ON RESISTING EXTINCTION: A REVIEW OF
JONATHAN SCHELL'S THE FATE OF THE EARTH¹

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In the analysis of behavior, extinction refers to the cessation of responding when reinforcement is discontinued. It is sometimes called "experimental extinction," suggesting the possibility of replication after reconditioning, or repeated measurement under varied conditions. The term "resistance to extinction" designates some measure of the tendency for responding to persist during non-reinforcement, and many researchers have explored its determiners.

There is, of course, another and darker meaning of extinction: the termination of a species, usually as a result of some radical alteration of the environment in which its members evolved and lived. There is nothing experimental about this sort of extinction, because it is a unique event. Once extinct, no species can be reestablished (so far as we know) to permit exploration of the conditions that determine its resistance to extinction.

Our species, *homo sapiens*, now possesses the power to bring about its own extinction through nuclear warfare. The greatest problem in the world today is how to deal with this fact. If we do not solve this problem, there may be no other problems to solve, because there may be no humans to solve them or to profit from their solution.

Most immediately, the problem is the continued growth of nuclear arsenals as the United States and the Soviet Union strive to maintain national "security" through a policy of mutually assured destruction. For thirty

years, the policy has "worked" in the sense that neither superpower has used a nuclear weapon. However, each side seems to be compelled to increase the size, accuracy, and diversity of its deterrent force with every passing year, and some of the weapons now being developed, such as the MX missile, are designed more to eliminate the opponent's deterrent than to deter. The development of such weapons, coupled with the logic of deterrence, requires that each side move toward a "launch-on-warning" policy to insure that any temptation to unleash a first strike will still be deterred by the certainty that the attacker's society will be destroyed. This is a supremely dangerous state of affairs, especially in the light of recent statements to the effect that nuclear weapons may be used in a moment of crisis if vital national interests are threatened. It is widely agreed that *any* use of nuclear weapons would be likely to escalate into a massive nuclear exchange, especially if both superpowers maintain their weapons systems on hair-trigger alert. Such an exchange would result in immediate and short-term deaths of perhaps 50 to 70 per cent of the population of the countries involved. Unspeakable human suffering would ensue, and civilized society as we have known it would cease. The long-term effects of such a conflict are harder to estimate, but the disruption of the entire ecosphere on which our lives depend would be so severe that there is a modest probability of extinction of our species and many others as well.

The Fate of the Earth, by Jonathan Schell, is concerned with the effects of nuclear warfare and with various technical, political, and philosophical aspects of the threat that nuclear weapons pose. It is also a powerful statement of moral outrage at the prospect of nuclear extinction. The purpose of this review essay is to analyze Schell's major themes from a behavioral perspective and to restate his call for

¹New York: Knopf, 1982. Pp. 231 + index.

Dedicated to B. F. Skinner for his continuing concern that the experimental analysis of behavior be brought to bear on the vital issues of human survival and well-being. I am indebted to V. G. Laties for encouraging the preparation of this review. Reprints may be obtained from John A. Nevin, Department of Psychology, University of New Hampshire, Durham, New Hampshire 03824.

action to eliminate nuclear weapons from the world.

The question now before the human species . . . is whether life or death will prevail on earth. . . . One might say that after billions of years nature, by creating a species equipped with reason and will, turned its fate, which had previously been decided by the slow, unconscious movements of natural evolution, over to the conscious decisions of just one of its species. . . . Thought and will became mightier than the earth that had given birth to them. (Schell, p. 113)

I agree that the question of whether life will prevail is upon us with the utmost urgency, and it is given to us, here and now, to answer affirmatively and effectively.

All practitioners of the experimental analysis of behavior take it to be axiomatic that we are part of the natural order and that our behavior is to be understood by identifying the environmental variables, acting in concert with genetic factors, that determine it. Action is not effectively explained by inner processes designated by traditional terms such as thought, desire, or will. Rather, these private processes are themselves construed as forms of behavior—thinking, desiring, or willing—to be explained in the same way as overt action. A failure of action is not ascribed to a failure of the will, but rather to the lack of a critical environmental history or the absence of current conditions on which the overt action, and the concurrent private activity termed willing, both depend. When action is desperately needed, it is less likely to be occasioned by appealing to the will than by supplying the necessary environmental conditions.

As behavioral scientists, we have been trained in scrupulous objectivity. For example, we do not label changes in behavior as “better” or “worse,” but more or less accurate: Accuracy is not a desideratum, but a neutral measure. This objective stance can lead to a peculiar and potentially devastating view of the world.

Regarded objectively, as an episode in the development of life on earth, a nuclear holocaust that brought about the extinction of mankind and other species by mutilating the ecosphere would constitute an

evolutionary setback of possibly limited extent—the first to result from a deliberate action taken by the creature extinguished but perhaps no greater than any of several evolutionary setbacks. (Schell, p. 114)

After all, we are only one among many species, living on one of many presumably habitable planets in the galaxy: one of the universe’s many experiments, perhaps informative to some universal Experimenter, but of no more (nor less) account than the dodo, which proved to be readily extinguishable when humans brought guns to Mauritius.

