costs, the absence of feelings of worry about abstract and distant negative consequences of failures to act, and the discounting of future benefits will result in ecologically damaging consumption decisions and actions.

The preferences-as-memory framework of Weber and Johnson (2006) has examined the attentional processes and memory-retrieval operations that underlie preference construction. Under this framework, query theory (Johnson, Häubl, and Keinan, 2007) assumes that when asked to delay consumption, people first assess the evidence arguing for immediate consumption and only then assess evidence that argues for delaying consumption. Query theory postulates that, in order to help people reach a decision, evidence generated in favor of an action (e.g., immediate consumption) tends to interfere with the subsequent generation of evidence arguing against that action and for other actions. Weber et al. (2007) provided empirical support for both conjectures and succeeded in drastically reducing the intertemporal discounting in people's choice by prompting them to first generate evidence in favor of deferring consumption, followed by a prompt to generate evidence in favor of immediate consumption. Query theory thus provides policy makers with a tool that may help with the successful implementation of environmental policies as further discussed in the section "Useful Behavioral Insights," below.

Risk and Ambiguity Aversion and Small Probabilities

In addition to behavioral phenomena that influence the valuation of outcomes of different choices, there also are behavioral regularities that can bias people's evaluation of the probabilities of environmentally relevant choice options.

RISK AND AMBIGUITY AVERSION

Expected utility theory (von Neumann and Morgenstern, 1944) has been central in the analysis of choice under risk and uncertainty not only for its compelling axiomatic foundation and mathematical tractability, but also for its ability to describe a large number of economic choices (Woodward, 1998). It describes deviations from expected value maximization by postulating a nonlinear and mostly concave utility function that goes back to Bernoulli (1738/1954). Classical demonstrations referred to as the Allais (1953) and Ellsberg (1961) paradoxes have given rise to additional theoretical elaborations (Camerer 2000; McFadden 1999). The Allais paradox demonstrates the certainty effect, an important feature of prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992). The certainty effect, namely, that certain outcomes get more decision weight than they deserve based on their likelihood of occurrence, is captured by prospect theory's probability weighting function, which has a discontinuity before the endpoints, making events that occur or do not occur for sure far more impactful than those that occur with probability .999 or .001, respectively. Because sure outcomes in environmentally relevant decisions (such as deciding between a more energy-efficient refrigerator with a higher purchase price and a cheaper refrigerator with higher energy consumption and thus more carbon dioxide emissions) tend to be on the negative or cost side (i.e., the greater purchase price), while gains (i.e., the energy savings) are delayed in time and somewhat uncertain, it is easy to see that the certainty effect may introduce yet another bias toward environmentally less responsible choices in such decisions.

The Ellsberg paradox established that decision makers distinguish between well-specified probabilities (risk) and ill-defined probabilities (uncertainty), even if the best estimates of the latter have the same value as the former. Ellsberg (1961) referred to the dislike that decision makers have for options with ill-defined probabilities as *ambiguity aversion*, and Hsu et al. (2005) recently provided neuroimaging evidence that risky and uncertain choices are processed in different brain regions. Heath and Tversky (1991) demonstrated that ambiguity aversion is not universal and, in particular, is not found in situations in which decision makers believe they have expertise in the domain of choice, preferring, for example, sports gambles with ill-defined probabilities of winning or losing to money lotteries with well-specified probabilities. Whereas one can expect to find many members of the general public who think of themselves as experts in such domains as sports or the stock market, and thus do not shy away from choice options with ill-defined probabilities, the number of people who would believe themselves to be experts in environmentally relevant technical domains (e.g., the pros and cons of hybrid electric vs. conventional gasoline engines in cars) has to be much smaller at this time. This suggests that for such decisions the uncertainty and ambiguity of positive benefits of environmentally responsible choice options will more likely be seen as a

handicap rather than an opportunity. It also suggests a perhaps unexpected advantage of educating the public about technological innovations. Such education not only provides more accurate input for people's analytic processing of environmentally relevant choice options, but will also help to remove negative affective reactions to uncertainty that are associated with not-well-understood probabilistic mechanisms related to climate events and their consequences.

EFFECTS OF SMALL PROBABILITIES

An important distinction has been made between uncertain or risky decisions made from personal experience and those made from statistical description, because the ostensibly same information about possible outcomes and their likelihood of choice alternatives can lead to different choices depending on how the information was acquired (Hertwig et al., 2004, 2006). Decisions from experience rely on (repeated) personal encounters with uncertain choice options, the way animals make risky foraging decisions (Weber, Shafir, and Blais, 2004). While the outcomes of choice options may initially be completely unknown, repeated choices provide the decision maker with feedback about possible outcomes and their likelihood, in the limit with great objective accuracy. Decisions from description, on the other hand, are made based on outcome and probability information provided in some statistical summary that is communicated in verbal, graphic, or numeric form. This way of information communication and acquisition is available only to humans, with their ability for abstract, symbolic representation, but is the method on which almost all laboratory studies of risky decision making have been based (Weber, Shafir, and Blais, 2004).

Knowing *how* people have come to know about the possible outcomes of real-world choice options and their probabilities matters, because choices differ quite dramatically under the two information conditions when choice options include small-probability events. Members of the general public and domain experts often learn about choice option outcomes and their probabilities in different ways. In the case of insurance decisions (e.g., federally subsidized flood insurance, Kunreuther, 1984), individuals considering the purchase of insurance appear to make their decision based on personal experience with flood events in previous years, whereas the industry experts have access to actuarial information and thus make decisions from description. In the case of childhood inoculation decisions, the situation is the opposite. The pediatrician who administers hundreds of inoculations per year knows about the outcomes and their probabilities of inoculating or failure to inoculate from personal experience, whereas parents make this decision based on a description of outcomes provided in medical-information pamphlets or on websites. Weber, Shafir, and Blais (2004) and Hertwig et al. (2006) described the association- and affect-based learning mechanisms by which personal experience with low-probability events leads to more apparent risk taking than that observed when the same options are presented by statistical summary descriptions. People's evaluations of risky options under repeated sampling follow classical reinforcement learning models where initial impressions are continuously updated in a way that gives recent events more weight than distant events.[1] Because rare events have a small(er) probability of having occurred recently, they (on average) tend to have a smaller impact on the decision than their objective likelihood of occurrence would warrant.[2] In those rare instances where they do occur, recency weighting gives them a much larger impact on the decision than warranted by their probability, making decisions from experience more volatile across respondents and past outcome histories than decisions from description. In contrast, the probability weighting function of prospect theory, which was developed to account for data sets that describe risky decisions from description, predicts that decision makers in decisions from description will overweight small probability events, that is, give them more weight in their decisions than they deserve based on their likelihood of occurrence.

