

## **The Cybernetic Theory of Decision: New Dimensions of Political Analysis**

(Princeton University Press, 1974, 2003)

### *Preface to the Second Paperback Edition*

This book was the result of emigration across disciplinary boundaries. The point of departure was cognitive psychology and its philosophical underpinnings, a realm of meticulous experimental observation and highly generalized interpretative reasoning. The eventual destination was international security policy whose reigning doctrine—the concept of deterrence—was derived from an idealized vision of human mental operations that basic psychology would suggest is regularly violated in everyday life. In the initial stages of this journey I was astonished that security policies of such consequence could be constructed in apparent ignorance, or at any rate cheerful defiance, of what I understood to be some of the more important facts about how the human mind actually works. Since that remarkable instrument provides the foundation of all organized behavior, it seemed to me, its known features should inform any activity as serious as the deployment of nuclear weapons.

In the course of writing the book and thereafter I became more accustomed to prevailing security logic and more tolerant of the role it has come to play in the management of inherently dangerous technology. The chief advantage of the logic of deterrence is that so many people are readily willing to believe in it and to accept its asserted requirements. If the underlying suppositions of the deterrence doctrine are difficult to reconcile with major characteristics of human behavior, they do nonetheless reflect how most people prefer to understand the business of determining threat and devising protection. Organizing ideas that can command widespread acceptance are an essential element of any coherent policy. Nuclear weapons and the broader issues of international security definitely require reliably coherent policies.

Despite that practical accommodation, I have sustained my original sense of concern. The fundamental conceptual distinctions presented in this book identify general aspects of organized behavior likely to affect the formulation and implementation of virtually any public policy. They are especially important in understanding the interaction of military organizations and the much broader set of activities that determine the state of global security. They illuminate problems not

readily visualized in standard assessments of these matters. Three decades later the distinctions remain relevant and, I regret to say, insufficiently appreciated.

The core distinction has to do with the difference between adaptive processes and direct outcome calculations derived according to what is herein termed analytic logic. Blind adaptation through the process of natural selection is currently understood to be the basic method of evolution. It is capable of producing exquisitely refined and highly successful behavioral strategies that in other species are assumed not to have been intentionally designed. In contrast, intentional design—and indeed rational design—is considered to be the principal characteristic of organized human behavior. International security, it is supposed, is conducted through conscious calculation. Misjudgments are admitted, as are unintended consequences, but explicitly formulated and systematically pursued intentions are assumed to be the driving force of human interactions—as distinct from the interactions of nature. The argument of the book suggests that adaptive logic affects human behavior more significantly than is generally admitted. The central claim is that awareness of the distinction between adaptive and analytic logic and practical skill in using it will improve comprehension of most situations.

Understanding of adaptive logic and of the remarkable characteristics of recursive processes has advanced substantially in a variety of disciplines since this book was originally published. The central distinction in question can now be pursued through extensive literatures on subjects such as complexity, chaos theory, catastrophe theory, and adaptive agent dynamics. The latter body of work, enabled by dramatically improved access to advanced computational capability, is especially relevant. Adaptive agent modeling has demonstrated that coherent outcomes, suggestive of human experience, can emerge from adaptive interactions without any attributed intention or analytic outcome calculation.<sup>1</sup> In one instance it has been demonstrated that such a process can track reasonably closely the actual behavior of a historical human society over a thousand-year period.<sup>2</sup> This body of work has not dislodged the habit of attributing intentions and is not likely to do so any time soon. Nonetheless it has strongly reinforced the

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<sup>1</sup> Joshua Epstein and Robert Axtell, *Growing Artificial Societies: Social Science from the Bottom Up* (Washington, D.C.: Brookings/MIT Press, 1996).

<sup>2</sup> Joshua Epstein and Robert Axtell, “Understanding Anasazi Culture Change Through Agent-Based Modeling,” in T. Koehler and G. Gumerman, eds., *Dynamics in Human and Primate Societies* (New York: Oxford University Press, 2000).

importance of the conceptual distinction. If widely dispersed adaptive interactions are capable of overriding or bypassing organized intentions, then it is truly a vital matter to understand what the consequences might be—both the dangers and the opportunities.

## CHANGING CONTEXT

In using adaptive logic to understand organized behavior, one is sensitized to the environment in which it is occurring and to the importance of major changes in that environment. In the past three decades, of course, there have been dramatic changes in that regard. The case material presented in this book was set in the context of the Cold War. The defining confrontation of that period has now dissolved, at least in terms of declared political attitudes, and as yet there has been no alternative formulation of comparable prominence. The word globalization does appear to have acquired sufficient standing, however, to provide a candidate label for the ensuing era. Neither the meaning nor the implications of globalization have been determined with agreed clarity, but the circumstances that inspire it have become reasonably evident.<sup>3</sup>

One of the most important is the widely noted phenomenon of information technology. Over the past five decades there have been very large efficiency gains in the handling of information. The costs of storing a unit of information and of processing it at a given location have declined by a factor of 100 million for some important applications and continue to decline. The cost of transmitting a unit of information over long distances has declined by a factor of a million and also continues to decline.<sup>4</sup> These advances have enabled human organizations to operate on a global scale, as they are increasingly doing.