Such a detached view may be congenial to us under some circumstances, but it is hardly likely to prolong our existence. A more immediate and personal approach may not be much more help, though. As Schell says,

regarded subjectively, from within human life, where we are all actually situated, and as something that would happen to us, human extinction assumes awesome, inapprehensible proportions. (p. 114)

Not only would all the people in the world die, but in addition, all future generations would be cancelled. Such an eventuality is so remote from our experience as to be without meaning. Thus, neither objective nor subjective views provide a solid base for action.

Schell devotes much of his book to the moral and philosophical implications of extinction—in particular, to the argument that our present existence derives its value from its continuity with past and future generations. There are many stirring passages and one effective thought experiment in which the reader is asked to contemplate a world where all of humanity had been sterilized. Would there be any point to living, working, loving, when no generations would follow? It is easy to answer “No” and to be moved by other aspects of Schell’s arguments, but somehow this entire section of the book misses the mark: If we must be persuaded that it is valuable for the species to survive, we are in real trouble.

In any case, it is not enough to affirm the value of survival; we must also act to prevent self-imposed nuclear extinction. Yet, as Schell points out, “in spite of the immeasurable importance of nuclear weapons, the world has declined, on the whole, to think about them very much.” From a behavioral perspective,

the failure of thought (and action) is not entirely surprising. Since the atomic bombing of Hiroshima and Nagasaki in 1945, we have been warned frequently of impending nuclear disaster; and now we are told almost daily of immense investments in nuclear weapons and of political instability that makes national leaders contemplate their use. Yet life goes on. It is small wonder that these warnings are ignored: As actually experienced, they are correlated with continued existence, just like other events of daily life. The research literature on blocking and validity clearly suggests that uninformative or redundant cues of this sort do not acquire control over behavior. In common parlance, they are ignored because they have no experienced predictive value: Warnings of an impending holocaust have not been followed by the holocaust.

However, a spectacularly salient stimulus may command attention even under such circumstances (consider, for example, "supernormal" releasing stimuli encountered for the first time in an organism's life). The first part of Schell's book is surely such a stimulus. Drawing on various published sources and interviews with a number of scientists, he paints a horrendous picture of the consequences of a full-scale nuclear exchange. Coldly, grimly, and in chilling detail, he describes the mechanics of nuclear explosions and their effects on humans, their habitats, and the other species that share the earth. The careful objectivity of the presentation makes it doubly effective. It is *required* reading even for those who regard themselves as knowledgeable in nuclear matters.

It is impossible not to acknowledge the power of Schell's presentation, but its very power may lead to two further problems. First, his account of Armageddon generates strong aversive emotional reactions, and we know from the study of negative reinforcement that such stimuli strengthen behavior that removes them. The orienting-response literature also suggests that organisms will orient away from cues that signal aversive events. We are, therefore, likely to turn away from warnings of nuclear warfare and engage in other activities. Second, the ultimate horror that Schell portrays is widely regarded as inevitable. The arms race is often said to possess a sort of impersonal momentum, like a massive object that rolls on inexorably, regardless of our actions;

and certainly the recent history of negotiations to control the arms race, conducted by people who are well aware of its potential ultimate outcome, does nothing to reassure us. In the laboratory, uncontrollable aversive events have been shown to produce a state of inactivity termed helplessness. Taken together, the history of uncontrollability of the arms race, the aversiveness of our reactions to warnings of nuclear warfare, and the lack of correlation of such warnings with experienced events would seem to explain the absence of effective private action (thinking) to analyze the problem or overt behavior to effect disarmament. This combination of factors may be responsible for what Robert Jay Lifton has termed "psychic numbing," a refusal to confront the threat of universal death that hangs over our heads like an executioner's sword.

How can we approach the absence of relevant action—the refusal to look up at the sword and do something to blunt it or prevent it from falling—from a behavioral perspective? Consider an analogy. If we saw a person afflicted with a potentially fatal disease, taking daily doses of an addictive drug that gave temporary relief from distress but in addition exacerbated the disease, we would diagnose the behavior as maladaptive. Appealing to this person to exercise "self-control" would not be likely to have much effect. If this person became our client, we would immediately regulate access to the drug and take steps to eliminate its use, while at the same time arranging a program of behavioral therapy to maintain abstinence when treatment ended. Schell suggests that human society, living as it does under the constant threat of self-imposed termination while using its economic resources to build more instruments of universal death in the name of security, is like this client—"insane," in Schell's words. Immediate therapy is essential. However, our society is both client and therapist. Consequently, we are enmeshed in a problem, at the level of society and species, that parallels the problem of "self-control" at the level of the individual.

Schell poses the choice facing humanity in terms very close to the laboratory study of self-control:

One response is to decline to face the peril, and go on piling up the instruments of doom, year after year until, by accident

or design, they go off. The other response is to recognize the peril, dismantle the weapons, and arrange the political affairs of the earth so that the weapons will not be built again. (p. 148)

In the language of self-control research, the first response has no immediate aversive consequences—we can proceed with the business of life as usual—but there is a deferred, ultimate, aversive consequence in the eventual nuclear holocaust that will engulf us all. The second response has immediate but less aversive consequences—acknowledging the peril and risking the temporary economic disruptions and political uncertainties attendant upon abandoning the presumed stability of mutually assured destruction—but the ultimate catastrophe is avoided.