Consistent with these predicted differences in the weight given to rare events under the two information conditions, people living in flood plains—who, as mentioned above, make decisions about flood insurance based on their personal experience with floods, a low base-rate event—have tended to turn down even federally subsidized insurance (Kunreuther, 1984), which is consistent with an *under* weighting of the actuarial frequency of such floods. Parents contemplating inoculations of their children against childhood diseases that have a low probability of life-threatening side effects, who make this decision based on statistical summary information about the benefits and side effects, have often turned down epidemiologically effective inoculations, which is consistent with an *over*-weighting of the low probability of severe side effects.

Slovic, Kunreuther, and White (1974) argued for the importance and utility of studying bounded rationality in field settings and already predicted that incremental personal experience of natural hazards and decisions based on such information may not be captured by expected utility models and their extensions. Recent work on important differences in decisions from experience and decisions from description confirm their predictions. The relative indifference with which most politicians and members of the general

public consider small-probability–high-consequence events like catastrophic rainfall and bursting levies, until and unless they have recently occurred, is much closer to the predictions made by the reinforcement learning models of decisions from experience than to that of prospect theory for decisions from description.

Useful Behavioral Insights

This section will review insights from behavioral decision research that may offer more hopeful predictions for the feasibility of environmentally responsible and sustainable decisions. A better appreciation of the three types of cognitive abundance that will be reviewed in this section will provide environmental policy makers and those charged with implementing such policies with tools to shape the decision environment in ways that may facilitate more environmentally sustainable behavior. In particular, I will show that there is utility in knowing that there are (1) multiple ways to represent (or frame) choice options that influence decisions, (2) multiple goals held by decision makers, typically in parallel, that are activated to different degrees by contextual features, and (3) multiple qualitatively different modes in which people can arrive at a decision, with the mode or process often influencing the outcome.

Multiple Representations: Framing and Mental Accounting

People have been found to represent choice options in different ways that, while normatively equivalent, nevertheless affect their decisions.

GAIN VERSUS LOSS FRAMING AND RISK AND LOSS AVERSION

Our neural system is set up in ways that makes the relative evaluation of outcomes much easier and more accurate than absolute evaluation (Weber, 2004). As a result, people can be expected to search for implicitly or explicitly provided reference points in the environment by which to judge the value of outcomes (Hsee, 1996). Shifting the perspectives of decision makers in ways that change their subjective evaluations of choice options is referred to as framing (Kahneman and Tversky, 1984). Often such changes in perspective are brought about by moving the decision maker's point of reference. Given what we know from prospect theory about differential risk attitudes for gains versus losses and about loss aversion, it is obvious that choice selection can be influenced dramatically if the up-front costs can be reframed not as losses but rather as forgone gains. In a simulation based on realistic farm cultivation decisions involving economic and physical conditions and crop models, Podesta et al. (2008) showed that changes in the reference point by which farmers encode farm profits as either gains or losses strongly affect what combination of crops turn out to be optimal, if farmers are assumed to attempt to optimize their returns as evaluated by a prospect-theory value function rather than by an expected-utility function. Another variable that differs quite significantly as a function of the reference point for returns (and thus the region of the return distribution that is encoded as a loss and subject to loss aversion) is the value of information (VOI) of available seasonal climate forecasts, which tell farmers probabilistically, but with some measure of skill, whether the coming growing season is of an El Niño, a La Niña, or a "normal" type. Whereas the VOI of such climate forecasts is on average positive, in the vicinity of 6%–7% (meaning that farmers' satisfaction with their returns can be expected to improve by this percentage if they use the climate forecast in an optimal fashion), for some combination of parameter values (high reference points or aspiration levels and large loss aversion), the VOI can actually be negative (Letson et al., 2009). These results suggest more generally that policy makers need to better understand decision makers' utility function and reference points in order to evaluate the impact of technological innovations and policy interventions.

SOCIAL COMPARISONS AND REGRET

The outcomes obtained by others provide a very salient reference point for relative comparisons. Regret theory, which was independently first proposed by Bell (1982) and Loomes and Sugden (1982), assumes not only that people make such comparisons after the fact (feeling somewhat good when they fared better than others, and very bad when they fared worse), but also that they anticipate these comparisons and incorporate them into their original decision of what to do. If regret about worse outcomes and rejoicing about better outcomes were of equal magnitude, anticipation of such emotions would cancel each other out. The assumption that regret is stronger than rejoicing puts regret theory into the class of models that assume that people often operate under asymmetric loss functions, where an error in one direction is seen as resulting in more severe consequences than an error in the opposite direction (Weber, 1994). The experience of strong regret following the mental comparison of a decision's unfavorable outcome with better outcomes that would have been obtained had a different decision been made has obvious teaching functions and

can improve the quality of decisions. The prominent use of available climate-change adaptation technologies by trusted opinion leaders (e.g., seasonal climate forecasts that help adaptation to the greater climate variability known to accompany climate change; or the use of more drought-resistant seed corn in agriculture) can be a way of putting experienced and subsequently anticipated regret about worse outcomes to work to help later adopters of such technologies modify their practices in a more timely fashion.

Advocacy of the precautionary principle to guide action in situations of highly uncertain but potentially very high stakes decisions can be traced back to a host of political and otherwise strategic motivations (Löfstedt, Fischhoff, and Fischhoff, 2002). Those motivations do not exclude, however, an intuitive psychological appeal of the principle, based on the anticipation of regret that could be extremely large (even if experienced only under a low-probability future state of the world) if human habitability of planet earth were to be compromised by the failure to take action because of the desire to not incur manageable economic costs.

DECISION-MAKING UNIT

Another way in which environmentally relevant decisions could be reframed in ways that might affect choices is by changing the focus of such decisions from individuals to groups. The decision makers' default foci of attention may be on themselves (i.e., on their needs, goals, and interests), since human processing limitations guide people into the direction of minimal effort, and personal needs, goals, and interests are most easily ascertained and most important. However, this typical attentional focus can be influenced by both the immediate decision environment and the more chronic surrounding cultural environment. Priming of broader social identities (e.g., national identity by a country's flag or other cultural icons) have long been used in times of war or other conflict to induce people to incur personal sacrifices for the sake of larger collectives and future times. Milch et al. (2009) showed that something as simple as the decision-making unit can focus attention on different goals and motivations. When groups of three people considered a delay-of-gratification decision (that affected them individually, as well as the group as a whole) for the first time collectively, they showed much greater patience and spent less time discounting than individuals either alone or in a group who had first considered the decision individually.

The "we" in a broader frame does not even need to be interpreted as "I and others." It can also refer to "my current self and my future self." Thus Bartels and Rips (2010) showed that individual differences in the perceived closeness to future selves had implications for how much people were willing to sacrifice current consumption for future consumption. When people make choices for their future selves, those choices tend to be affected more by rational, and less by affective, considerations and tend to resemble the choices they would make for other people (Pronin et al., 2008). In an extension, Wade-Benzoni (2009) found that people's perceived distance to future generations was inversely related to their generosity toward those generations.