Simultaneously there has also been a surge in the total human population and a resulting increase in the aggregate effects of its activities. Since 1950 the number of living human beings has increased by 1 billion every twelve to fourteen years. Barring some cataclysm, that process will continue through at least the year 2025.<sup>5</sup> There are, moreover, two notable distributional

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<sup>3</sup> The process of globalization and its implications for security policy are discussed in John Steinbruner, *Principles of Global Security* (Washington, D.C.: The Brookings Institution Press, 2000).

<sup>4</sup> Kenneth W. Dam and Herbert S. Lin, eds., *Cryptography's Role in Securing the Information Society*, Report of the Committee to Study National Cryptography Policy, National Research Council (Washington, D.C.: National Academy Press, 1966), p. 384.

<sup>5</sup> Steinbruner, *Principles of Global Security*, p. 8.

features of this surge. More than 97 percent of the population increase is occurring at the lowest levels of income and wealth, and overall population concentration is shifting from two-thirds rural in 1950 to what is projected to be two-thirds urban by 2025.<sup>6</sup>

So far, at least, the pattern of economic growth associated with these events has been disproportionately concentrated at the top of the economic spectrum. At the bottom, where virtually all of the population surge is occurring, there has been a net decline in standard of living over the course of two decades, at least in the United States where measurement of that somewhat elusive notion is most advanced.<sup>7</sup> That pattern poses fundamental problems of social equity. Its indefinite continuation would presumably pose grave dangers to the basic consensus required to operate any society

If those dangers are to be mastered, then the apparent decline in the economic fortunes of the poorest populations will have to be reversed, and there are in turn serious implications of that basic criterion. Total economic product will have to increase by a factor of 5 over five decades if comprehensive improvement is to be achieved. Total energy production will have to increase by a factor of 3, and food production will have to double. If potentially catastrophic effects on global climate patterns are to be reliably avoided as these increases occur, then human-induced carbon gas emissions will have to be reduced to levels that assure total atmospheric concentrations of greenhouse gases are held below 500 parts per million. That means that over the course of the next five decades the technical basis of energy production will have to shift from a predominant reliance on fossil fuels—over 70 percent at the moment—to an equally predominant reliance on non-fossil fuels.<sup>8</sup> Current market rules will not generate the necessary technical transformation on that schedule; indeed, they will present major resistance on behalf of fossil fuel technologies. There are as yet no institutional arrangements capable of organizing this transition. Meanwhile chronic civil violence in economically stressed parts of the world and extreme forms of terrorism in the United States give pointed warning of the danger of not organizing it.

These circumstances impose major conceptual burdens. There is good reason to believe

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<sup>6</sup> Allen Hammond, *Which World: Scenarios for the 21st Century* (Washington, D.C.: Island Press/Shearwater Books, 1998), p. 73.

<sup>7</sup> Steinbruner, *Principles of Global Security*. p. 9.

<sup>8</sup> See J. T. Houghton, Y. Ding, D. J. Griggs, M. Noguer, P. J. van der Linden, and D. Xiaosu, eds., *Summary for Policymakers: A Report of Working Group I to the Third Assessment Report of the Intergovernmental Panel on*

fundamental principles of policy and prevailing political attitudes will have to be altered substantially if adequate performance is to be achieved. In particular, security and economic policies will have to be integrated much more effectively than they have historically been, and both will have to be more global in scope and more equitable in content. Presumably, existing human institutions of all types will be severely tested, and it is prudent to assume that their basic viability is in question. If so, their ability to adapt successfully will depend on whether the requirements for doing so can be conceived with sufficient accuracy, clarity, and consensus in sufficient time.

At the moment, that observation itself would probably not command broad consensus, and the more specific implications that might be derived from it certainly would not. Nonetheless there are some evident possibilities to consider. For security policy it seems plausible that the concept of threat will have to be adjusted at least to supplement and probably to subordinate the traditional concern with deliberate aggression so that more systematically organized protection against spontaneous forms of violence can be developed. It seems plausible as well that a serious effort to determine the requirements of constructive adaptation would enhance the weight given to social equity considerations in devising economic policies. The distinction between a deliberate enemy and a dangerous process connects reasonably directly to the conceptual distinctions presented in the book. The connection to issues of social equity is less evident and is not directly discussed in this volume. One can at least suggest, however, that prevailing concepts of political identity and principles of affiliation can be usefully addressed with these distinctions in mind. If, as appears possible and even likely, a largely spontaneous process of globalization is tying everyone's fate to everyone else's to a greater extent than has ever been experienced, then one would expect extraordinary organizational adaptations to emerge. The historical attitudes, policies, and patterns of affiliation of traditional states and cultural groupings would not be an adequate guide to that development.

