

BEYOND THE INERTIA OF AFFLUENCE

PARA ALÉM DA INÉRCIA DE AFLUÊNCIA

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**ABSTRACT**

Global warming poses unprecedented dangers to humankind, and it is a product of human activities: Production and consumption of fossil fuels, accompanied by steadily increasing levels of greenhouse gasses in the atmosphere. Some of the predicted consequences of warming are already upon us; yet more catastrophic effects will be experienced in the future. Two behavioral processes operate to maintain fossil fuel use: 1) Delay discounting studies suggest that relatively lesser-valued outcomes (e.g., driving private cars) that are available now are likely to be preferred to the value of a sustainable planet for all humankind, to be achieved in the indefinite future; and 2) ongoing fossil-fueled activities are likely to be highly persistent because of the long and rich history of reinforcement for individuals (e.g., comfort and convenience) and for the fossil-fuel industry as a whole (e.g., jobs and profits). One way to counter that persistence is to tax greenhouse gas emissions, which can shift current incentives away from fossil-fuel based energy toward renewables, even though the ultimate slowing of climate change may be remote. Carbon-tax contingencies are similar to those employed to treat problem behavior; a successful example of this approach is described.

*Key words:* Global warming, fossil fuel consumption, carbon tax, delay discounting, behavioral momentum

**RESUMO**

O aquecimento global engendra perigos sem precedentes para a humanidade e é um produto de atividades humanas: a produção e o consumo de combustíveis fósseis, acompanhados de níveis cada vez maiores de gases de efeito estufa na atmosfera. Algumas das consequências previstas do aquecimento já se fazem presentes; efeitos ainda mais catastróficos serão experimentados no futuro. Dois processos comportamentais operam para manter o uso de combustíveis fósseis: 1) Estudos sobre descontos do atraso das consequências sugerem que resultados de valor relativamente menor que estão disponíveis agora (e.g., dirigir carros pessoais) são provavelmente preferidos frente ao valor de um planeta sustentável para toda a humanidade, a ser atingido em um futuro indefinido e 2) atividades atuais que envolvem o uso de combustíveis fósseis são, provavelmente, muito persistentes devido à longa e rica história de reforçamento para indivíduos (e.g., conforto e conveniência) e para a indústria de combustíveis fósseis como um todo (e.g., empregos e lucros). Uma maneira de confrontar essa persistência é taxar as emissões de gases de efeito estufa, o que pode transferir os incentivos atuais da energia baseada em combustíveis fósseis para as energias renováveis, mesmo que o abrandamento final das mudanças climáticas seja remoto. As contingências de taxaço do carbono são semelhantes às empregadas para tratar o comportamento problema; descreve-se um exemplo bem-sucedido desta abordagem.

*Palavras-chave:* aquecimento global, consumo de combustível fóssil, taxaço do carbono, desvalorizaço pelo atraso, momento do comportamento.

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This article is based in part on previous articles and talks, including *The Inertia of Affluence* (Nevin, 2003) and an invited address at the 2015 meetings of the Berkshire Association for Behavior Analysis and Therapy. It includes some policy prescriptions that are political only in the sense that to make them effective, regional or national governments must enact relevant laws and regulations. Correspondence should be sent to: John A. (Tony) Nevin. 20 Harborview Lane. Vineyard Haven, MA 02568. tony.nevin@unh.edu

In 2014, the UN Intergovernmental Panel on Climate Change (IPCC) assembled data from many sources showing that if the rate of fossil fuel consumption continues its present upward trajectory, the predicted effects on the earth's climate will be large and irreversible: Within a few decades, temperatures will increase by about 7 degrees C, ice sheets will melt (this is already happening), and as a result, sea levels will rise by as much as 7 meters. According to the Union of Concerned Scientists (2017), frequent flooding is already forcing some residents abandon low-lying islands along the US east coast. And this is just the beginning of the list of accompanying consequences, such as droughts and spread of infectious diseases; almost every week a new prediction of calamity is announced.

In the Paris Agreement of 2016, the international community agreed on national commitments to reduce greenhouse gasses. Even if current commitments to reduce greenhouse gasses are actually achieved, the warming trend will continue, albeit at a slower pace than if fossil fuel consumption were to continue at its present rate, so that the world's nations will have more time to move toward a zero-carbon economy. But these relatively abstract concerns about the distant future may be too far removed from current circumstances that maintain ongoing fossil fuel consumption to be effective in changing human behavior. This was the principal topic of Skinner's (1991) article entitled "*Why we are not acting to save the world.*" The present essay will discuss near-term changes in behavior relevant to global warming.

There are at least two fundamental behavioral processes that can help us to understand the ineffectiveness of temporally remote outcomes: Choice between alternatives that differ in the values and delays of their consequences, and the persistence of activities that are sustained by their recent histories of reinforcement.

### INTERTEMPORAL CHOICE

Many studies of choice between alternatives that differ in delay to an outcome, and the value of that outcome, have suggested that both humans and animals often prefer a small reward after little or no delay (smaller-sooner, or SS) to a larger reward after a long delay (larger later, or LL). A consistent preference for relative immediacy is often termed "impulsivity." However, natural selection may favor organisms that take advantage of immediate food or other biological necessities; a larger delayed alternative may arrive too late to sustain life. Moreover, "impulsivity" can be restrained or reversed by various commitment mechanisms (e.g., Rachlin & Green, 1972).