Social psychological research has shown that group identity that turns the decision maker and actor from an "I" to a "we" can be induced by very minimal manipulations (Brewer, 1979). In any given decision, such changes in focus from individual identity and individual goals to group identity and group goals will be transient. However, as with any repeated execution of a process or behavior, initially transient and effortful processes become more chronic and automatic over time (Schneider and Chein, 2003). Cultures that emphasize the importance of affiliation and social goals over autonomy and individual goals have been shown to influence the way in which decisions under risk and uncertainty get made (Weber and Hsee, 1998), and different cultural emphases on individualism vs. collectivism are reflected in cultural products that shape chronic attention, from children's books, to proverbs and novels (Weber, Ames, and Blais, 2004; Weber and Hsee, 1998) and in cultural institutions and other affordances (Weber and Morris, 2010).

MENTAL ACCOUNTING

Mental accounting, or people's tendency to post financial and other income and expenses to separate accounts with different rules (Thaler, 1980), has often been depicted as a somewhat irrational adaptation to finite mental capacity and to self-control issues (Heath and Soll, 1996). However, the principle of psychological judo can be applied to this behavioral regularity as well, and somewhat dysfunctional behavior can be used at times as a tool that helps decision makers achieve their own best long-term interests. Just as new life events and attendant new goals result in the setting up of physical accounts (e.g., a savings account to pay for future college expenses of a new baby), goals can be made more salient to decision makers by helping them set up mental accounts for those goals. Concrete and vivid concepts like a person's carbon footprint, which can be measured using simple web tools (e.g., http://www.carbonfootprint.com/calculator.aspx), have played an important role in raising awareness among members of the general

public (in the Western world, at least) about their personal impact on local and global carbon dioxide levels. Whereas much remains to be done to make existing personal carbon-footprint calculators consistent and transparent (Padgett et al., 2007), these physical accounts facilitate the establishment of a mental account and, more importantly, provide a metric on which personal progress can be tracked. Setting up such accounts is especially effective if paired with actionable suggestions about how carbon dioxide emissions can be reduced with no financial penalties (Granade et al., 2009). Websites or personal consultants (e.g., http://www.carbon-partner.com/) who provide calculation aids to determine one's carbon footprint help individuals overcome attentional and information-processing limitations. Organizations that provide low-transaction-cost, web-based ways of offsetting carbon dioxide producing activities are an easy way for individuals to alleviate the guilt produced by an affective processing of the situation or to put their carbon dioxide account back into the black if the situation is processed analytically, though some have recently questioned whether these solutions are too "easy" (Wish, 2008) and may actually result in increased CO2 emissions, likening such offsets to modern indulgences.

Multiplicity and Flexibility of Goals

People's behavior is motivated by a broad range of goals, from individual goals of self-preservation and procreation; to more social goals, such as feeling connected; to meta-cognitive goals, such as feeling confident or in control. Various taxonomies of human needs—in sociology (Weber, 1921/1984), philosophy (Habermas, 1972), and psychology (Hilgard, 1987)—suggest that human needs are far broader than the maximization of personal material survival or genetic propagation. While material needs and instrumental goals (the human needs acknowledged for rational-economic man) are important, other classes of needs also play important roles. Social needs, for example, include both affiliation (wanting to belong) and individuation (asserting one's autonomy and uniqueness). Tyler (this volume) also emphasizes the fact that social motivation matters.

In any given situation, people have a multiplicity of goals. Choice options may be evaluated on their ability to satisfy the largest number of active goals, and new choice options may be generated if existing ones do not allow the decision maker to reach all of the important goals (Krantz and Kunreuther, 2007). To the extent that different goals in many situations are contradictory (e.g., wanting to consume *and* to conserve), decisions typically require a trade-off between the extent to which one or the other goal can be satisfied, even though people dislike this realization and have evolved ways of making decisions that minimize conscious tradeoffs (Payne, Bettman, and Johnson, 1993).

Specific human needs or goals can be temporarily activated by the nature of the choice set (Krantz and Kunreuther, 2007), primes in the external environment (North, Hargreaves, and McKendrick, 1997), or by a preceding task that implies the goal in question (e.g., a communal writing task, where a group of students compose a joint letter to the dean; Arora et al., 2009). North, Hargreaves, and McKendrick (1997) found that German wines were purchased 73% of the time when German (rather than French) background music was playing in the store, and French wines 77% of the time when French music was playing, even though customers were not aware of any effect on their purchase behavior. Arora et al. (2009) reported that cooperation in a social dilemma game went up from 43% to 75% when the preceding task required cooperation, relative to a control where individual students each previously had to act on their own.

Multiple Modes of Making Decisions

In the section "Behaviors of Concern," several pieces of evidence suggested that environmentally relevant decisions (e.g., choices in common-pool resource dilemmas) are seriously handicapped if people consider them in an analytic or calculation-based way, either with the unbounded rationality of selfish individual utility maximization or in a boundedly rational fashion (Marx and Weber, 2011). Fortunately, people are not restricted to making such decisions in an analytic way that compares costs and benefits and weighs outcomes and their probabilities. Calculation-based decision making may not even be the mode most prominently used by most people most of the time to make these and other decisions (Weber, Ames, and Blais, 2004). In this section, we further describe calculation-based, as well as other modes, of making decisions.

Weber and Lindemann (2007) distinguished between three classes of decision modes, namely calculation-based, affect-based, and recognition-based, which are referred to colloquially as decisions made by the head, by the heart, and by the book. These three classes of decision modes encode and utilize different situational inputs and apply different psychological processes. Calculation-based decisions involve analytical thought. Affect-based decisions are based on immediate, holistic, affective reactions (Damasio, 2000) and include impulse shopping (i.e., approach behavior that is driven by positive affect

toward the object of purchase) and decision avoidance (i.e., avoidance behavior that is driven by negative affect toward situations that offer no positive choice options or are too complex).

In recognition-based decision making, the decision maker recognizes a decision situation as a member of a class for which a satisfactory action is known (Simon, 1990). Recognition-based decisions come in different variants. In case-based decisions, the decision maker is typically an expert with a memory store full of specific situations in her domain of expertise, with the most appropriate action stored for each one. These mental representations can be thought of as "if-then" productions, where the *if* element is a set of conditions that must be met in order to trigger the resultant action represented by the *then* part of the production. The expert decision maker is able to unconsciously apply these production rules, which have been developed through repeated experience, as has been suggested by research on experts such as firefighters and jet pilots (Klein, 1999).

Rule-based decisions are another type of recognition-based decisions. These rules may be laws ("if you are driving and come to a red light, then you must stop") or other types of regulations (parental rules, self-imposed admonishments, societal norms, or company rules) (Prelec and Herrnstein, 1991). In role-based decisions, the decision context elicits a rule of conduct that derives from one of the social roles of the decision maker (March and Heath, 1994). Roles can include positions of responsibility within society (the role of parent), group memberships (the role of being a Christian), and self-defining characteristics (the role of being honest). Each of these roles has associated obligations that are recalled and executed when a triggering situation is encountered.