## CATALYTIC PROBLEMS

Admittedly, however, broad concepts and their global implications are likely to be matters of spirited dispute for quite some time before settled judgments could be expected to

emerge. Major reformulations of policy that do occur will probably be initiated in the context of specific problems that prove to have broader implications than initially realized. There are at least two contemporary security problems that might plausibly have that catalytic effect. One has to do with the pattern of nuclear weapons deployment inherited from the Cold War period, and the second with the problem of terrorism that has recently emerged as a riveting concern. Both issues appear starkly different when viewed from the perspective of adaptive processes than they do when more traditional and more established perspectives are applied. Moreover, the connections between them appear much more significant. Since major consequences are at stake in both instances, there are strong reasons to expect them to provide the occasion for conceptual adjustment.

The multilateral force proposal discussed in the book was one episode in the extended historical sequence that produced the prevailing pattern of nuclear weapons deployment—a pattern currently involving five actively operated national nuclear forces and at least three more inchoate ones. Of those eight national establishments, the two maintained by Russia and the United States are substantially larger than the others and more directly coupled. In raw numbers both of these main forces are smaller than they were at the height of the Cold War and are projected to decline further. The political context in which they operate is also less contentious. But despite all that, their destructive potential is virtually as lethal as it ever was, and their operational configuration has not fundamentally changed. While declaring themselves to be aspiring partners, Russia and the United States still continuously maintain thousands of nuclear warheads on advanced alert status poised to initiate mass attack within a few minutes.

It is a nearly universal conviction that the powerful deterrent effect emanating from this configuration of forces reliably assures that the elaborately prepared attack plans would never be implemented. And indeed, as far as the calculus of strategic intention is concerned, it is very difficult to quarrel with that contention. The prevailing configuration of forces clearly enables a massively destructive accident to occur, however, and the danger looms much larger if one admits the possibility that the intricate operations of the forces in particularly stressful circumstances might be determined more by adaptive logic than by the analytic outcome calculation on which the deterrent effect depends.<sup>9</sup> In the perspective of adaptive logic, actions that are

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<sup>9</sup> The substantive aspects of the problem are discussed in more detail in Steinbruner, *Principles of Global Security*, Chapter 2.

considered by both sides to be prudent precautions might inadvertently trigger a catastrophic engagement that neither country intended nor anticipated. That inherent danger is compounded by the fact that Russia, undergoing extensive economic and social transformation, cannot reasonably sustain the effort required to operate forces in alert configuration with high standards of safety.

Since an adequate deterrent effect can clearly be achieved with much smaller forces not committed to alert operations—a fact long demonstrated by China—it would in principle be possible to undertake a substantial reduction of nuclear weapons deployments without a corresponding revision of underlying policy conceptions. If the number of weapons were all that mattered, that might well happen. As the number of weapons is reduced, however, the operational practices of the forces become ever more significant. The very extensive effort required to reconfigure deeply entrenched American and Russian operational procedures is not likely to occur unless it is accompanied by a substantial shift in conceptual perspective. The destructive potential of the principal nuclear arsenals creates a powerful incentive for that shift to occur. It is by far the greatest immediate physical threat to the two societies in question and to all others as well. Eventually, one can presume or at least hope, the inherent threat will have to be more decisively contained.

In sharp contrast to that situation, the threat and the actual occurrence of terrorism has only recently become a major security concern in United States, and there is very little established doctrine or operational procedure to go by. The deterrent capacity of nuclear forces is acknowledged to be largely inapplicable. Their intimidating power may contribute to the circumstances that incite terrorism but does not offer effective protection. Terrorists cannot be attacked if they cannot be found. If they are found, nuclear weapons are not needed and are far too destructive to be used.

Terrorist incidents are understood, virtually by definition, to be the result of explicitly formulated intentions. The label would not be applied unless there was some reasonably imputed purpose extending beyond normal crime—a political or social outcome being pursued by violent means. And despite the anger and revulsion terrorist violence inspires, there is grudging recognition of the logic that generates it. Terrorism is a natural resort of an overmatched adversary, in which the inherently weaker side attempts to provoke the stronger one into self-destructive or discrediting reactions. In that perspective the effort to contain terrorism appears to

be as much a contest of analytic calculation as the conduct of deterrence. It therefore appears to be subject to similar conceptual assumptions, even if the implications work out differently in starkly contrasting circumstances.