Empirically, the degree of preference between outcomes depends on the relative magnitudes of the delays and amounts, as suggested by Mazur's (1987) widely adopted expression:

$$V = A/(1+kD) \quad \text{Eq. 1}$$

Where A is the magnitude of reward and D is the delay to its presentation. The scaling parameter k characterizes variations in sensitivity to delay: A large value amplifies the effect of increasing delays (see Odum, 2011, for review and discussion). The addition of 1 in the denominator keeps the equation from exploding when the delay is 0.

This simple hyperbolic-decay equation predicts a rapid decrease in outcome value as D increases from near 0, slowing as D becomes indefinitely large, with rate of decrease depending on k. Although various refinements have been proposed, Eq. 1 does a first-rate job of describing delay discounting data from many studies in which people or animals are offered a choice between SS and LL alternatives, either hypothetical or real.

Let's consider interpreting responses to the threat of climate catastrophe in relation to Eq. 1. In terms of the dichotomy proposed above, LL corresponds to the achievement of a sustainable planet for all of humankind (large!) at some uncertain time in the future (later) by moving to a carbon-free economy. The alternative SS corresponds to the current but lesser value of continuing to burn fossil fuels in order to maintain our lifestyles. Because the value V of SS experienced by any individual (especially a CEO of an energy corporation) is greater than that of the predicted LL alternative, which may be achieved slowly (if at all) through global efforts spread out over decades, there is no basis in individual preferences for the massive, sustained political action that would be needed to reduce fossil fuel consumption across the planet as a whole.

The foregoing is conjectural, based in part on the data on choice between immediate and delayed outcomes, and in part on the daily news, where predictions of calamity are printed side-by-side with reports of lobbying against restrictions on use of fossil fuels and denial of the climate consequences. Nevertheless, we can gain some understanding by measuring individual judgments of humans in an equivalent of the delay-discounting paradigm with well-defined concrete alternatives. People could be asked to choose between continuing to drive your present car (assumed to be in good working order, SS), and an opportunity to buy an all-electric vehicle costing \$35,000 with a rebate of \$A to be paid D months after purchase (LL). The value of D could be varied from trial to trial to identify an indifference point D for each of several values of A to map out a set of hyperbolic functions. To address possible determiners of k, and hence the value of the indifference point, people could be tested after watching videos about predicted effects of global warming as compared to neutral material.

The only relevant example is a study by Berry et al. (2014), who arranged standard delay-discounting tasks with choices between SS and LL outcomes specified as hypothetical sums of money. Images of natural landscapes, man-made structures, or geometric figures were presented before trials. They found that natural images decreased

discounting rates ( $k$ ) by about half. The results at least suggest that real-life decisions could be affected by well-designed, environmentally informative and aesthetically appealing material.

### BEHAVIORAL PERSISTENCE

There is a second process that can combine with delay discounting to exacerbate the problem – the persistence of ongoing behavior. Many experiments with humans and animals have shown that the resistance to change of operant behavior is directly related to the amount and frequency of reinforcers obtained during an organism's history. These results have been interpreted in relation to Behavioral Momentum Theory (Nevin & Grace, 2000), which uses an analog to Newton's Second Law of Motion to suggest that the persistence of reinforced responding in a distinctive context during some form of disruption depends directly on the magnitude of a disruptor, and inversely on a mass-like term representing the amount and frequency of reinforcement experienced in that context.

Consider driving one's present car, as in the SS example above, is ongoing operant behavior with an extensive history of reinforcement that occurs repeatedly, and cannot really be compared with the LL choice of a rebate for buying hypothetical electric vehicle. Here's a personal example. I live on an island whose low-lying towns, homes, and farms will be inundated within a few decades if sea levels rise as predicted; and I am well aware of the predictions and their dependency on the rate of greenhouse gas emission. Nevertheless, I drive my modest 30+ mpg Toyota almost every day and enjoy all sorts of reinforcing consequences: I pick up groceries, visit friends, get health checkups, attend concerts and movies, and go to meetings with like-minded islanders on how to influence state and local energy policy, all of which enhance my general well-being and enjoyment of life. I suggest that the sum of these and other reinforcers for driving, accumulated over many years, have established a substantial behavioral mass of driving in the context of my daily life.

What might disrupt such well-established behavior? In principle, frequent reminders of the fact that my 2004 Toyota deposits about 6 metric tonnes (mT) of carbon into the atmosphere per year could have some impact. But in the overall scale of the world's carbon emissions, this is trivial – scarcely worth the effort of trying to conserve by refraining from driving – so I will probably continue to drive my car as long as I can. Because of its cumulative adverse consequences for the atmosphere, however, driving can fairly be considered problem behavior that is highly resistant to change.<sup>1</sup>

Now let's extrapolate from an individual driving a car to the global business of extracting, transporting, refining, distributing, and selling fossil fuels and their byproducts. Because the global fossil-fuel business has produced rich and widespread rewards over many years, including jobs for workers, comfort and convenience for consumers, profits for

shareholders, and astounding wealth for top executives, I suggest that this business has acquired an aggregate behavioral mass that will make it extraordinarily resistant to change.