Implicit rules and role-related obligations are often acquired through observational learning and imitation. Sociologists and psychologists (from Ellwood [1901] to Sloate and Voyat [2005]) have long argued that modern notions of the autonomous self have falsely emphasized the role of individual decisions on human behavior over that of social influences. Copying the observed behavior of others is a widespread phenomenon of which the imitator is typically unaware and plays a large role in human development (Meltzoff and Moore, 1999).

Conditioned responses and habits acquired without conscious awareness probably determine a large amount of behavior. Unconscious processing occurs at the encoding stage of learning, where much information is stored for future use without our explicit intention (Reber, 1996), and at the retrieval stage, where primes in the external or internal environment can increase the accessibility of a subset of information, goals, or intentions, thus influencing observed behavior (Weber and Johnson, 2006). For example, the dimension of comfort versus price could be primed by exposing internet shoppers who were looking for sofas to either feathery clouds or $ symbols, respectively, in the background wallpaper of the initial web store page. Shoppers bought sofas that scored higher on the primed dimension (Mandel and Johnson, 2002). Emotional reactions above or below our level of awareness also often mediate learning by leading to approach and avoidance responses (Damasio, 1994; Loewenstein et al., 2001). While conscious learning or problem solving typically requires that the individual perceives there to be a problem, learning or adaptation without awareness has the advantage that it can happen without a conscious diagnosis that something is wrong and requires action.

Different decision modes can be executed in parallel and differ in their time course, with the more automatic ones turning in their verdict earlier, while the more conscious and effortful ones require more time to completion. People report using between two or three modes for any given decision (Krosch, Figner, and Weber, 2009; Weber and Lindemann, 2007). When the choice option selected by different decision modes is the same, cross-modal consensus on the best action contributes to decision confidence. When the indicated best choice option differs between decision modes, the relative weight given to the output of the different modes will determine which one gets selected, and decision confidence will be low(er) (Weber et al., 2000).

Engel and Weber (2007) discuss how the human information-processing system might implicitly decide which mode of decision making to apply in a given situation, or to which decision mode to give the deciding weight in situations of choice conflict. High-level goals or motives with high activation levels in a particular cultural context have been shown to influence the choice of decision modes. When cultures differentially emphasize the importance and desirability of such goals as autonomy versus social connectedness, for example, different decision modes become more prevalent, because different modes are differentially suited to satisfy those goals. Thus Weber, Ames, and Blais (2004) found that characters in Chinese twentieth-century novels, who operated in a collectivist culture emphasizing affiliation, were more likely to make role-based decisions and less likely to make affect-based decisions than characters in American twentieth-century novels, who operated in an individualist culture with its emphasis on autonomy. Western, consumption- and economic-growth oriented societies and their formal and informal institutions (including education, advertising,

entertainment, and the media) may be priming values and goals that are incompatible with more environmentally sustainable behavior. Their conceptualization of progress through competition, both against other economic or political players and/or against oneself over time, may stack the cards against the resource conservation and cooperation needed to overcome common-pool resource dilemmas, unless such competition can be redirected toward (friendly) competition to achieve carbon dioxide mitigation and other sustainability goals.

This previous discussion suggests that policy interventions should be designed to prime social roles that will induce people to use rule-based processes to determine their environmentally relevant behavior, which may necessitate changes in the dominant culture and its primes in Western countries.

Discussion

The goal of environmental policy is to change behavior of companies, governing boards and committees, and members of the general public in the direction of more sustainable, long-term, and socially and environmentally responsible actions. Conventional policy interventions do so either by command and control or by changing incentives, applying both carrots to encourage desirable behavior and sticks to discourage undesirable actions. This chapter has argued that this understanding of policy intervention options is too narrow in at least two ways. First, conventional policy interventions are not using the full range of goals that motivate behavior and changes in behavior. Second, conventional policy interventions do not utilize the full range of processes that people use to decide on a course of action. The tools described in the previous section (multiple and flexible goals, representations, and decision modes) suggest that there might be cheaper and more effective ways of achieving environmental goals than taxes and regulations. Evidence that neither the public nor markets are fully responsive to material incentives comes from the fact, already mentioned earlier, that many existing energy-efficiency increasing technological innovations (e.g., CFL or LED lighting, space heating and cooling technology) are nowhere near fully utilized. This is despite the fact that changing to such technologies constitutes net present-value savings, that is, the initial expenditures to switch are more than fully compensated by subsequent energy-cost savings over the lifetime of the devices. Why do consumers resist change even for such "low-hanging fruit" that provide net energy-cost savings, without any compromises in lifestyle and with positive social and environmental effects, let alone changes in environmentally relevant behavior that are perceived as requiring upfront sacrifices in quality of life? Are there ways in which policy makers can reframe such choices in ways that decision makers will act in individually, socially, and environmentally more beneficial ways willingly?

If people were rational-economic decision makers, the answer to this question would be the provision of better information about the possible risks of status-quo behavior to themselves or their children or grandchildren and about the benefits of changes in behavior. One obstacle to the success of rational calculation-based approaches in bringing about environmentally responsible, that is, sustainable-growth-promoting, behavior, even if people were Bayesian updaters and utility maximizers, is the fact that most of the costs and benefits of different behavioral options lie well into the future, with the result that the relative expected utility of different options depends critically and almost exclusively on one factor, namely the rate at which people discount future outcomes (Weitzman, 2007). This effectively turns calculation-based decision making in this domain into a philosophical or ethical question about the "correct" discount rate to use.

A large and growing literature on behavioral, and in particular psychological, issues in discounting (Loewenstein and Elster, 1992; Weber et al., 2007) has equal, and perhaps more important, implications for policy design. While there is some evidence to suggest that people discount outcomes in different domains differently (e.g., are even more impatient for immediate positive health outcomes than they are for immediate financial outcomes [Chapman, 1996]), environmental and financial outcomes seem to be discounted at very similar rates (Hardisty and Weber, 2009). In addition, domain differences in discounting are much smaller than differences in the discounting of future outcomes when they are being framed as either gains or losses, with much less discounting of future losses (Hardisty and Weber, 2009). These and other behavioral results suggest that there are different psychological, economic, and ethical reasons for discounting, which need to be better understood and disentangled (Hardisty et al., 2010), because they have different implications for policy design.

If not absence of information in the face of optimal or even biased cost-benefit calculations, what other reasons contribute to people's reluctance to change their behavior in environmental, as well as in other, contexts? This chapter points to automatic processes and behavior as contributing causes of people's apparent status quo bias. This suggests that people need to be jolted into changing any thoughtless resource-consuming habits, perhaps by scaring them, in the way movies like *The Day after Tomorrow* or

An Inconvenient Truth have been trying to do for climate change mitigation. Unfortunately, as described in the first part, people do not appear to be easily or lastingly scared by chronic environmental risks, and appeals to fear have important drawbacks in general.