It is doubtful, however, that the problem of terrorism can be adequately understood or effectively managed entirely in terms of the calculated maneuvers of perpetrators and defenders. Superior skill on one side or the other in the deadly game of provocation and reaction is not likely to produce a tolerable result. It is at least plausible that the problem is being generated by the social equity pressures associated with globalization—that it is in effect a pathology or a symptom of pathology in the broadly dispersed adaptive process induced by the underlying circumstances that drive globalization. If so, then that fact will have to be recognized as a general and compelling security problem. That possibility is particularly difficult to visualize from an analytic perspective because it entails the implication that the indiscriminate violence practiced by terrorists is somehow justified. Adaptive logic offers a more impersonal account, suggesting that the essence of the problem is not only the terrorist actions themselves but more fundamentally the breakdown of legal standards and principles of civil behavior that normally prevent malicious violence. If terrorists do not constitute the prime threat to social coherence but are rather the manifestation of a deeper spontaneous threat that is not intentionally organized, then appropriate responses will have to be much more extensive and different in character. That would certainly include exercising much more robust managerial control over nuclear weapons and the fissionable materials used to create them. The conceptual distinction between analytic and adaptive logic is certainly not all that would be required to devise effective responses in that situation, but it might prove to be quite important.

## THE ISSUE OF GLOBAL RISK

The incipient dangers embedded in widely dispersed nuclear weapons operations and the active violence associated with terrorism are not the only immediate problems, of course, that offer a specific context and a strong incentive for more advanced conceptualization. They are good illustrations but not an adequate guide for predicting the general evolution of policy perspectives. There are many other immediate issues where the underlying distinction between analytic and adaptive reasoning might be pursued with broadly significant results, too many to



make a comparative assessment with any confidence. It currently appears likely, however, that over the course of several decades problems associated with the management of global ecology will assume a truly unusual degree of importance capable of altering the foundations of policy, patterns of affiliation, and the design of institutions. Those problems, moreover, can be expected to pose an especially dramatic test of analytic and adaptive logic.

As noted, the basic source of the global management issues is the increase in aggregate human activity resulting from total population increases and more advanced forms of economic production. One cannot be sure that all the relevant dimensions of this increase have yet been identified, and some of those that have been are not as yet adequately measured. But a few have been measured and their consequences outlined with enough precision to pose a very sharp warning. In particular it has become evident that the accumulation in the atmosphere of carbon gases emitted by human activity is reaching levels capable of triggering state changes in global climate patterns. The basic process whereby these gases absorb and reradiate infrared energy is known with as much certainty as anything is ever known, and the lengthy dwell time in the atmosphere of an emitted molecule—on the order of a century or more—is known with confidence as well. Pre-industrial atmosphere concentrations of the most sensitive gases—carbon dioxide and methane—has been estimated, their current concentrations measured, and increases of 30 percent and 100 percent respectively recorded. The projected concentration of these gases is a matter of some uncertainty as are the climatological effects of prospective concentrations. Consensus scientific judgment suggests, however, that an increase in average surface temperature of three degrees centigrade or more is likely to occur over the course of a century.<sup>10</sup> A temperature shift of that magnitude, occurring over 1000 years rather than 100, was associated with the onset of the last ice age 18,000 years ago. Although that was a decrease rather than an increase, the clear implication is that basic global climate patterns are subject to radical shifts over the average temperature range in question. That in turn implies that the viability of contemporary human societies is also in question.

There is, of course, a powerful inclination to doubt that consequences of vitally significant magnitude would actually occur anytime soon, but that is not an adequate reason for dismissing the possibility. It inexorably looms with accumulating but inconclusive evidence as a

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<sup>10</sup> Intergovernmental Panel on Climate Change, *Climate Change 1995—The Science of Climate Change. Summary for Policymaker and Technical Summary of the Working Group I Report*, 1996.

monumental problem of prudential judgment. If we all wait until the character and timing of specific climatological effects can be demonstrated with normal standards of scientific confidence, the momentum of the effect in question is likely to be too large to be deflected. If we act in mistaken anticipation, we will at least waste time, effort, and resources and could have some perverse effect.

That dilemma imposes severe burdens on each of the basic decision processes discussed in the book and amplifies their distinctive features. If ever there were an occasion for the valid application of analytic logic this would be it. It is truly vital to anticipate accurately the potential consequences of carbon gas accumulation and of many other human-induced environmental effects as well, but that mandate is well beyond what current knowledge can accomplish. If we rely on adaptive processes that do not require accurate anticipation, we may avoid assertive errors of judgment but fail to perceive approaching calamity until it is too late. The adaptive process succeeds in natural evolution at the cost of repeated failure, as the extinction of many species that once flourished on the planet reminds us. Presumably it is important to keep both perspectives in mind.

To put it mildly, there are no easy answers in prospect, but there certainly are strong reasons to marshal the best effort we can manage. I continue to hope that this book and the distinctions it presents will help in some way with that effort.

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