If we construe the ongoing activities of extracting, refining, and selling fossil fuels as problem behavior on a global scale, what sort of feasible intervention can help to reduce it in the near future? Students of microeconomics will note that for frequent drivers, gasoline consumption is highly *inelastic*: For example, a 10% increase in the price of gasoline will lead to far less than a 10% decrease in consumption (for a primer on determiners of elasticity, see Hursh, Madden, Spiga, DeLeon, & Francisco, 2013). Thus, the persistence of gasoline consumption can be explained by a microeconomic model as well as by the reinforcement-based persistence of driving behavior (for discussion of the relations between behavioral economics and behavioral momentum, see Nevin, 1995).

Microeconomic theory proposes that the inelasticity of gasoline consumption arises from the absence of substitutes. Thus, to make gasoline consumption more elastic, alternative power sources are needed, such as solar- or wind-generated power for electric vehicles. At the same time, the price of gasoline should be increased to reflect what economists call externalities – the costs to the public at large of dumping greenhouse gasses freely into the atmosphere as byproducts of production and consumption. This would increase the cost of gasoline at the pump and tend to reduce consumption (thereby reducing profits for producers), and provide incentives for businesses to develop affordable alternatives.

A number of economists have proposed a fairly straightforward way to encourage development of alternatives and to charge for the production and use of fuels that generate greenhouse gasses: a "carbon tax" imposed by a regional or national government, but without any regulatory agency that restricts emissions. Such a tax allows people to burn as much fuel as they like, but they must pay according to the amount of carbon they emit into the atmosphere. Thus, a carbon tax can be politically palatable for libertarians as well as environmentalists, and is widely supported by economists (e.g., *The Guardian*, 2016). The empirical question is whether such a tax is effective in reducing greenhouse gas emissions.

In behavioral terms, a carbon tax implies a set of contingencies: Response cost for fossil fuel consumption, and reinforcers for switching to alternatives based on solar- or wind-generated electric power. To be effective, of course, these alternatives must be affordable for people with limited incomes. The effective cost of alternatives can be reduced by a "revenue-neutral" carbon tax that distributes at least some of its proceeds to taxpayers, with special consideration for low-income consumers. (With respect to the material above on delay discounting, research could evaluate preferences between smaller-sooner and larger-later rebates to maximize taxpayer satisfaction.)

Data on the consequences of taxing carbon emissions, from the Canadian province of British Columbia (BC), suggest that this approach can be both effective and popular. Here's a summary of data from BC's program, which was established in 2008. The BC tax started at \$10/ton of carbon (or equivalent greenhouse gas), and increased \$5 each year up to \$30. Every resident received a \$100 check just before the tax kicked in, and there is a low-income tax credit for families with incomes below \$37,000. As of 2015, the tax has brought in some \$5 billion in revenue so far, with \$3 billion returned as business tax cuts, \$1 billion in individual tax cuts, and \$1 billion in low-income tax credits. Most importantly, there have been greater decreases in fossil fuel consumption and carbon emissions than in the rest of Canada, with no overall decrease in economic activity. (For a description of BC's program, its political success, and its popularity with residents, see *Mother Jones*, 2014).

As behavior analysts seeking to effect durable behavior change, we look to behavioral contingencies such as arranging response cost for problem behavior, concurrently with access to a reinforced, socially desirable alternative. Extrapolated to climate-related activities aggregated over many people, from consumers to suppliers of fossil fuels, this sort of approach to problem behavior is entirely consistent with widely endorsed economic approaches that emphasize the power of near-term incentives to alter human behavior.

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Footnote: 1. In applied behavior analysis, a standard method for reducing or eliminating problem behavior is to reinforce an incompatible, socially desirable alternative. A number of basic research studies and clinical applications have shown that arranging concurrent reinforcement within the same context as problem behavior, either contingent on alternative behavior or independently of responding, can have the counter-therapeutic effect of increasing the persistence and post-treatment relapse of problem behavior (for review see Podlesnik & DeLeon, 2015).

Nevin (2003) argued from these findings to suggest that driving, as a problem behavior, could become more persistent if a variety of other reinforcers that are not dependent on driving were available in the same context. The presence of such reinforcers in my comfortable daily life should promote the persistence of daily activities such as driving a car. This extrapolation is speculative, of course, but it suggested a behavioral interpretation of the "inertia of affluence," a phrase introduced by McKibben (1989) to describe the lack of effort, by people living in comfortable situations, to preserve a valued environment. I omit that line of argument here because a) the direct reinforcing consequences of driving are sufficient to make the case; b) the added reinforcers must be experienced concurrently, not successively, in the "same" context, which is not well defined as "daily life;" and c) recent empirical and theoretical analysis, summarized by Nevin et al. (2017), challenge the mechanism whereby added reinforcers are presumed to affect persistence.