The second part of this chapter provided some more positive suggestions about how to attract people's attention to environmental risks, that is, how to generate the *ex ante* concern that these risks seem to warrant *ex post*. The concretization of future events and movement of them closer in time and space seem to hold promise as interventions that will raise visceral concern (Marx et al., 2007). For example, simulations that provide visual evidence of the projected 10–30 year effects of plausible sea-level rises in people's favorite summer vacation location or of the disappearance of snow covers in their favorite ski resort may well raise visceral concern. Such interventions would need to be conducted with full awareness about unintended side effects (like reductions in concern about other important risks) and in ways designed to help people overcome cognitive and affective capacity limitations (e.g., the single-action bias).

Query theory (Johnson, Häubl, and Keinan, 2007; Weber et al., 2007) suggests that guided protocols by which decision makers consider arguments for conservation and climate change mitigation before they are allowed to consider arguments for staying with the status quo will help to improve the balance of support between the desire for immediate gratification and the goal of longer-term environmental preservation or sustainability toward the latter. Finally, better education in (environmental) science and statistics can create the familiarity with the scientific presentation of information that will reduce people's aversion to behavior options with uncertain consequences and may create citizens who give greater weight to the less-distorted output of their analytic processing system, moving the risk perception of the general public and its officials closer to that of environmental scientists.

Rule-based decision making, where choice follows from consciously or more automatically triggered norms of conduct, also seems to offer considerable advantages. Evangelical churches and other Christian denominations in the United States have recently started to reframe the debate about economic development versus environmental conservation from one about material costs and benefits to one of moral responsibilities and obligations (see Robinson and Chatraw, 2006). When a message about the moral imperative to preserve our planet with its natural resources for future generations ("stewardship of the earth") comes from credible sources (e.g., the National Council of Churches in the United States), decisions about consumption or conservation of resources will less likely be made by personal and myopic cost-benefit calculations and more likely by role- and rule-based decision processes that are less susceptible to impatience and excessive discounting of future consequences. There probably is considerable cultural universality in the effectiveness of such reframing of consumption decisions from a calculation of costs and benefits to one of responsibilities and obligations. What can be expected to differ across countries or cultures is the most effective organization to issue or endorse the norms of responsible consumption and stewardship. While evangelical or Christian churches may be a natural source of such rules of behavior in the United States, in more secular countries this role could fall to political organizations (e.g., green parties in Europe). In general, institutions with a long time horizon and a nongeographic and nonnationalistic focus that possess the trust of the general population would seem to be ideal issuers and disseminators of a philosophy and ethic of resource stewardship, preservation, and responsible and mindful consumption.

Even with the best intentions (e.g., about responsible stewardship of the earth), the devil is in the details. Goals and attitudes do not always translate into intended action (Gollwitzer, 1999). Attention to one's goals waxes and wanes with the activation levels of these goals, and many consumption behaviors have become partially or fully automatic, that is, they happen without much conscious thought. Overcoming these habitual behaviors may require explicit coaching followed by constant reminders and frequent feedback. Such active interventions are effortful, both for the mentor and the mentee. With humans' finite attention and processing capacity, more passive approaches toward keeping attention on the relevant goals and on instantiating the desired behaviors have much to commend themselves.

Measuring the costs of thoughtless consumption behavior by prominently displayed meters that provide constant feedback could be one way to draw and keep people's attention on the goals of saving and conservation. The arrival of smart-grid technology will enable careful experimentation with the best way of putting metering and feedback devices into action without overstretching people's processing capacity or losing their attention over extended periods of time. Immediate and prominent feedback (e.g., online fuel-efficiency calculation for a car, in a prominent dashboard display) can turn conservation into a video game where players can improve on their own previous record and can also engage in friendly competitions against other players on websites where their accomplishments can be listed.

Socially desirable goals can be kept active, either chronically or at strategic moments of important decisions, by designing decision environments that expose people to reminders of these goals or by designing

social environments that prime these goals and thus keep them active (Weber and Morris, 2010). The fact that the economic development of countries or regions is related to the degree of civic engagement of its population (Putnam, 1995), for example, can be explained by the greater chronic accessibility of economic-development-enhancing goals (which are related to social capital) as the result of recreational activities that require and foster these goals.

Another promising avenue toward encouraging environmentally responsible behavior in a low-effort and low-awareness way is the use of social influence, observational learning, and imitation. People are influenced by the behavior of others even in such seemingly rational settings as financial markets, and social influence seems to be particularly prevalent in situations with ambiguity about the best way to proceed (Schoenberg, 2007). Imitation can lead to behavioral change without any need for the realization that change is in order. At levels beyond the individual, demonstration projects conducted by visible groups or companies can serve a similar function, not only by showing the feasibility of a particular new technology or institution but also by triggering imitation on the part of other players.

A final promising tool is the judicious use of decision defaults (see Johnson and Goldstein, this volume). Most decisions have explicit defaults (e.g., nonresponse to a letter from a utility company will result in continuation of the electricity being provided from nonrenewable sources) even when these are not clearly spelled out. Only very rarely do we encounter situations where an active decision must be made. Given that defaults are unavoidable and do not diminish people's ability to choose the option they truly prefer if they are willing and able to process all available information to make an informed calculation-based decision, behavioral economists like Benartzi and Thaler (2004, this volume) argued, in the context of supplementary pension-savings decisions, that decision defaults should be set to the choice option that maximizes people's own long-term utility rather than to an option that the decision maker will later regret taking. Setting judicious decision defaults will ensure that people are not hurt by decision avoidance that might be triggered by informational overload and lack of interest (Goldstein et al., 2008). A similar argument has been made for decisions that impact other individuals and society at large, for example, organ donation. Johnson and Goldstein (2003) showed that differences in the decision default (from "opting in," that is, not being a donor unless one decides to be one to "opting out," that is, being a donor unless one decides not to) in European countries led to stunning differences in stated willingness to donate as well as in actual organ transplantations, with effects that far exceeded any other interventions, including very expensive information campaigns. Such observations have implications for environmentally relevant domains such as building codes, where energy-efficient and environment-friendly choice options should and could appear as decision defaults, thus greatly increasing their uptake (Dinner et al., 2009).

Query theory (Johnson et al., 2007; Weber et al., 2007) correctly predicts people's failures of hedonic forecasting in the case of changes in status quo. Changes to options other than the status quo are often resisted because people tend first to generate arguments for the status quo options, and subsequent queries that explore arguments for other choices are disadvantaged because of output interference. What people fail to realize is the fact that this process also kicks in after a default has been changed, often against their better judgment, so that their future evaluations of the new default tend to be far more positive *ex post* than they were *ex ante*. One such example is the smoking ban in bars imposed in New York City by Mayor Bloomberg in 2006 against much *ex ante* industry and public opposition, which was evaluated quite positively *ex post* by a large majority of New Yorkers a year or two later.[3] Query theory and such examples suggest that policy makers may sometimes be well advised to shape and lead public opinion rather than follow it.