How might the species arrange its environment to make the second response more probable? Schell relies primarily on rational argument. A rational calculus suggests that although the probability of nuclear extinction may be small, its value—the termination of life—is minus infinity, and the product of any non-zero probability and minus infinity is minus infinity. In terms of relative expected utility, then, the choice is clear (Schell, p. 95). The choice correctly posed and evaluated by Schell is structurally identical to Pascal's wager on the existence of God, which has an expected utility of plus infinity despite the possibly infinitesimal probability that belief in God is necessary and sufficient for eternal life. But Pascal's rational argument never made converts—faith appears to derive from certain immediate experiences, even in his own case. Likewise, I fear that Schell's calculus will not make converts to disarmament—choice behavior depends not on rational calculation but on experienced events.

One significant event that can be experienced by any reader is exposure to Schell's book itself. As a warning of imminent disaster and a motivator of action, it is supremely effective in arousing concern and activating behavior. The problem now is to identify events and contingencies that will foster sustained commitment, by the species, to the second alternative—survival. Laboratory work on commitment and self-control suggests that humans and animals will usually choose the smaller but more immediate of two rewards,

or the larger but more delayed of two punishers, to their own long-term detriment. Our current choice, as a species, of the first alternative—continuation of the arms race—is therefore entirely consistent with laboratory data. Can knowledge from the laboratory help us switch over to the second alternative? One way in which animals can be trained to choose the larger, more delayed reward (or the lesser but more immediate punisher) is to adjust the delay values gradually, while giving repeated exposure to both outcomes; but of course this method is ruled out by the nature of the nuclear dilemma. Another method is to train the subjects to make an early "commitment" response that precludes access to one of the choices later. However, as Schell points out, we can never really preclude access to nuclear weapons, because the methods for making them are well known and cannot be unlearned; the commitment response must be continuous.

Perhaps the problem is best approached by invoking more immediate, smaller-scale, molecular events. For example, we can try to get a large audience for Schell's book, which (as noted above) is a strikingly potent stimulus. We can also expose all people, everywhere, to stimuli correlated with nuclear warfare such as pictures of the burned and dying and dead at Hiroshima, and films showing the awesome power of nuclear test explosions, which bring at least some of the future aspects of the first alternative into the present. But this is not sufficient, because it might merely serve to generate numb passivity or avoidance of the entire issue. We need, in addition, to instigate and maintain behavior that is compatible with the second alternative, including open discussion, nonviolent protest, and political action that opposes the momentum of the arms race and leads to disarmament. Clearly, we have witnessed some of the requisite behavior during this year, as hundreds of thousands of people in many countries have rallied to demonstrate their opposition to the threat of nuclear war. Political support for disarmament is on the rise. However, such behavior must be reinforced if it is to be maintained through the protracted negotiations and rearrangements of international politics that will be required; and it cannot be reinforced by the nonoccurrence of a nuclear holocaust, because that non-event will always be equally well correlated with pursuit of the arms race until the holo-

caust occurs. Much more immediate and local reinforcers such as societal approval, access to political office, and economic well-being will be necessary.

In the final portion of his book, Schell argues that the present system of sovereign nation-states, coupled with the existence of nuclear weapons, has led to the doctrine of deterrence through mutually assured destruction. In the past, protection or expansion of national interests found its ultimate expression in warfare, and there were winners and losers. Winners were those nations possessing superior military might—more or better footsoldiers, crossbows, machine guns, tanks. Perhaps the reason that the arms race seems to escalate endlessly is that we have a collective cultural history in which superior power was correlated with winning—there was no such thing as “enough” weaponry if the opponent had more. But the advent of nuclear weapons fundamentally alters this state of affairs, because there can no longer be a winner in a nuclear conflict—all, including nonbelligerents, will be losers. If the system of sovereign nation-states persists, Schell argues, the arms race will necessarily continue, or resume even after negotiated reductions. Sooner or later one nation will allow nuclear defense of a seemingly vital national interest to take precedence over the universal interest in survival even though the survival

of humankind is thereby placed in doubt. The entire system of sovereign nation-states is therefore a dangerous relic of pre-nuclear times and must be abandoned.

Schell's argument may or may not be compelling, but he is surely correct that major changes in the conduct of international affairs will be necessary, and this will take a long, long time. Just as we would regulate and discontinue access to addictive, self-injurious drugs for our hypothetical individual client in order to gain the time necessary for effective behavior modification, we must act at once to freeze and reduce the world-wide levels of nuclear arms in order to gain the time necessary for gradual social and political change.

Because everything we do and everything we are is in jeopardy, and because the peril is immediate and unremitting, every person is the right person to act and every moment is the right moment to begin, starting with the present moment. (Schell, p. 226)

Perhaps the analysis of behavior has evolved in human affairs just in time to aid in the instigation and maintenance of the necessary action. It is essential for our own survival that we use all our analytic skills and all the behavior we can muster to resist extinction.