Failing these various efforts to help individuals overcome their egocentric and present-focused myopia and lack of hardwired affective early-warning responses to environmental concerns that typically require present actions to prevent future problems, many environmental problems can be expected to increase in both the severity and detectability of negative consequences. While mounting personal and local evidence of such phenomena as climate change and its potentially devastating consequences can be counted on to be an extremely effective teacher and motivator in future years, these lessons may unfortunately arrive too late for corrective action.

Notes

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1. This sort of updating and learning is adaptive in dynamic environments, where circumstances might change with the seasons or according to some other cycles or trends.

2. An additional reason that rare events get underweighted is that with small samples, they often are not experienced at all and hence do not enter into the decision at all. The underweighting of small-probability events does not

depend on just these cases, however, but follows from the iterative updating rule, where the most recent event gets a high weight and the weight of previous events decays fairly rapidly. Rare events get underweighted on average, because they have a small(er) probability of occurring as the most recent event than more likely events.

3. I thank Eric Johnson for this example.

References

Ainslie, G. (1975). Specious reward: A behavioral theory of impulsiveness and impulse control. *Psychological Bulletin, 82*, 463–496.

Allais, P. M. (1953). Le comportement de l'homme rationnel devant le risque: Critique des postulats et axiomes de l'école americaine. *Econometrica, 21*, 503–546.

Ames, D. R., Flynn, F. J., and Weber, E. U. (2004). It's the thought that counts: On perceiving how helpers decide to lend a hand. *Personality and Social Psychology Bulletin, 30*, 461–474.

Arora, P., Peterson, N. D., Krantz, D. H., Hardisty, D. J., and Reddy, K. R. (2009). *Testing the limits of group affiliation on cooperation in social dilemmas.* Working paper. Center for Research on Environmental Decisions (CRED).

Bartels, D. M., and Rips, L. J. (2010). Psychological connectedness and intertemporal choice. *Journal of Experimental Psychology: General, 139*, 49–69.

Bell, D. E. (1982). Regret in decision making under uncertainty. *Operations Research, 30*, 961–981.

Benartzi, S., and Thaler, R. H. (1995). Myopic loss aversion and the equity premium puzzle. *Quarterly Journal of Economics, 110*, 73–92.

———. (2004). Save more tomorrow: Using behavioral economics to increase employee saving. *Journal of Political Economy, 112*, 164–187.

Bernoulli, D. (1738/1954). Exposition of a new theory on the measurement of risk (L. Sommer, Trans.). *Econometrica, 22*, 23–36.

Bowles, S. (2004). *Microeconomics: Behavior, institutions, and evolution.* Princeton, NJ: Princeton University Press.

Brewer, M. B. (1979). In-group bias in the minimal intergroup situation: A cognitive-motivational analysis. *Psychological Bulletin, 86*, 307–324.

Camerer, C. (2000). Prospect theory in the wild. In D. Kahneman, and A. Tversky (Eds.), *Choice, values, and frames* (pp. 288–300). New York: Cambridge University Press.

Chaiken, S., and Trope, Y. (1999). *Dual-process theories in social psychology.* New York: Guilford.

Chapman, G. B. (1996). Temporal discounting and utility for health and money. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 22, 771–791.

Damasio, A. (1994). *Descartes' error: Emotion, reason and the human brain.* New York: Penguin Books.

———. (2000). *The feeling of what happens: Body and emotion in the making of consciousness.* San Diego: Harvest.

Dinner, I. M., Johnson, E. J., Goldstein, D. G., and Liu, K. (2009). *Partitioning default effects: Why people choose not to choose.* Social Science Research Network Working Paper. Retrieved from http://ssrn.com/abstract=1352488

Dunlap, R. E., and Saad, L. (2001, April 16). *Only one in four Americans are anxious about the environment.* Princeton, NJ: Gallup Organization. Retrieved from http://www.gallup.com/poll/1801/only-one-four-americans-anxious-about-environment.aspx

Ellsberg, D. (1961). Risk, ambiguity and the Savage axioms. *Quarterly Journal of Economics, 75*, 643–669.

Ellwood, C.A. (1901). The theory of imitation in social psychology. *American Journal of Sociology*, 6, 721–741.

Engel, C., and Weber, E. U. (2007). The impact of institutions on the decision of how to decide. *Journal of Institutional Economics, 3*, 323–349.

Evans, J.S.B.T. (2007). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology, 59*, 255–278.

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., and Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sciences, 9*, 127–152.

Gillingham, K., Newell, R. G., and Palmer, K. (2009). Energy efficiency economics and policies. Discussion Paper dp-09-13. Washington, DC: Resources For the Future. Retrieved from http://www.rff.org/documents/RFF-DP-09-13.pdf

Goldstein, D. G., Johnson, E. J., Herrmann, A., and Heitmann, M. (2008, December). Nudge your customers toward better choices. *Harvard Business Review*, pp. 99–105.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*, 493–503.

Granade. H. C., Creyts, J., Derkach, A., Farese, P., Nyquist, S., and Ostrowski, K. (2009). *Unlocking energy efficiency in the U.S. economy.* Technical report. McKinsey Global Energy and Materials, McKinsey and Company.

Habermas, J. (1972). *Knowledge and human interests* (Trans. J. Shapiro). London: Heinemann.

Hansen, J., Marx, S., and Weber, E. U. (2004). *The Role of climate perceptions, expectations, and forecasts in farmer decision making: The Argentine Pampas and South Florida.* Technical Report 04-01. Palisades, NY: International Research Institute for Climate Prediction (IRI).

Hardin, G. (1968). The tragedy of the commons. *Science, 162*, 1243–1248.

Hardisty, D. J., Johnson, E. J., and Weber, E. U. (2010). A dirty word or a dirty world? Attribute framing, political affiliation, and query theory. *Psychological Science, 21*, 86–92.

Hardisty, D. J., Orlove, B., Krantz, D. H., Small, A., and Milch, K. (2009). *About time: An integrative approach to effective policy.* Working Paper. Columbia Center for Research on Environmental Decisions.

Hardisty, D. J., and Weber, E. U. (2009). Temporal discounting of environmental outcomes: Effects of valence outweigh domain differences. *Journal of Experimental Psychology: General, 3*, 329–340.

Heath, C., and Soll, J. B. (1996). Mental accounting and consumer decisions. *Journal of Consumer Research, 23*, 40–52.

Heath, C., and Tversky, A. (1991). Preference and belief: Ambiguity and competence. *Journal of Risk and Uncertainty, 4*, 5–28.

Hersch, J., and Viscusi, W. K. (2006). The generational divide in support for environmental policies: European evidence. *Climatic Change, 77*, 121–136.

Hertwig, R., Barron, G., Weber, E. U., and Erev, I. (2004). Decisions from experience and the effect of rare events. *Psychological Science, 15*, 534–539.

———. (2006). Rare risky prospects: Different when valued through a window of sampled experiences. In K. Fiedler and P. Juslin (Eds.), *Information sampling as a key to understanding adaptive cognition in an uncertain environment* (pp. 72–91). New York: Cambridge University Press.

Hilgard, E. R. (1987). *Psychology in America: A historical survey.* San Diego: Harcourt.

Holtgrave, D., and Weber, E. U. (1993). Dimensions of risk perception for financial and health risks. *Risk Analysis, 13*, 553–558.

Hsee, C. K. (1996). The evaluability hypothesis: An explanation for preference reversals between joint and separate evaluations of alternatives. *Organizational Behavior and Human Decision Processes, 67*, 247–257.

Hsu, M., Bhatt, M., Adolphs, R., Tranel, D., and Camerer, C. F. (2005). Neural systems responding to degrees of uncertainty in human decision-making. *Science, 9*, 1680–1683.

Johnson, E. J., and Goldstein, D. (2003). Do defaults save lives? *Science, 302*, 1338–1339.

Johnson, E. J., Häubl, G., and Keinan, A. (2007). Aspects of endowment: A query theory of loss aversion. *Journal of Experimental Psychology: Learning Memory and Cognition, 33*(3), 461–474.

Kahneman, D. (2003). A psychological perspective on economics. *American Economic Review, 93*(2), 162–168.

Kahneman, D., and A. Tversky (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*, 263–292.

———. (1984). Choices, values, and frames. *American Psychologist, 39*(4), 341–350.

Klein, G. (1999). *Sources of power: How people make decisions.* Boston: MIT Press.

Krantz, D. H., and Kunreuther, H. C. (2007). Goals and plans in decision making. *Judgment and Decision Making, 2*, 137–168.

Krosch, A., Figner, B., and Weber, E. U. (2009). *Choice processes and their consequences in morally conflicting military decisions.* Working Paper. Columbia Center for Decision Sciences.

Kunreuther, H. (1984). Causes of underinsurance against natural disasters. *Geneva Papers on Risk and Insurance, 31*, 206–20.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics, 112*, 443–477.

Letson, D., Laciana, C. E., Bert, F., Weber, E. U., Katz, R. W., Gonzalez, X. I., and Podesta, G. (2009). Value of perfect ENSO phase predictions for agriculture: Evaluating the impact of land tenure and decision objectives. *Climatic Change, 97*, 145–170.

Levin, I. P., and Gaeth, G. J. (1988). Framing of attribute information before and after consuming the product. *Journal of Consumer Research, 15*, 374–378.

Lichtenstein, S., and Slovic, P. (Eds.), (2006). *The construction of preference.* New York: Cambridge University Press.

Loewenstein, G., and Elster, J. (Eds.). (1992). *Choice over time.* New York: Russell Sage.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., and Welch, E. (2001). Risk as feelings. *Psychological Bulletin, 127*, 267–286.

Löfstedt, R., Fischhoff, B., and Fischhoff, I. (2002). Precautionary principles: General definitions and specific applications to genetically modified organisms (GMOs). *Journal of Policy Analysis and Management, 21*, 381–407.

Loomes, G., and Sugden, R. (1982). Regret theory: An alternative theory of rational choice under uncertainty. *Economic Journal, 92*, 805–824.

Mandel, N., and Johnson, E. J. (2002). When web pages influence choice: Effects of visual primes on experts and novices. *Journal of Consumer Research, 29*, 235–245.

March, J. C., and Heath, C. (1994). *Primer on decision making: How decisions happen.* New York: Free Press.

Marx, S., and Weber, E. U. (2011). Decision making under climate uncertainty: The power of understanding judgment and decision processes. In T. Dietz and D. C. Bidwell (Eds.), *Climate change in the Great Lakes region: Navigating an uncertain future.* East Lansing, MI: Michigan State Univ. Press.

Marx, S. M., Weber, E. U., Orlove, B. S., Leiserowitz, A., Krantz, D. H., Roncoli, C., and Phillips, J. (2007). Communication and mental processes: Experiential

and analytic processing of uncertain climate information. *Global Environmental Change, 17*, 47–58.

McFadden, D. (1999). Rationality for economists? *Journal of Risk and Uncertainty, 19*, 73–105.

Meltzoff, M. A., and Moore, M. K. (1999). Persons and representation: Why infant imitation is important for theories of human development. In J. Nadel and G. Butterworth (Eds.), *Imitation in infancy*. Cambridge: Cambridge University Press.

Milch, K. F., Appelt, K. C., Weber, E. U., Handgraaf, M.J.J., and Krantz, D. (2009). From individual preference construction to group decisions: Framing effects and group processes. *Organizational Behavior and Human Decision Processes, 108*, 242–255.

Mischel, W., Grusec, J., and Masters, J. C. (1969). Effects of expected delay time on the subjective value of rewards and punishments. *Journal of Personality and Social Psychology, 11*, 363–373.

North, A. C., Hargreaves, D. J., and McKendrick, J. (1997). In-store music affects product choice. *Nature, 390*, 132.

O'Donoghue, T., and Rabin, M. (1999). Doing it now or later. *American Economic Review, 89*, 103–124.

Ostrom, E., Dietz, T., Dolsak, N., Stern P. C., Stonich, S., and Weber, E. U. (Eds.) (2002). *The drama of the commons*. Washington, DC: National Academy Press.

Padgett, J. P., Steinemann, A. C., Clarke, J. H., and Vandenbergh, M. P. (2007). A comparison of carbon calculators. *Environmental Impact Assessment Review, 28*, 106–115.

Payne, J. W., Bettman, J. R. and Johnson, E. J. (1993). *The adaptive decision maker*. Cambridge: Cambridge University Press.

Peters, E., and Slovic, P. (2000). The springs of action: Affective and analytical information processing in choice. *Personality and Social Psychology Bulletin, 26*, 1465–1475.

Pew Research Center. (2009). *Fewer Americans see solid evidence of global warming. Modest support for "cap and trade" policy*. Pew Research Center. Retrieved from http://www.people-press.org/2009/10/22/fewer-americans-see-solid-evidence-of-global-warming/

Podestá, G., Weber , E. U., Laciana, C., Bert, F., and Letson, D. (2008). Agricultural decision-making in the Argentine Pampas: Modeling the interaction between uncertain and complex environments and heterogeneous and complex decision makers. In T. Kugler, J. C. Smith, T. Connolly, and Y.-J. Son (Eds.), *Decision modeling and behavior in uncertain and complex environments* (pp. 57–76). Berlin: Springer.

Prelec, D., and R. J. Herrnstein. Preferences and principles: Alternative guidelines for choice. In R. Zeckhauser (Ed.), *Strategic reflections on human behavior* Cambridge, MA: MIT Press.

Pronin, E., Olivola, C.Y., and Kennedy, K. A. (2008). Doing unto future selves as you would do unto others: Psychological distance and decision making. *Personality and Social Psychology Bulletin, 34*, 224–236.

Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy, 6*, 65–78.

Read, D., Loewenstein, G., and Rabin, M. (1999). Choice bracketing. *Journal of Risk and Uncertainty, 19*, 171–197.

Reber, A. S. (1996). *Implicit learning and tacit knowledge: An essay on the cognitive unconscious*. Oxford: Oxford University Press.

Robinson, T., and Chatraw, J. (2006). *Saving God's green earth: Rediscovering the church's responsibility to environmental stewardship*. Norcross, GA: Ampelon.

Schneider, W., and Chein, J. M. (2003). Controlled and automatic processing: Behavior, theory, and biological mechanisms, *Cognitive Science, 27*, 525–559.

Schoenberg, E. (2007). *Beauty is in the eye of the other beholders: Strategy matching in financial markets* (Doctoral dissertation). Columbia University, New York.

Simon, H. A. (1982). *Models of bounded rationality* (Vols. 1 and 2). Cambridge, MA: MIT Press.

———. (1990). Invariants of human behavior. *Annual Review of Psychology, 41*, 1–19.

Sloate, P. L., and Voyat, G. (2005). Language and imitation in development. *Journal of Psycholinguistic Research, 12*, 199–222.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin, 119*(1), 3–22.

Slovic, P. (1997). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. In M. Bazerman, D. Messick, A. Tenbrunsel, and K. Wade-Benzoni (Eds.), *Psychological perspectives to environmental and ethical issues in management* (pp. 277–313). San Francisco: Jossey-Bass.

Slovic, P., Kunreuther, H., and White, G. F. (1974). *Decision processes, rationality and adjustment to natural hazards*. In G. F. White (Ed.), Natural hazards: local, national and global (pp. 187–205). New York: Oxford University.

Slovic, P., Lichtenstein, S., and Fischhoff, B. (1984). Modeling the societal impact of fatal accidents. *Management Science, 30*, 464–474.

Sunstein, C. R. (2006). The availability heuristic, intuitive cost-benefit analysis, and climate change. *Climatic Change, 77*, 195–210.

Thaler, R. H. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization, 1*, 39–60.

Thaler, R., and Johnson, E. J. (1990). Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management Science, 36*, 643–660.

Trope, Y., and Liberman, N. (2003). Temporal construal. *Psychological Review, 110*, 403–421.

Tversky, A., and Kahneman, D. (1992). Advances in

prospect theory, cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5, 297–323.

von Neumann, J., and Morgenstern, O. (1944). *Theory of games and economic behavior*. Princeton, NJ: Princeton University Press.

Wade-Benzoni, K. A. (2009). The egoism and altruism of intergenerational behavior. *Personality and Social Psychology Review*, *13*, 165–193.

Weber, E. U. (1994). From subjective probabilities to decision weights: The effect of asymmetric loss functions on the evaluation of uncertain outcomes and events. *Psychological Bulletin*, *115*(2), 228–242.

———. (1997). Perception and expectation of climate change: Precondition for economic and technological adaptation. In M. Bazerman, D. Messick, A. Tenbrunsel, and K. Wade-Benzoni. (Eds.), *Psychological perspectives to environmental and ethical issues in management* (pp. 314–341). San Francisco, CA: Jossey-Bass.

———. (2004). Perception matters: Psychophysics for economists. In J. Carrillo and I. Brocas (Eds.), *Psychology and economics* (pp. 165–176). Oxford: Oxford University Press.

———. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). *Climatic Change*, *70*, 103–120.

Weber, E. U., Ames, D. R., and Blais, A.-R. (2004). "How do I choose thee? Let me count the ways": A textual analysis of similarities and differences in modes of decision-making in China and the United States. *Management and Organization Review*, 1, 87–118.

Weber, E. U., Böckenholt, U., Hilton, D. J., and Wallace, B. (2000). Confidence judgments as expressions of experienced decision conflict. *Risk Decision and Policy*, *5*, 1–32.

Weber, E. U., and Hsee, C. (1998). Cross-cultural differences in risk perception, but cross-cultural similarities in attitudes towards perceived risk. *Management Science*, *44*, 1205–1217.

Weber, E. U., and Johnson, E. J. (2006). Constructing preferences from memory. In S. Lichtenstein and P. Slovic (Eds.), *The construction of preference* (pp. 397–410). New York: Cambridge University Press.

———. (2009). Mindful judgment and decision making. *Annual Review of Psychology*, *60*, 53–86.

Weber, E. U., Johnson, E. J., Milch, K., Chang, H., Brodscholl, J., and Goldstein, D. (2007). Asymmetric discounting in intertemporal choice: A query theory account. *Psychological Science*, *18*, 516–523.

Weber, E. U., and Lindemann, P. G. (2007). From intuition to analysis: Making decisions with our head, our heart, or by the book. In H. Plessner, C. Betsch, and T. Betsch (Eds.), *Intuition in judgment and decision making* (pp. 191–208). Mahwah, NJ: Lawrence Erlbaum.

Weber, E. U., and Morris, M. W. (2010). Cultural differences in judgment and decision making: Insights from constructivist, structuralist approaches. *Perspectives on Psychological Science*, *5*, 410–419.

Weber, E. U., Shafir, S., and Blais, A.-R. (2004). Predicting risk-sensitivity in humans and lower animals: Risk as variance or coefficient of variation. *Psychological Review*, *111*, 430–445.

Weber, E. U., Siebenmorgen, N., and Weber, M. (2005). Communicating asset risk: How name recognition and the format of historic volatility information affect risk perception and investment decisions. *Risk Analysis*, *25*, 597–609.

Weber, M. (1921/1984). *Soziologische Grundbegriffe*. Tuebingen, Germany: J.C.B. Mohr.

Weitzman, M. L. (2007). A review of the Stern review on the economics of climate change. *Journal of Economic Literature*, *45*, 686–702.

Wilde, G.J.S. (1998). The theory of risk homeostasis: Implications for safety and health. *Injury Prevention*, *4*, 89–91.

Wish, V. (2008). Pay as you go: The pros and cons of carbon offsets. Retrieved from http://knowledge.allianz.com/climate/?280/carbon-offsets-pros-cons

Woodward, R. T. (1998). *Should agricultural and resource economists care that the subjective expected utility hypothesis is false?* Selected paper presented at the meeting of the American Agricultural Economics Association. Salt Lake City, Utah. Retrieved from http://ageconsearch.umn.edu/bitstream/20941/1/spwood01.pdf